The urbanisation of Irish society has had a profound impact on the character and mix of Irish research. The research agenda now encompasses such diverse issues as the urban consequences of economic restructuring, inner-area economic and physical regeneration, environmental protection and building conservation, residential development and the crisis of housing affordability, the suburbanisation of employment and the impacts of the separation of land-uses on traffic circulation and congestion. It has been concerned with investigating urban issues in advance of policy development and engaging in the monitoring and review of urban policies.

The publication of the Journal of Irish Urban Studies marks a growing recognition of the importance of urban-related issues in Irish society. It was established as a forum for the dissemination of research and the stimulation of discussion and debate. It is a joint production of the Centre for Urban and Regional Studies, Trinity College Dublin, and the School of Geography, Planning and Environmental Policy, University College Dublin. This Special Issue is supported by the Urban Environment Project, UCD Urban Institute Ireland.
NOTES FOR CONTRIBUTORS:

The Editors welcome the submission of articles for consideration for publication. Articles should be original contributions not previously published or under consideration for any other journal. Authors should ensure that the work does not infringe any existing copyright or breach laws of libel.

Articles will be forwarded for review to appropriate members of the Editorial Board for anonymous evaluation. Additional expertise may be sought in determining the merits of any submitted article.

The Journal welcomes the submission of articles from researchers and professional practitioners working in either the public or private sectors. Papers should be relevant to contemporary Irish urban issues. Reviews of non-Irish issues will also be considered insofar as they demonstrate considerable relevance to the Irish situation.

Short papers from urban practitioners (planners, surveyors, architects, housing managers, community workers etc.) reflecting on or critically evaluating specific aspects of contemporary policy and practice are particularly welcome for publication in the Papers from Practice section of the Journal.

Articles should not exceed 7,500 words and submissions for Papers from Practice should not exceed 4,000 words.

Copies of articles should be sent to one of the Managing Editors. The title of the article, the author’s name and institutional or business affiliation should appear separately. Tables, figures, maps and other illustrative material should be included separately at the end of the article.

Citation of other publications should be in Harvard style (i.e. author’s name followed by the year of publication). A list of publications to which reference has been made in the text should appear at the end of the article, ordered alphabetically and entitled References. The layout and referencing format of the current issue should be followed. Full stops should be followed by a single space. Footnotes should be kept to a minimum.

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Dr. Ronan Foley and Professor John Sweeney
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Introduction
The increasing concerns across Europe for the likely future urban environments of its major city regions are often modelled within a set of planning and sustainable development frameworks (European Commission, 2006). In Ireland, the Environmental Protection Agency (EPA) has taken a lead in considering urban environmental futures through a range of funded research projects. One core project, the Urban Environment Project (UEP) has involved the development of a multi-disciplinary model of the future Dublin city-region based around the spatial modelling tool, “Monitoring Land Use/Cover Dynamics” (MOLAND) (Williams and Convery, 2010). Though the principal objective of the project was to incorporate and embed current indicators into a predictive model of the future urban environmental fingerprint, there was considerable interest in the ways in which existing planning policy also critically informed the likely future shape of the city (Walsh, 2008). As a summary of the work of the UEP project, the team, in conjunction with the Forum for Irish Urban Studies, organised a one-day workshop on Friday, November 13th 2009 in Trinity College Dublin to disseminate its findings and discuss a range of key themes that might shape the urban environment of the Dublin city region in 2026. The outcomes of the presentations and discussions that took place in that workshop form the basis of this special issue. The presenters and invited audience represented a range of academics, planners, community organisations and local authorities, all of who had an interest in the future of the city.

Context of the Papers
The EPA-funded UEP project was managed by a team of researchers drawn from the lead agency, Urban Institute Ireland at UCD, led by Frank Convery, together with academic partners from Trinity College Dublin and NUI Maynooth, and private sector partners including ERA-Maptec. The wider brief of the project was to adapt and create a generic land-use model for the Greater Dublin Area (GDA) that could be applied to other urban areas in Ireland and that could be used with, and compared to, international models (Williams and Convery, 2010). Within the project, five distinct applied sub-themes were developed: urban sprawl, air quality, biodiversity, climate change and transport. All of the five sub-themes had overlapping components, which in turn were modelled within a cellular-automata framework. The cellular-automata approach utilised the MOLAND GIS model developed by the Research Institute for Knowledge Systems (RIKS) in the Netherlands (White and Engelen, 2000). At the same time, each of the sub-themes were explored by a team of research students and supervisors to examine a wider set of critical questions. It is this combination of modelling and deeper critical analysis that has shaped the material included here. While some work focused directly on MOLAND, other researchers took a wider perspective and extended the reach of the discussions to consider urban planning issues in a broader context.
In summarising the wider context around which the discussions took place, it is useful to list these as a variety of approaches emphasising technological, empirical, environmental and other planning considerations. The critical importance of the GDA as the engine of growth for the Irish economy makes this work relevant in a wider context of regional development and this has been recognised by its influence on the Regional Planning Guidelines, as well as on transportation, services and strategic environmental resource management planning throughout the region.

The Papers
While the papers in this issue vary in their direct connection with, and use of, the MOLAND approach, all are focused on the wider urban environmental implications of planning in the GDA with particular emphases on the interrelationships between planning policy and development trajectories in the region, both in the past and potentially into the future.

The first paper by Williams, Walsh & Boyle focuses on models of urban form and the differences in the drivers creating these forms. The notion of a more fluid ‘zwischenstadt’ urban form provides an interesting view of currently experienced mobilities. Within the paper there is a strong focus on functional urban regions (FURs), framed against how FURs are in turn shaped by policy and governance. Perhaps the key finding is the relatively significant impact on meaningful sustainable development associated with the ongoing disconnect between functional and administrative spatial units. This is expressed on the ground in the types of urban sprawl identified in Dublin. To manage this more effectively into the future suggests a more meaningful engagement in the debates over governance and functional spaces.

A linked paper by Maclaran, Attuyer and Williams has a specific interest in patterns of office location, in particular in relation to inner-city and suburban shifts between 1960-2008. The paper clearly describes empirical patterns, with a more detailed discussion of critical causative factors. These include shifts in supportive policy, local authority reorganisation, and economic pressures, all of which are implicated in accounting for the spatial shifts described. The wider impacts on commuting and environmental sustainability associated with the mobile location of office developments is also usefully identified.

Both residential and commercial expansion, however, have particularly serious impacts on natural environments and these are explored by Brennan, Hochstrasser and Shahumyan. Modelled land use futures are shown to be particularly serious for habitat loss and fragmentation in coastal Co. Dublin where adverse impacts may be exacerbated by an increased risk of coastal flooding. Adaptive solutions are available and should be assisted by forthcoming planning legislation. The breathing space provided by the current economic slowdown, it is argued by the authors, offers an opportunity to implement a more far-seeing sustainable planning approach.

Environmental aspects are explored further by Brennan, Convery and Brennan, who provide field-based evidence of the linkages between various stages of urban development and biodiversity in the GDA. Green infrastructure is increasingly seen as an integral component of urban planning and this paper addresses the practicalities of how best to incorporate biodiversity considerations into urban design.
As city regions increasingly become the dynamic foci of economic and social activity within countries, issues of governance assume greatly increased importance. This is further complicated by globalisation blurring the jurisdictions between local, regional and national priorities and reducing democratic inputs into the planning process. O’Broin explores these themes for Dublin, identifying structural deficiencies and democratic deficits which hinder Dublin’s performance on the international urban stage as it faces challenges such as climate and demographic changes, a shift to a low carbon economy, reorganisation of the global financial system, and the necessary restructuring of the city-region’s economy. Democratic renewal and meaningful partnership are seen as the essential ingredients for tackling these issues and ensuring that a future Dublin prospers contentedly and sustainably.

This issue of the Journal thus exemplifies the multidimensional aspects of modern urban management, using the case study of the Greater Dublin Area. These complexities can be better understood using powerful modelling methodologies such as MOLAND. Pointers for where future concerns will arise can be incorporated into planning structures and alternative futures tested out to some degree. However, even during the short duration of the Urban Environment Project, fundamental shifts in circumstances have occurred for Dublin and new issues of consolidation and retrenchment for the city region have appeared on the horizon. Fundamental changes in the relationship between the core and periphery of the city region are emerging, exerting a new set of challenges. The papers described above offer some key pointers on how such challenges should be addressed using evidence-based approaches founded on good spatial analytical techniques at appropriate scales of investigation. The crucial significance of the planning process and governance of that process is also highlighted, together with the need to prioritise to a greater extent the sustainability of both the natural and social environments as they are impacted by economic drivers. Ultimately, the project demonstrates that if the lessons of the past are learned, they can be incorporated into a new approach to planning for a different, more environmentally and socially sustainable, and better governed, Dublin City Region.

References


The Development of the Functional Urban Region of Dublin: Implications for Regional Development Markets and Planning

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Abstract
This paper investigates the land transformation process and growth pattern emerging in the functional Greater Dublin Area (GDA). The process is considered in the light of the growth pattern of the GDA, which is analysed based upon economic and social statistical evidence. The emergence of discontinuous patterns of development and rapidly expanding functional urban areas has been observed in many developing city regions. Two contrasting trends have emerged with an urban regeneration-driven return of development to the central areas of economically strong cities and a concurrent significant dispersal of housing and employment activities development in a sprawl type manner. It is recognised that such patterns have significant implications for the long-term urban development of regions such as Dublin. This paper includes empirical evidence on emerging development patterns, which it is expected will assist in evaluating the effectiveness of policy measures. The paper argues that the absence of an effective strategic decision-making process at the functional regional level negates national development policy aspirations. A methodology is proposed to develop a regional understanding of current and proposed patterns of development and their influence on urban form. The paper includes a contrast between stated policy aims, analysis of development data and conclusions on likely future trends. The conclusions explore the likely future development trends in the functional urban region and their implications for policy making and development.

Key words: Functional urban regions, urban form, land and housing markets, regional growth patterns.

Section 1: Introduction

City Regions and Functional Urban Areas.
Regional economic development has played an increasingly important role in planning and development policies in Ireland and Europe in recent decades. This can include building economic competitiveness in Ireland or addressing declining industrial competitiveness in established industrial regions suffering from the effects of global economic restructuring (Danson, 2003). From the 1990s onwards, the seminal works of Porter (1990) and Krugman (1991) have developed a critical focus on exploring issues of agglomeration economies and economic competition in a geographical setting (Evans, 2003). Modern enterprise development policies often prioritise enterprise clusters and the role of institutional structures and capacities in developing cost advantages and urban/regional competitiveness. The new urban economic patterns of more diffuse settlement patterns - spread city, edge cities and polycentric city form - are explored from this period in the work of Garreau (1991), and Fujita
Sassen (2001) is one of a group of researchers who have stressed the emergence and economic importance of major urban regions as dominant economic entities in the emerging global economy.

The structure of the paper involves analysis of the management of growing urban city regions in terms of their urban form which impacts upon their planning and development. The concept of the Functional Urban Region (FUR) is developed, and arising issues of governance, planning and development are outlined. The evolution of policy approaches and objectives in managing growth in the Dublin Region is then analysed and compared with data analysis of the actual development pattern emerging. This spatial representation of emerging development trends is followed by an analysis of the policy implications of such trends and arising issues for the development of the Greater Dublin Area.

**Forms of Urban Development**

Patterns of urban development are expressed through a variety of distinct forms, which act to constrain and influence the patterns of development in metropolitan areas. Each metropolitan region is the product of a number of principal economic, social, physical and political factors that have influenced the respective character of each urban region to varying degrees (Sassen, 2001). Urban areas have evolved through, and been affected by, various urban development processes, including:

**Agglomeration of economic activity**

Commercial enterprises tend to cluster together in order to achieve economies of scale and derive the benefits associated from complementarities and the use of a developed infrastructure (Asheim et al, 2006). Major urban areas tend to offer a wide range of infrastructure support to businesses, including transport (roads, rail, airports, and ports), telecommunications, educational institutions and ancillary services. In addition, the agglomeration process tends to be self-reinforcing, as incoming enterprises recognise the economic benefits offered at existing locations and accordingly locate adjacent to these. In essence, businesses that cluster together adopt a risk-minimisation strategy and benefit from shared availability of services (Asheim et al, 2006).

**Restructuring of economic activity**

Due to the trend towards globalisation of industry and commerce, many traditional industries in Europe and the developed world, particularly of a labour intensive nature, are relocating to low-wage developing economies. The consequence for the built fabric of cities as a result of these trends has been the physical decline of older manufacturing and port areas, and the economic and social exclusion of the semi-skilled and unskilled workforce, contributing to increased unemployment rates (Kasanko et al, 2006). Within Europe, metropolitan regions have increasingly engaged in competitive strategies with each other in order to attract their share of a reducing amount of new commercial activity (Gemaca II/Cheshire, 2002). Evidence of the increasing effective market size of metropolitan regions is emerging internationally (Parr et al, 2002). This is associated with developments in transportation and technologies, as modern economic growth is often based upon the knowledge industries, including financial services and ICT industries. The major thrust of such growth is towards larger capital and administrative cities, creating tensions with other regions not benefiting from such growth.
The implementation of growth management strategies often proposed by national plans or guidelines is a recurring theme in many areas experiencing rapid urbanisation. Throughout the 1980s and 1990s, concerns about unrestrained suburban development induced national and state authorities across Europe and North America to examine proactive planning legislation to promote compact urban form and more sustainable forms of development. Some of the drivers for this managed, or smart, growth approach are emerging policy priorities, including minimisation of air and water pollution, reutilisation of derelict lands, reduction of commuter travel distances, creation of critical mass for city regions and preservation of natural lands.

The success or failure of such policies in preventing unmanaged or dispersed development continues to be the subject of diverse opinion as to whether growth management works. In particular, attention is often paid to the role of landowners in the transformation of land affected by metropolitan expansion and leapfrog development patterns (Sazak, 2004). The use of urban growth boundaries within regional physical planning in cities as diverse as Oregon, Melbourne and Santiago is cited by Frenkel (2004), who notes the absence of empirical studies to provide evidence for the effectiveness of tools and policy measures.

Recognition of the importance of major cities and their role within all international economies has grown significantly with the rapid pace of economic restructuring. In tandem with such recognition, relationships and governance issues arise in many large metropolitan regions. Combinations of voluntary or statutory authorities have evolved to deal with regional planning issues. (Gemaca 1/ Knapp, 2002).

Fragmented decision-making processes internationally present particular difficulties within a region in dealing with vital infrastructure. As infrastructure is vital to both urban development (Hall 1998) and the economy (World Bank, 2003), pressures for reform towards effective co-ordinating capacities at a regional level are likely to continue. It is therefore essential that mechanisms be developed at an appropriate regional level to ensure an organising capacity exists at this level to plan and implement development policy.

The relative decline in state direct involvement compared to stated aspirations in social and economic development projects is apparent internationally (Stadler, 2008). This is evident in states traditionally viewed as having strong spatial policies aimed at compact and planned urban form, such as the Netherlands. Louw et al (2003) note the trend in the Netherlands towards a reduced role for local government as land developer and an increasing role for private interests. By comparison, in parts of the USA, which might be considered as less open to public interventionist policies, concern is evident at the consequences of unplanned urban growth. Since the 1970s, the land area found to be occupied by urban and metropolitan areas has more than doubled (US Department of Agriculture, 2000) and this expansion is reported to have accelerated in recent years. This is leading to public support for growth management, evidenced in the approval of many measures being adopted across the USA to protect existing open space (Wu et al, 2004).

As North America is the region most affected by sprawl, the debate on its consequences has been ongoing since the late 1970s (Nechyba and Walsh, 2004). In defending the sprawl process, commentators document that sprawl is ubiquitous, and will continue. Sprawl settlement patterns are driven by the choice of consumers for improved housing and living standards and reflect the modern choices for car-based living, and negative quality of life impacts are considered overstated (Glaeser and Kahn, 2003). Opponents of sprawl point to
congestion, environmental damage and a declining sense of community as among the negative impacts of the uneven spatial economic and social developments that result (Squires, 2002). Such commentators further allege that sprawl is not an inevitable function of market forces and choice, but has been supported by public policies favouring new build green-field and roads-based development (Rusk 1999). The continued decentralisation of employment and population to suburban locations along transport infrastructure and the impacts of emerging sub-centres on urban spatial structure continue to be a major feature of the analysis of the development of major metropolitan areas (McMillen and Lester, 2003).

The growth of cities in Europe has historically been driven by increasing urban populations. However, despite the fact that population pressure no longer looms as large a threat as it once did during the mid 20th century, a variety of factors are still driving urban sprawl (European Environmental Agency, 2006). These are entrenched in the desire to follow new lifestyles in a suburban context, outside the inner city. As the EEA further points out, sprawl has accelerated in response to improved transportation links and enhanced mobility. This has made it possible to live increasingly farther away from city centres, while retaining all the advantages of a city location. It has also enabled people to live in one city and work in another. Kasanko (2006) states that the most rapid growth rates for European cities were generally experienced during the 1950s and 1960s, and that in half of the cities studied in his paper Are European cities becoming dispersed?, over 90% of all new housing areas built after the mid-1950s can be described as ‘discontinuous urban developments’. This leads Kasanko (2006) to conclude that: “It is clear that the structure of European cities has become less compact. In most cases it is more a question of taste whether to call it urban sprawl or urban dispersion.”

Sieverts (2003), however, stresses that it is imperative not to draw a rigid line between urban sprawl and the compact city and emphasises the importance of avoiding a polarising debate in this regard. In his book Cities without Cities, Sieverts asserts that the modern built environment is not simply a city, but increasingly a number of large urban conurbations connected by transportation corridors. Using the German term Zwischenstadt1, Sieverts discusses the the creation of a city web or ‘mega city’. This emergence has been facilitated by a movement from a strong social cohesion and interest in towns and cities to individuals pursuing their own goals, with global social links and little interest in ‘their’ city (Stadler, 2008). Sieverts points out that the “difficulties in managing or even controlling the city web, which is divided arbitrarily into areas of limited size and political power, are enormous”. As a consequence, various areas compete with each other rather than co-operate. Rather than applying the simple conjecture of ‘sprawl’, a better understanding and improved planning systems for a new, emerging urban form is needed. A range of contextual issues arises in such international debates including private versus public property rights and the issues of an individual’s right to own, use and develop property (Judge, 2002). This debate as to individual rights, externalities and the constraints of regulation is the subject of continuing debate in Ireland with the recent report of the Commission on Private Property. The divergence in understandings and interpretations of property rights and resulting property pricing systems creates confusion in our understanding of the functioning of property markets (Cole and Grossman, 2002) and, importantly, makes international policy comparisons more difficult.

1 Zwischenstadt is described as a new form of urbanity experienced internationally. It is the urbanised landscape or the landscaped city. Sieverts calls this the Zwischenstadt, or “in-between city”, as it exists between old historical city centres and open countrysides, between place as a living space and the non-places of movement, between small local economic cycles and the dependency on the world market.
Defining and Measuring Urban Functional Areas

A Functional Urban Region (FUR) is defined as the geographic space appropriate for the comparison of economic development in urban areas (Williams, 2007). It is the space within which businesses enjoy access to a wide range of infrastructure and services including:

1) Telecommunications
2) Business premises
3) Skilled labour Force
4) Educational institutions and research centres

In simple terms, the Functional Urban Region is the space in which businesses operate. Antikainen (2005) provides a more quantitative definition whereby the FUR is described as:

the ‘travel to work area’, principally it is an agglomeration of work places attracting the work force from the surrounding area. If a certain share of the labour force in a defined fringe area are out-commuters it is attached to the municipality to which the largest portion of commuters go. This method is good for defining the most pronounced employment centres to which the more simple threshold level of commuting applies. In many international studies, a commuting threshold of 15 – 20% is used to determine whether a municipality is attached to a particular centre or not.

The international definition of a metropolitan area differs widely. In the European context, many historical boundaries of cities developed originally for defensive purposes were absorbed into larger entities for national, regional and local governmental purposes. This has led to boundaries that have major historical, cultural and regional associations. The revision of such boundaries has largely been a political issue, with revisions occurring in some countries, such as the UK, and less frequently in others. In the USA, a similar historical evolution of metropolitan boundaries used for political/administrative purposes has been augmented by significant US census bureau analysis of what is defined as a Metropolitan Statistical Area (MSA). An MSA is defined as an area containing a large population nucleus and nearby areas that are economically integrated as measured by structure of employment, commuting flows and population density.

Differing approaches throughout Europe of what represents a city and its territorial basis presents a challenge to policy makers and planners. Continuous additions to existing urban areas have provided a basis for defining urban areas. In France, the concept of agglomeration and urban morphology are relied upon, which may not include the outward spread of a growing city region. Contiguous urbanisation is prevented by land use policies in countries such as the Netherlands, while current and adapted political/administrative definitions are applied in other jurisdictions.

The research carried out by the EU Gemaca II project aimed to address this issue by adapting from best European and international practice and providing a methodology for analysis of data for comparably and usefully defined cities (Gemaca, 2002). The aim of the project was to define FURs by a consistent set of criteria, including population and employment densities,
and capture the economic and social sphere of influence of each area included in the study. The definition adopted is the Functional Urban Region (FUR) and is examined in the case of Dublin in this paper. In this context, a key message emerging from international experience and research is the necessity for the co-ordination of urban and regional strategies due to:

i. The reciprocal links between core cities and their regions;

ii. The necessity to ensure that the remit of effective strategies and boundaries extends beyond artificial boundaries and administrative jurisdictions (Robson, 2000).

Section 2: Functional Urban Regions and Objectives of Urban Spatial Policy in Dublin

A number of previous studies have examined the spatial implications of the Celtic Tiger period of accelerated economic growth, specifically in relation to the Dublin city-region. Williams and Shiels (1998, 2000 and 2002) identify an increased concentration of development and economic growth in the Dublin and Mid-East Regions since the mid-1990s, associated with a sectoral shift towards high-technology and high-skill industries (see also Breathnach 1998). Williams and Shiels further identify the emergence of an ‘edge-city’, comprising new employment nodes at locations on the periphery of the existing contiguous built-up area of Dublin city and extending into the Mid-East Region. The M50 C-ring motorway constructed in the 1990s is explicitly identified as a locus for this spatial dispersal of industrial and commercial development. The spatial expansion of the functional labour market area of the Dublin city-region is further characterised in terms of the emergence of ‘Outer Leinster’ as a location for residential development marketed towards people employed in Dublin. It is argued that residential development has ‘leap-frogged’ established dormitory towns in the Greater Dublin Area due to a shortage of housing supply within the Dublin Region in particular, and significant house-price differentials between the GDA and other regions (Williams & Shiels, 2002; Williams et al., 2007).

Gkartzios and Scott (2010), in a study of urban-rural migration in the Dublin city-region, highlight the importance of consumer choice in recent settlement trends in Ireland. They identify a preference for rural living and a distinctive Irish rural idyll associated with owner-occupied single rural dwellings in the countryside. For Scott et al (2006), “urban sprawl and dispersed patterns of settlement growth with long-distance commuting” are established as the characteristic features of settlement structure within the GDA (see also Williams & Shiels, 2002). A European Environment Agency study published in 2006 found Dublin to be a worst-case scenario of urban sprawl in Europe (EEA, 2006). However, the EEA study examined patterns of land-use change only and did not explicitly examine the demographic drivers of urban growth or the functional relationships between areas of settlement growth and traditional urban areas within a city-region.

It is clear from the analysis of population, housing and travel-to-work trends that existing administrative boundaries in Ireland often fail to reflect the reality of contemporary housing and labour markets, which operate at a regional scale and are characterised by complex intra-regional and urban-rural relationships. The purpose of this section is to further explore this

2 ‘Outer Leinster’ is understood as the eight counties surrounding the Greater Dublin Area, within the traditional province of Leinster.
In Ireland, an advisory regional authority carrying out regional planning functions assists a combination of voluntary horizontal linkages between local authorities, along with state sector agencies responsible for infrastructure and services. The principal regional planning strategy that works from a national perspective is the National Spatial Strategy 2002–2020.

Using the guiding principles of the NSS, the Dublin Regional Authority produced the Regional Planning Guidelines (RPGs) for the Greater Dublin Area (2004-2016), applying the vision of the NSS to the GDA. The RPGs followed the Strategic Planning Guidelines for the Greater Dublin Area, which were published in 1999 and reviewed in 2000. Concerning local planning and development practices, County Councils are required to produce a County Development Plan every six years. The purpose of a County Development Plan is to set out the planning authority’s policy stance for the sustainable development and use of land within its administrative area. This is done in accordance with the requirements of legislation, ministerial guidance and directives, and other relevant policies and plans. The Plan provides a strategic framework that directs new development towards appropriate locations and clearly sets out criteria against which development proposals are determined. A Development Plan must contain certain objectives (e.g. roads, zoning, proposals to treat wastewater) as listed in Planning & Development Act 2000 (Section 10.2). The County Development Plan is required to be consistent with the Planning and Development Act, the RPGs and the NSS with a view to achieving sustainable growth and development within its administrative area.

In discussing the objectives of urban spatial planning and the role of urban governance, it is necessary to identify those core policy issues which urban development and management policies are directed towards. The National Spatial Strategy (DoEHLG, 2002) was prepared by the Department of the Environment, Heritage and Local Government and set out a 20-year planning framework designed to deliver more and balanced social, economic and physical development across Ireland. Considering the GDA, the NSS aims to consolidate “the growth of the metropolitan area”, in order to maintain its status as a driver of national development. The National Spatial Strategy makes a distinction between the existing built up area of Dublin and its immediate environs; that is, the Metropolitan Area and the Hinterland Area, and proposes separate development strategies for these regions. At regional level, the Regional Planning Guidelines for the Greater Dublin Area (2004–2016) embrace the principles of sustainable development as set out in the National Sustainable Development Strategy and aim to provide a coherent strategic planning framework for Development Plans and the provision of major transportation, sanitary services and other infrastructure for the GDA in particular (DoEHLG, 2004). The issue of synchronisation of related policies is relevant; however a more substantial issue is the lack of serious implementation and support at local level.

From stated policy in recent years (DOE, 1997), priority in terms of sustainable urban development is accorded to the following:

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3 The text of the published European Environment Agency does not, in fact, include reference to Dublin as a worst-case scenario. This characterisation emerged from a media interview with the lead author at time of publication (McDonald, 2006).
• Encouraging careful location of residential, commercial and industrial uses;
• Planning and making effective use of existing developed urban areas;
• Integrated strategic economic and social planning.

The NESC report on “Housing in Ireland” (2004) identified the essential characteristics of a sustainable neighbourhood, including the importance of providing essential facilities within walking distance of new homes. This policy approach has been included in the recently published Guidelines on Sustainable Residential Development in Urban Areas (DoEHLG, 2009), which state the range of relevant national policies can be distilled into a series of high-level aims for successful and sustainable residential development in urban areas. Housing developers, their design teams, the planning system, and the community they serve, should share a goal to create high-quality places which should, among their objectives:

• Prioritise walking, cycling and public transport, and minimise the need to use cars;
• Deliver a quality of life which residents and visitors are entitled to expect, in terms of amenity, safety and convenience;
• Provide a good range of community and support facilities, where and when they are needed;
• Provide a mix of land uses to minimise transport demand.

There is a widely recognised need for the growth of Dublin to be consolidated (National Spatial Strategy, 2002) through the use of policy measures to encourage mixed-use, increased-density development. The current pattern of development is characterised by the rapid physical expansion of towns and villages located in a commuter belt extending up to 100 kilometres from Dublin city centre. Development is taking place in an often random, inefficient pattern with insufficient or no regard to the lack of social amenities, particularly in small villages. Decisions by the individual local planning authorities in the outer parts of the region to allow development often conflict with regional planning guidelines.

Unsustainable patterns of development were frequently supported by planning decisions influenced by lobbying from landowners at local level. The prioritisation of individual or local benefits over the general public good is often the result of such advocacy-based planning decisions. From ongoing tribunal level enquiries into planning matters in Ireland, it is clear that such approaches have also resulted in corruption of the decision-making process.

In 2002 An Taisce sought a judicial review of the Meath County Development Plan on the basis that an oversupply of land had been zoned for residential use. The High Court upheld the Plan despite evidence that it did not comply with the Greater Dublin Area Strategic Planning Guidelines, and ruled that councillors were required to have regard to guidelines rather than be strictly bound by them.

Contemporary with the expansion of hinterland towns, older suburban areas of Dublin have experienced population decline in recent decades, exemplified by falling population and school attendance figures (CSO, 2002). There is an apparent need to regenerate the demographic balance of inner suburban communities by consolidating development patterns instead of adding further pressure to rural locations and road networks through long-distance commuting. Limited progress has been achieved in these difficult planning and environmental policy areas, which may necessitate both structural institutional changes and
a cultural acceptance of such priorities. Just as fundamental as achieving specific objectives on targets as set is the basic issue of urban management systems. Achieving such objectives, whether in the short- or medium-term, obviously requires a process of urban management with a capacity to deliver. The need for effective urban management increases with rapid economic development of the type experienced in Dublin in recent years. Existing resources and infrastructure is relatively fixed in the medium-term and the need for effective urban management is consequently greater than before. In particular, the negative effects of rapid growth were quickly felt in the Dublin Region as infrastructure constraints led to congestion and affordable housing problems. As the long-term future of the urban region is intrinsically linked to urban environmental quality, it is essential that a co-ordinated and integrated response be developed to the city region’s infrastructure, land-use and economic development pattern.

The National Spatial Strategy 2002–2020 specifies a number of criteria that should be followed by local authorities in permitting housing. The objective is to encourage sustainable residential development through satisfying a set of seven headings. These measures are included below. Whether this test was properly applied to the decision-making process is arguable. Many existing housing developments have been located in poorly selected areas or in places lacking the necessary support infrastructure. For example, large amounts of housing have been constructed in areas where few community resources exist, which goes against the asset test, in flood plain areas, which goes against the carrying capacity test, and in areas dependent on the private motorcar for transport needs, which goes against the transport test. The influence of the NSS Residential Development Evaluation Criteria in the decision-making process is therefore questionable.

**Figure 1. National Spatial Strategy 2002–2020 (Residential Development Evaluation Criteria)**

<table>
<thead>
<tr>
<th>Box 5.1: Housing Location in Urban Areas</th>
<th>Evaluation Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Asset Test</td>
<td>Are there existing community resources such as schools etc with spare capacity?</td>
</tr>
<tr>
<td>The Carrying Capacity Test</td>
<td>Is the environmental setting capable of absorbing development in terms of drainage etc?</td>
</tr>
<tr>
<td>The Transport Test</td>
<td>Is there potential for reinforcing usage of public transport, walking and cycling?</td>
</tr>
<tr>
<td>The Economic Development Test</td>
<td>Is there potential for reinforcing usage of public transport, walking and cycling?</td>
</tr>
<tr>
<td>The Character Test</td>
<td>Will the proposal reinforce a sense of place and character?</td>
</tr>
<tr>
<td>The Community Test</td>
<td>Will the proposal reinforce the integrity and vitality of the local community and services that can be provided?</td>
</tr>
<tr>
<td>The Integration Test</td>
<td>Will the proposal aid an integrated approach to catering for the housing needs of all sections of society?</td>
</tr>
</tbody>
</table>
This growing dominance of the Dublin Region placed particular pressures on urban land markets and is clearly shown in the emerging constraints on development in this region, including problems of accessibility, infrastructure constraints and housing shortages. This situation has resulted in surges of development both at the edge of existing settlements and in a sprawl type pattern at locations connected to Dublin by the region’s arterial road network.

This region and other major urban centres, such as Cork and Galway, have remained the location of choice for significant inward investment that continues to favour Ireland as a location due to its generally favourable business environment and low rates of corporate taxation. An aim of national government policy is to achieve a wider dispersal of such development to achieve balanced regional development.

The Strategic Planning Guidelines (SPGs) were introduced in 1999 in order to address the problems of the growth of Dublin and to channel such growth into a series of development centres within the commuter belt of the city.

However, the spatial form of recent development often does not conform to the plans outlined in the Guidelines. In addition, a number of problems exist with the policy direction of the Strategic Planning Guidelines, including the following:

- The absence of effective co-ordination amongst principal stakeholders;
- Competition for resources and revenue amongst the individual affected local authorities who remain the statutory planning authorities for the region;
- The under-estimation of the scale, pace and immediacy of the economic growth experienced in the Greater Dublin Area over the past five years.

Section 3: Dublin’s Functional Urban Region: Demographic expansion, economic growth and decline and spatial development patterns

Regional scale spatial planning reports and strategies for the Dublin city-region since the 1960s have attempted to demarcate the boundary of the functional urban area of Dublin. The Wright Plan, published in 1967, sought to plan for the wider functional region of Dublin as stated in the first paragraph of the report: ”The Dublin Region may be broadly said to be that part of the Republic where life and livelihood are appreciably influenced by proximity to Dublin” (Wright, 1967a, 3). Although the report contains a detailed mapping of the functional region of the city based on indices of accessibility, commuting and shopping behaviour, the study region was taken to include all of counties Dublin (including Dublin City), Kildare, Meath and Wicklow, as well as south Louth, in recognition of the significance of the functional relationship between Drogheda and the Dublin region. Metropolitan Dublin is defined as the zone where “the regional influence of Dublin is overwhelmingly dominant” and to encompass land lying within 10 to 15 miles of the city and extending further along

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5 The SPGs were replaced in 2004 with statutory Regional Planning Guidelines (RPGs) prepared by each Regional Authority in the State, with the explicit purpose of implementing the National Spatial Strategy published in 2002. The RPGs for the Greater Dublin Area reaffirmed the core spatial strategy and spatial development objectives outlined in the SPGs, with minor alterations to reflect developments in the intervening period.
Figure 2: Strategic Planning Guidelines Spatial Strategy

Source: Brady Shipman Martin et al. 1999
primary routes (Wright, 1967b, 106-7). Similar to the currently designated Metropolitan Area, it includes portions of Kildare, Meath and Wicklow in addition to all of Dublin City and most of the former Dublin County. The Eastern Regional Development Organisation (ERDO) study, produced in 1985 sought to analyse the functional relationships between settlements in the East Region (the current GDA). In total, 11 sub-regions were identified through statistical analysis of commuting flows, spatial analysis modelling techniques and information derived from employment surveys and County Development Plans. Sub-regions were explicitly defined as the functional areas “within which the bulk of day-to-day activities… takes place for the majority of its population” (ERDO, 1985, 39-40). The principal primary data source for identification of commuting flows was place of work data from the 1981 Census of Population. The Dublin Sub-Region identified in the ERDO report was subsequently adopted as the study area for the report of the Dublin Transportation Initiative, published in 1994 (DTI, 1994).

The Strategic Planning Guidelines for the Greater Dublin Area and subsequent Regional Planning Guidelines distinguish between the Metropolitan Area (described as the “existing built up area and its immediate environs”) and surrounding “Hinterland Area”. It is noted that a key issue for the Hinterland Area is the “spill-over of development pressures from the built-up area of Dublin”, indicating the perceived functional relationship between the Metropolitan and Hinterland Areas (Brady Shipman Martin, 1999, viii).

A recent study commissioned by the Society of Chartered Surveyors on housing trends and urban sprawl in the GDA (Williams et al., 2007) included a detailed mapping of the Functional Urban Region and Economic Core Area of Dublin derived from 1996 and 2002 Census of Population data and employment data provided by an economic consultancy firm dated from 1999 (IDS). In this study the Economic Core Area concept was defined as agglomerations of Electoral Districts (eds), where a minimum of seven persons per hectare are employed in that ED with a threshold figure of 20,000 for the minimum size of individual agglomerations. On this basis the Dublin Economic Core Area (ECA) was found to be the only economic core area within the GDA. The Functional Urban Region of Dublin was defined to include all EDs within a distance of 15 miles of Dublin City Centre and those EDs located at greater distances from the city centre where greater than 10 per cent of the population travelled over 15 miles to work and in excess of the 10 per cent of the population at work were employed in public administration and professional services categories (Williams et al. 2007, 48). Employing place of residence data only, this analysis rested on an assumption that the majority of those commuting in excess of 15 miles in the province of Leinster were commuting to Dublin city.

Here, the spatial extent of the Dublin Functional Urban Region and Economic Core Area is derived from 2006 Census of Population data. In contrast to the methodology outlined above, the Place of Work Census of Anonymised Records (POWCAR) subset of the 2006 Census of Population allows for a direct assessment of employment density at a fine spatial scale and a direct matching of origin and destination data for the analysis of commuting flows. The Dublin Economic Core Area, as shown in Figure 3, comprises all EDs where employment density is at least 7 jobs per hectare (700/sq.km) within the four Dublin counties. The ECA includes approximately 406,000 people at work and 525,000 residents in 159 EDs and covers an area of 150.0 square kilometres (sq.km). In addition to the traditional Commercial Business District (CBD), large suburban nodes, including Blanchardstown, Swords, Dublin
Airport, Tallaght and Sandyford, indicate the increasingly dispersed and polycentric pattern of employment distribution within the city (Attuyer et al., 2009).

**Figure 3: Dublin Economic Core Area, 2006**

The spatial extent of the Dublin Functional Urban Region (FUR) is subsequently defined in relation to the ECA. The inclusion of EDs within the FUR is determined by two criteria:

- At least 10% of workers resident in the ED work in the Dublin ECA;
- 50 workers, resident in the ED, work in the Dublin ECA.

The POWCAR dataset records workers resident in all counties in the state who are employed in the Dublin ECA. Although the absolute numbers of commuters commuting from outside of Leinster are small, it may be assumed that many of the apparent long-distance commuting flows indicated do not in fact represent daily flows, but the misleading recording of migrants to the Dublin city-region as resident at their ‘family home’ rather than their principal place of residence. The criteria outlined above, based on international standards, are selected to reflect the actual spatial extent of the FUR based on daily commuting flows (Cheshire & Gornostaeva, 2002; Yarwood et al., 2005). In total, 454 EDs are included within the 2006 FUR. The total FUR area covers 4,138 sq.km. (Figure 4). For comparative purposes the spatial extent of the Dublin Sub-Region as defined by the ERDO strategy on the basis of 1981 data is shown in Figure 4. The area of the Dublin Sub-Region (2,016 sq.km) is less than half that of the 2006 FUR. Differences in methodology preclude further inferences to be drawn regarding the spatial expansion over the 1981-2006 period. With the exception of Togher, Calary and Altidore, located in north Wicklow, all EDs included in the ERDO sub-region are also included in the 2006 FUR. The principal contiguous area of the 2006 FUR extends to include all of the Dublin Region and large parts of northeast Wicklow, northeast and central Kildare, south and east Meath and southern Louth. Urban centres located at some distance from the principal contiguous area but included within the FUR include all or parts of Dundalk, Kells, Portarlington, Borris, Athy Baltinglass, Arklow, and Gorey. It should be noted that the spatial extent of the FUR as defined differs from that defined by Williams et al. in the Society of Chartered Surveyors commissioned study. The FUR has not contracted between 2002 and 2006. Rather, improvements in data availability and methodological changes have allowed for a significantly more accurate assessment of the spatial extent of the Dublin Functional Urban Region. In total, approximately 388,000 workers resident in the FUR in 2006 commuted to work in the Dublin ECA. This is, however, only 52% of the total number of resident workers in the FUR, indicating the continued significance of smaller dispersed centres of employment.

A county and regional level analysis of the workforce in the Greater Dublin Area is provided in Tables 1 and 2 below. The Greater Dublin Area workforce (defined by place of work) is composed of workers commuting to a fixed place of work (‘commuters’), those working primarily at home (‘home workers’) and those with no fixed place of work (‘mobile workers’). In this analysis mobile workers are excluded as their principal county of work is unknown. Almost 70,500 mobile workers are recorded with places of residence within the Greater Dublin Area. This compares to a total of 626,162 commuting to work in the GDA and 25,968 working from home in the GDA.

The statistics in Table 2 include both commuters and home workers. The place of work of home workers is determined by their place of residence. The total number of jobs in the Dublin Region (525,204) was significantly higher than in the Mid-East Region (126,886) in 2006.
Comparing with total population figures, however, provides a more meaningful basis for comparing the regional distribution of employment. There were approximately 442 jobs per 1000 population in the Dublin Region, compared with 267 jobs per 1000 population in the Mid-East Region.
In total 82.6 per cent of those at work in the Dublin Region were resident within the Dublin Region. An additional 13.4 per cent are recorded as commuting from the neighbouring Mid-East Region. By comparison, 77.6 per cent of those at work within the Mid-East Region were resident within the Mid-East Region. 11.4 per cent of those at work in the Mid-East Region commuted from beyond the Greater Dublin Area, a significantly higher proportion than for the Dublin Region. In total, 35,845 workers are recorded as commuting from beyond to the GDA to places of work within the GDA. This figure, however, represents only 5.5 per cent of the total workforce in the GDA.

Section 4: Policy issues Arising and Conclusions

The dispersed form of urban development in Dublin is a consequence of rapid expansion of urban development in an often spatially inappropriate manner: for example, the exacerbation of urban sprawl and unsustainable growth patterns emerging on the edge of the city. Such dispersed urban growth, characterised by single use and low-density development, can be viewed as a wasteful use of land and infrastructure resources. In addition it has tended to create oversupplies of speculative housing development in areas where little demand exists (Williams et al, 2010). An analysis of existing local and regional governmental structures impacting upon the region’s economic development indicates a need for reorganisation of such structures based upon an analysis of the requirements of the Functional Urban Region of Dublin. This could include an analysis of both the formal local government structures and the equally important linkages of local government, industry and community interests, which shape the future of the urban region. The past experience of horizontal co-operative systems in Ireland has seen a largely fragmented decision-making process. It is therefore suggested that there is a need for an integrated and co-ordinated approach.

In 2009/10, discussions on reforming local government structures in the greater Dublin Area followed the arguments in the consultation paper New Institutional Arrangements for Land Use and Transport in the Greater Dublin Area (DOELG, 2001), which provided recognition of the need for key structural changes in the urban management processes for the Dublin area. Existing arrangements, involving the sharing of administrative and executive powers over several layers of central and local government, create overlapping responsibilities. This is often characterised by competing or conflicting interests and an inadequate implementation capacity. The document envisaged the creation of a strategic level authority with responsibilities for linking transportation policy with planning and land-use. This was in recognition of Dublin as a high growth urban centre, facing a number of strategic challenges in areas including planning, transport, housing, waste, water provision and wastewater disposal. The document stated that a regional mayor for Dublin with defined strategic functions should be introduced and that the role of the mayor in relation to current and future institutional arrangements needs careful consideration, particularly with regard to the four Dublin local authorities, the adjoining local authorities, and national offices.

The potential for sudden changes in political priorities is clear when one considers the evolution of these proposals. The document proposed, for example, that the Dublin mayor

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6 If mobile workers are assigned to their region of residence, this figure increases to 84.0 per cent for the Dublin Region, with a corresponding figure of 81.4 per cent for the Mid-East Region.
Table 1: Greater Dublin Area workforce classified by place of work and place of residence, 2006

<table>
<thead>
<tr>
<th>Place of Work</th>
<th>Commuting Status</th>
<th>Origin of Commuters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Commuters</td>
<td>Home</td>
</tr>
<tr>
<td>Dublin City</td>
<td>289,200</td>
<td>5,281</td>
</tr>
<tr>
<td>South Dublin</td>
<td>82,878</td>
<td>2,505</td>
</tr>
<tr>
<td>Fingal</td>
<td>73,055</td>
<td>3,403</td>
</tr>
<tr>
<td>Dún Laoghaire-Rathdown</td>
<td>65,106</td>
<td>3,776</td>
</tr>
<tr>
<td>Dublin Region</td>
<td>510,239</td>
<td>14,965</td>
</tr>
<tr>
<td>Kildare</td>
<td>53,969</td>
<td>3,673</td>
</tr>
<tr>
<td>Meath</td>
<td>33,176</td>
<td>4,158</td>
</tr>
<tr>
<td>Wicklow</td>
<td>28,778</td>
<td>3,132</td>
</tr>
<tr>
<td>Mid-East Region</td>
<td>115,923</td>
<td>10,963</td>
</tr>
<tr>
<td>Greater Dublin Area</td>
<td>626,162</td>
<td>25,928</td>
</tr>
</tbody>
</table>

*Source: CSO*

Table 2: Region of residence of GDA workforce, 2006

<table>
<thead>
<tr>
<th>Place of Work</th>
<th>Region of Residence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dublin (%)</td>
</tr>
<tr>
<td>Dublin City</td>
<td>84.7</td>
</tr>
<tr>
<td>South Dublin</td>
<td>77.1</td>
</tr>
<tr>
<td>Fingal</td>
<td>81.2</td>
</tr>
<tr>
<td>Dún Laoghaire-Rathdown</td>
<td>82.0</td>
</tr>
<tr>
<td>Dublin Region</td>
<td>82.6</td>
</tr>
<tr>
<td>Kildare</td>
<td>12.1</td>
</tr>
<tr>
<td>Meath</td>
<td>8.1</td>
</tr>
<tr>
<td>Wicklow</td>
<td>12.2</td>
</tr>
<tr>
<td>Mid-East Region</td>
<td>11.0</td>
</tr>
<tr>
<td>Greater Dublin Area</td>
<td>68.6</td>
</tr>
</tbody>
</table>

*Source: CSO*
should become the Chair of the proposed Dublin Transport Authority. Furthermore, detailed consideration was to be given to the administrative and institutional supports necessary for the proper functioning of a mayoral office in Dublin. The Government was progressing legislation to establish a Dublin Transport Authority (DoEHLG, 2008), however in 2009 the Dublin transportation Office was instead subsumed into an expanded National Transport Authority.

The role of economic forces, which ultimately drive the urban economy on a functioning region basis, is often neglected or misunderstood. The patterns of demand that policies in the areas of transportation and planning try to accommodate are directly generated by the flow and direction of investment and development. The key providers of transport services will need to plan for the future demands of the economy in advance of service shortages and deficiencies arising. Population predictions at national, regional and local level clearly play an important part in this.

This should ensure that decisions on development in this area are based upon the needs and emerging demands of the urban region rather than being dominated by the requirements and wishes of existing producers and providers of transport services. It is to be hoped that research and analysis in this policy area will develop and shift urban policy realities towards a more sustainable urban form. While it is clear that sufficient planning and development policy exists at the top level, whether this is put into practice at a local level is often debatable. What is needed in this instance is a more robust implementation of the ‘rules’, and to avoid divergence between rational policymaking and how it is interpreted on the ground.

Urban development trends are traditionally linked to the context of the general economy and the public policy and regulatory environment. Recent trends include a broadening of the concept of location decision-making to include telecommunications and bandwidth capabilities, and a prioritisation of essential infrastructure, including roads and airports, as transport systems become more congested. In Ireland, as internationally, public responses to planning and development are increasingly attempting to integrate physical, economic and social issues to create a more sustainable environment. The relevance and connectivity of infrastructure provision and its benefits are recognised in the National Development Plan (which outlines strategic infrastructure investment plans) and is linked with the National Spatial Strategy 2002-2020 (DOELG, 2002) which set out public policy on spatial development issues over the medium term and will influence demand and urban development trends. The National Development Plan identifies a number of key strategic infrastructure commitments that it states are critical to its successful implementation. Specific reference is made to the implementation of the NSS as being a crucial objective.

In the context of the Dublin area, the NSS envisages the consolidation of the existing metropolitan area for a more efficient and competitive regional future. The role of clusters and innovation is recognised and requirements of potential counterweights to the Greater Dublin Area are addressed in terms of developing the regional area with a critical mass of population skills and innovative capacity. Essential attributes for alternative growth centres are quality of infrastructure, cultural, social and environmental assets, and educational attributes. The development of each region is to be within the context of a set of Strategic Planning Guidelines with which all public and private agencies are expected to comply. All development proposals must conform with the Statutory Development Plan prepared by each Local Authority having had regard to the National Spatial Strategy.
The intention of the selection of such centres is to encourage alternative concentrations of economic activity in the expectation that critical mass will aid the more cost-effective provision of services. In addition, such trends are expected to produce a more sustainable development pattern with a greater regional balance and a reduction in the present trend towards sprawl, particularly in the GDA. In comparing such aspirations to their potential for implementation, the vital role of public finances is evident. The ambitious targets for infrastructure provision in the National Development Plan were subject to a major review in 2003 and 2010. While progress has been achieved on initial projects, the level of cost overruns and time delays occurring presents major challenges. With weakening public finances and continuing obstacles to implementation, difficulties emerge. An increased role for Public Private Partnerships is being promoted as potentially assisting in achieving policy goals. However, policy makers are continuing to seek additional options, including legislative change to speed actions on vital economic infrastructure projects necessary to maintain economic competitiveness.

A rationale presented for this dispersal is that the Dublin Region and other major urban centres such as Cork and Galway have remained the preferred locations for investment and development during the recent period of rapid economic development. This has created problems and development constraints in terms of housing, access, infrastructure and services. Such problems can be linked to past failures to invest in and plan adequate infrastructure and services, but are often simplistically represented as a function of city size.

Difficulties persist in the promotion of a dispersal of foreign direct investment to regions outside the GDA. Dublin remains the main focus for international mobile investment and for many of these investors the reality is that the main alternatives considered are other medium-sized European centres such as Edinburgh and Amsterdam. Despite its recent population and employment growth, Dublin, by international standards, requires considerable improved development and management rather than diversion of development funding. Some essential improvements identified in the NSS include improved land access to the airport and broadband capacity throughout the region. A central feature of urban development policy debates has been the sustainability of dispersed housing settlement patterns particularly in the Dublin area. The review of Regional Planning Guidelines for the region (2003) highlights the importance of quality of life and accessibility issues.

The general issue of housing and settlement patterns was also examined by the NESC report on *Housing in Ireland: Performance and Policy* (2004). This report characterised the Irish housing system as dynamic but unstable, with problems in terms of the uncertainty and variability in land supply. The weak supply response in areas where demand was highest, such as Dublin in the late 1990s, was identified as a factor in the exporting of such demand regionally in a sprawl type manner. The later strong supply response is described as poor in quality in urban development terms. As with previous studies, the report noted the absence of integration between housing, land use and transportation strategies within the Greater Dublin Area.

Future urban development trends are likely to be linked to progress in infrastructure improvement, which results in shifting urban development market trends. The consolidation of existing urban areas with development along principal transportation corridors is now commencing. This represents a refinement of the extensive sprawl type patterns of development experienced in recent times when commuting patterns up to 100km from city-
based employment developed, facilitated by improvements in the radial road networks near major urban centres. Development based upon improved access is seen particularly in Outer Leinster, which has the benefit of proximity to the major employment zones at edge city locations surrounding Dublin on the M50.

In the short term, the location that has received the most significant boost to infrastructure is the area included in the Dublin to Belfast corridor. The upgrading of existing rail systems and the completion of the motorway from Dublin to the border with Northern Ireland represent a significant uplift to access and potential developments in this area. If political stability is maintained, the benefits of linking more closely the two largest population centres on the island will increasingly become evident with significant implications for urban development trends. Yarwood (2006) confirms that this region is the principal driver behind both the Republic of Ireland and Northern Ireland economies and underlines that strong support for the former’s Regional Development Strategy and the latter’s National Spatial Strategy provide strong support for this corridor. Yarwood (2006) also suggests that the development of a healthy and internationally competitive all-island economy can be aided by the complementary development of nearby cities and intervening towns and rural areas. This will encourage the emergence of an integrated and well-connected package with distinctive urban and rural elements.

Conclusions
It is now clear that the urban regional market of city regions such as Dublin have expanded considerably beyond historic city and county boundaries. The level at which territorial administrative agencies operate needs to take account of such trends. The most appropriate level for territorial competitive agencies based upon international research evidence is the Functional Urban Region. Absence of co-operation between agencies within such regions can be both wasteful and inappropriate. Further discussion of urban form and spheres of influence and an improved understanding are necessary to move away from the term of ‘sprawl’ that is often applied too liberally in describing unsustainable urban forms.

Residential and commercial occupation, employment, development and investment trends are all now regional rather than local issues. There is a necessity to manage such growth in a sustainable manner in the regional and national interest. Evidence is therefore required as to what is the economic sphere of influence of the Dublin area. The Functional Urban Region concept offers an appropriate methodological basis for examination of the growth of urban/regional growth and can be readily applied to other regions. Having established the importance of the functioning regional dimension, debates on urban and regional governance, strategic planning, development and environmental issues arising will hopefully be more informed. This will assist in attempts at policy reform in the area of implementing agreed national and regional spatial strategies.

It is evident that current planning and development organisational structures were not capable of handling the management of development on the city-region or functional urban scale. Part of the problem lies in the lack of willingness within existing structures to accept multi-level partnerships and collaboration. There remains a need for effective spatial governance to achieve coordination in the provision of infrastructure in tandem with residential and commercial development.
Acknowledgments
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Simulated future development of the Greater Dublin Area: consequences for protected areas and coastal flooding risk

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Abstract
The Greater Dublin Area (GDA) has experienced rapid urban expansion over the past 20 years. The development pattern has been described as economically driven and developer-led. These changes have had some well recognised consequences such as urban sprawl, congestion and a decrease in environmental quality. Despite the economic downturn, it is projected that the population of the GDA will continue to increase, potentially exacerbating the negative consequences of urban expansion. The objective of this study was to assess the consequences of continued urban expansion on the region, with particular emphasis on protected areas and flooding risk.

To assess the consequences of continued urban expansion we used the MOLAND model; a cellular automaton-based spatial decision support system that has been widely applied across Europe. This model allows the user to explore urban growth under different population, infrastructure and policy scenarios. Using MOLAND we simulated urban expansion in the GDA under four population projections to 2026, assuming spatial trends of urban development stay similar to the recent past. In all scenarios development disperses widely across the study area, formerly separate towns merge and coastal regions are subject to particularly high growth. We discuss the simulated development in terms of its ecological, environmental, social and health effects.

Introduction
Ireland has undergone massive changes over the past three decades: recession in the 1980s, boom in the 1990s and economic collapse at the end of the 2000s (Bartley and Kitchin, 2007). Over this period there have been substantial land-use changes and increases in population. The Greater Dublin Area (GDA) has been the focus of much of this change (Williams et al., 2007). The built fabric of the city of Dublin increased by 9,569 hectares while built fabric within the entire GDA increased by 26,287 hectares over this time period (McInerney and Walsh, 2009). Land use change in the GDA was driven by population growth and economic development, as well as house type and price. With house prices rising within the city, the rural fringes of the city, where it was cheaper to buy or build a house, attracted a growing number of people (Mitchell, 2004). At the fringes of the city, individuals could acquire houses in open countryside while retaining the benefits of the proximity to the capital or other urban areas. A planning regime that imposed few constraints on the conversion of agricultural areas to low-density housing areas facilitated this realisation. Nearby rural towns and villages
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Simulated future development of the Greater Dublin Area grew and merged with Dublin city as urban–rural migration continued, with growth radiating outward along the lines of road and rail transport links (Williams et al., 2007).

Such a massive and rapid expansion of the city has had several well publicised consequences: loss of urban green space, increased ecological pressure on sites of importance, traffic congestion and increased stress, to name but a few (Stapleton et al., 2000, O’ Regan and Buckley, 2003, European Environment Agency, 2006, Brennan et al., 2009). These undesirable consequences have lead to the introduction of new planning legislation (Dublin and Mid-East Regional Authorities, 2004, Government of Ireland, 2009b) in an attempt to direct development toward more sustainable patterns. The desired goal of spatial planning policies at national and regional level has been to promote consolidation of the GDA, thereby facilitating a shift from private to public transport, reducing environmental and socio-economic impacts associated with car dependency and traffic congestion (Department of Arts Heritage Gaeltacht and the Islands, 2002, Dublin and Mid-East Regional Authorities, 2004, McInerney and Walsh, 2009). Such an integrated view of planning policy is often hindered by a lack of available spatial information and the necessary tools to address multiple development goals simultaneously (Seder et al., 2000). Developing such tools may alleviate pressures that have lead to significant divergence between spatial planning policy and practice in the past (MacLaran and Williams, 2003, Scott et al., 2006). In addition, it may allow improvement of spatial planning with regards to aspects that have so far been neglected, such as the conservation of natural heritage (Clerkin, 2002) and the prevention of flooding.

There is considerable uncertainty concerning Dublin’s continued growth into the future (Department of Environment and Local Government, 2002, Convery et al., 2006). The Central Statistic Office (CSO) has produced a range of population projections for the region over the period 2011-2026, all of them forecasting a rise in population to a greater or lesser extent (www.cso.ie).

Since the rapid economic development and land-use change of the past has had lasting impacts on the quality of life and environment of the city (Brereton et al., 2008), it would be useful to forecast development into the future, expose potential issues before they occur and structure policy accordingly. Urban growth has been successfully modelled using cellular automaton-based models that incorporate real-world spatial information (White and Engelen 2000). Indeed, this approach has been used in other cities both within Ireland and abroad to evaluate alternative policy scenarios, highlight potential antagonism between continued urban expansion versus limited water resources, and illustrate that urban centres can grow while valuable land-uses, such as agriculture, can be retained (He et al., 2006, Browne et al., 2009, Rafiee et al., 2009).

The MOLAND model is a spatial decision support system widely applied since 1998 at urban/ regional scale (Barredo and Demicheli, 2003, McCormick, 2003, Lavalle et al., 2004, Lavalle et al., 2005, Convery et al., 2006, Petrov et al., 2009). MOLAND allows a user to construct a spectrum of future development scenarios, taking into consideration varying levels of economic, population and policy regimes.

In this paper we have constructed four future scenarios based on regional population projections provide by the CSO, where we explore how the GDA may develop if the current development trends continue. This paper will provide summary statistics of the simulated
land-use in 2026 in each scenario and discuss the corresponding implications for protected areas and flooding risk.

**Methodology:**

**The MOLAND model:**
The MOLAND spatial decision support system comprises two sub-models working at different spatial scales. At the regional scale (macro scale), the model takes as inputs the population and the economic activity (number of jobs by sector) in a region. The model then splits this population and economic activity between the sub-regions encapsulated in the model area. In the Greater Dublin Area (GDA) application, the sub-regions are the administrative counties within the region (Louth, Meath, Kildare, Wicklow, Dublin). At the local scale (micro scale) the demand for housing (based on population estimates) and economic activities is translated into a number of land uses. For example, housing will be provided within residential land use types and economic activity is linked to commercial and industrial land use types (e.g. offices buildings, shopping centres, etc.). The land use type assigned to any given cell is determined by an algorithm which aims to satisfy the demands for land use in each time step (Engelen et al., 2007).

At the regional level, the split of population and economic activity into sub-regions is based on the past relative importance of each sub-region for accommodating population and on job data, including place of work and distance travelled to work. Most of these data for GDA were obtained from CSO Census 1991, 1996, 2002 and 2006 datasets (Shahumyan et al., 2009a).

At the local level, the spatial allocation of land use is modelled by a cellular automaton algorithm. The area modelled is represented as a mosaic of grid cells of 4ha each (200m on the side). Together they constitute the land use pattern of the area. Land use is classified in 24 categories for GDA, eight of which are land use functions (e.g. residential, commercial, etc.), seven are vacant land uses (e.g. arable land, pasture, etc) and nine are land use features (e.g. restricted areas, airports, etc.). This model is driven by the demand for land per region generated at the regional level. Four elements determine whether a piece of land (each 4 hectare cell) is allocated to a particular land use or not:

- The accessibility of the cell, calculated based on a input map consisting of the transport network;
- Physical suitability of the cell, determined by the topographic and environmental appropriateness of cell to support a particular land use and associated activity;
- Zoning status or institutional suitability (e.g. legal constraints);
- The quality of the neighbourhood of the cell, which consists of a circular area with a radius of eight cells. For each land use a set of user-defined rules determines the degree to which it is attracted to, or repelled by, the other land uses present in the neighbourhood.

Based on these elements, the micro model calculates for every simulation step (typically one year) the transition potential for each cell for each land use type (White and Engelen, 2000). In the course of time, and until regional demands are satisfied, cells will change to the land
use for which they have the highest potential. Further details of the MOLAND model can be found elsewhere (Barredo et al., 2003).

Calibration is achieved by running simulations over a known historical period (in this case 2000–2006). The simulations are initiated using the historical dataset (2000) in order to test the simulation results using the reference dataset (2006). Subsequently the simulations are validated by running the model forward (to 2050) and checking the consistency of the resulting map. The future simulation of land-use can then be performed using the parameters of the already calibrated model, assuming, however, that the calibrated factors will remain relatively stable during the studied period. Detailed description of the calibration technique and used datasets for GDA is presented in a separate paper (Shahumyan et al., 2009a).

Population projections:

The national projections included three international migration (M0, M1, M2) assumptions and two fertility (F1, F2) assumptions, giving a total of six scenarios; M1F1, M1F2, M2F1, M2F2, M0F1 and M0F2. Of these, the regional projections for the eight Regional Authorities only considered M2F1 and M0F1. When coupled with the two internal migration scenarios the regional projections included four scenarios; M2F1 Recent (M2F1R), M2F1 Traditional (M2F1T), M0F1 Traditional (M0F1T), M0F1 Recent (M0F1R).

Projection assumptions:
M2 assumes an annual net inward international migration of 21,400 to the region in the period, while M0 assumes zero annual net inward migration. F1 assumes the total fertility rate to remain at its 2006 level of 1.9 for the lifetime of the projections. The internal migration scenarios, ‘Recent’ and ‘Traditional’, were developed due to differences found between censuses carried out up to 1996 versus the 2002 and 2006 censuses. The 1996 and pre-1996 censuses reveal a fairly stable picture in terms of the magnitudes of the inward, outward and net migration flows, with the Dublin and Mid-East regions receiving positive net migration flows while all other regions had negative flows. This flow pattern was reversed in the 2002 and 2006 censuses. Due to the lack of stability in internal migration movements over the period 1996 to 2006 the two internal migration scenarios were formulated. ‘Recent’ assumes we apply the patterns observed in 2002 and 2006 up to 2026, while under ‘Traditional’, the 1996 pattern of inter-regional flows is applied in 2016 and kept constant thereafter, with the difference between the 2006 and 1996 patterns apportioned over the years between 2006 and 2016.

Greater Dublin Area (GDA) versus MOLAND study area:
The GDA, comprising the Mid-East region and the Dublin region, is of similar, though not identical, extent to the MOLAND study area named Greater Dublin Region (GDR). The GDA consists of the Dublin counties, Meath, Kildare and Wicklow. The GDR consists of the Dublin counties, Meath, Kildare, Wicklow and Louth. Thus it was necessary to estimate the population for Louth in 2026 and add it to projected GDA population in 2026.
Louth’s population in 2006 was known from CSO data to be 111,267 people. To estimate Louth’s population in 2026 under each scenario we used the formula:

$$2026\text{ population} = \left(\frac{\text{Border region 2026 population}}{\text{Border region population 2006}}\right) \times (\text{Louth 2006 population})$$

The resulting values for each scenario were added to the corresponding GDA population projections (Table 1).

Table 1. Projected populations in the GDR by 2026 under the four regional population projections

<table>
<thead>
<tr>
<th></th>
<th>2026 M2F1T</th>
<th>2026 M2F1R</th>
<th>2026 M0F1T</th>
<th>2026 M0F1R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border 2026 population</td>
<td>592,000</td>
<td>651,000</td>
<td>523,000</td>
<td>575,000</td>
</tr>
<tr>
<td>Louth Multiplier</td>
<td>1.26</td>
<td>1.39</td>
<td>1.11</td>
<td>1.22</td>
</tr>
<tr>
<td>Louth 2026 population</td>
<td>140,149</td>
<td>154,117</td>
<td>123,814</td>
<td>136,125</td>
</tr>
<tr>
<td>GDA 2026 population</td>
<td>2,413,000</td>
<td>2,195,000</td>
<td>2,010,000</td>
<td>1,816,000</td>
</tr>
<tr>
<td>GDR 2026 population</td>
<td>2,553,149</td>
<td>2,349,117</td>
<td>2,133,814</td>
<td>1,952,125</td>
</tr>
</tbody>
</table>

Table 2: Cell numbers and mean population density within Urban Land Use Types for Calibration

<table>
<thead>
<tr>
<th>County</th>
<th>Residential Class</th>
<th>Cell number</th>
<th>Mean Population Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louth</td>
<td>Continuous Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Medium Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Discontinuous</td>
<td>212</td>
<td>265</td>
</tr>
<tr>
<td></td>
<td>Discontinuous Sparse</td>
<td>273</td>
<td>336</td>
</tr>
<tr>
<td>Meath</td>
<td>Continuous Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Medium Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Discontinuous</td>
<td>149</td>
<td>268</td>
</tr>
<tr>
<td></td>
<td>Discontinuous Sparse</td>
<td>414</td>
<td>414</td>
</tr>
<tr>
<td>Dublin</td>
<td>Continuous Dense</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>Medium Dense</td>
<td>65</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Discontinuous</td>
<td>3,511</td>
<td>3,925</td>
</tr>
<tr>
<td></td>
<td>Discontinuous Sparse</td>
<td>405</td>
<td>481</td>
</tr>
<tr>
<td>Kildare</td>
<td>Continuous Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Medium Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Discontinuous</td>
<td>247</td>
<td>405</td>
</tr>
<tr>
<td></td>
<td>Discontinuous Sparse</td>
<td>394</td>
<td>526</td>
</tr>
<tr>
<td>Wicklow</td>
<td>Continuous Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Medium Dense</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Discontinuous</td>
<td>214</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>Discontinuous Sparse</td>
<td>388</td>
<td>486</td>
</tr>
</tbody>
</table>
Estimating population share per residential class:
There are four residential land use classes, namely Continuous Dense, Medium Dense, Discontinuous and Discontinuous Sparse, used in the current land use map in the MOLAND model (Engelen et al., 2004). However, in the Greater Dublin Region the majority of population is concentrated in discontinuous and discontinuous sparse land use categories. To increase the accuracy of the model we split the population into two groups: ‘Sparse’, which includes discontinuous sparse urban fabric, and ‘Other” which includes the remaining three categories. To estimate the share of the population in each class on a per county basis we used population densities in sample Electoral Districts (EDs) from each county. The EDs were sampled only if the relevant residential class was the sole residential class within the ED and was present in all three time periods of model calibration (1990, 2000 and 2006). Population densities were calculated using the mean value of the sample of EDs.

The population present in the two groups was calculated based on cell number and density values for each county using the following formulae:

Sparse Population = Density Sparse * Sparse Cell Number

Other Population = Total population – Sparse population

Table 3: Residential populations within urban land use types for the calibration period

<table>
<thead>
<tr>
<th></th>
<th>Estimated Sparse Population</th>
<th>Estimated Other Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meath</td>
<td>37,783</td>
<td>35,170</td>
</tr>
<tr>
<td>Dublin</td>
<td>76,552</td>
<td>83,093</td>
</tr>
<tr>
<td>Kildare</td>
<td>47,783</td>
<td>60,570</td>
</tr>
<tr>
<td>Wicklow</td>
<td>55,193</td>
<td>59,525</td>
</tr>
</tbody>
</table>

The population of the two groups in the projected year 2026 was calculated as follows:


Other Population 2026 = Projected population 2026 – Sparse population 2026

When calculating the effect of population growth on land use in the Greater Dublin Region we therefore assumed that current population density will be maintained, i.e. there is little ‘infilling’ and/ or high density urban development.
**Employment Projections:**

Employment data is divided into three broad categories in MOLAND: Industrial, Commercial and Services. It should be noted that this employment data should ideally be by place of work (POW) and not by place of residence (POR). In Ireland, place of work data has only been made available for 2002 and 2006, when Sample of Anonymised Records (POWSAR) and Census of Anonymised Records (POWCAR) were implemented. Prior to this censuses recorded employment data by place of residence.

Since POW employment data was available for only one of the model calibration time periods (2006) it was necessary to estimate POW employment data for the other two periods.

POW employment data for 2000 was calculated using the 2002 census which contained both POR, and POW employment data and the 1996 census which contained only POR employment data. The proportion of jobs in each sector per county was calculated using the formulae:

\[
\text{POR 2002/POW 2002} = \text{POW coefficient}
\]

\[
\text{POR 1996/Unknown POW 1996} = \text{POW coefficient}
\]

\[\Rightarrow \text{Unknown POW 1996} = \frac{\text{POR 1996}}{\text{POW coefficient}}\]

*Assumption: POW coefficient remains unchanged between 2002 and 1996.*

\[
\frac{\text{POW 2002} - \text{POW 1996}}{6} = \text{Yearly increase of POW}
\]

\[
\text{POW 2000} = \text{POW 2002} - 2 \times (\text{Yearly increase of POW})
\]

POW employment data for 1990 was calculated by a similar process using the 1996 and 1991 censuses.

POW employment data for 2026 was estimated using an annual linear growth rate:

\[
\text{POW 2026} = \text{POW 2006} + 20 \times (\text{POW 2006} - \text{POW 2000})/6
\]

The employment data was projected for 2026 M2F1 traditional scenario at first. Then taking into account population ratios between different scenarios the other three cases were estimated:

\[
\text{Employment 2026 other} = \text{Employment 2026 M2F1 traditional} \times \frac{\text{Population 2026 other}}{\text{Population 2026 M2F1 traditional}}
\]

The final data used in MOLAND for the current research is presented in Table 4.
Michael Brennan, Tamara Hochstrasser and Harutyun Shahumyan

Table 4: Data used in MOLAND for the 2026 scenarios simulation

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2006</th>
<th>2026 Scenarios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimated</td>
<td>POWCAR</td>
<td>M0F1R</td>
</tr>
<tr>
<td>Population (total)</td>
<td>1,590,790</td>
<td>1,773,803</td>
<td>1,952,125</td>
</tr>
<tr>
<td>Population (other)</td>
<td>1,289,575</td>
<td>1,437,010</td>
<td>1,581,474</td>
</tr>
<tr>
<td>Population (sparse)</td>
<td>301,215</td>
<td>336,793</td>
<td>370,651</td>
</tr>
<tr>
<td>Industry</td>
<td>223,494</td>
<td>259,800</td>
<td>290,984</td>
</tr>
<tr>
<td>Commerce</td>
<td>250,386</td>
<td>321,790</td>
<td>427,805</td>
</tr>
<tr>
<td>Services</td>
<td>166,673</td>
<td>211,656</td>
<td>161,831</td>
</tr>
</tbody>
</table>

Scenario outputs:
Each scenario represented a distinct end point along a spectrum of population growth. In order of increasing 2026 projected population the scenarios are M0F1R, M0F1T, M2F1R and M2F1T. M0F1R represents the lowest projected population of 1,952,125, with the projected populations of M0F1T, M2F1R and M2F1T containing approximately 200,000, 400,000 and 600,000 more people respectively. MOLAND simulated 2026 maps for each scenario were exported to ArcGIS system in raster format. Cell counts for each landuse type were calculated using the Hawth’s tools free extension for ArcGIS (http://www.spatialecology.com/) and then tabulated in MS Excel. For ease of data handling the cell counts were aggregated into three classes; Agriculture, Semi-natural and green urban, and Built. Cell counts were converted to an area value in hectares by multiplying by 4. The outputs from the four scenarios were contrasted in MS Excel.

GIS analysis of scenario outputs:
Since raw area values alone, even when compared on a county by county basis, are not greatly informative output maps for each scenario were examined using GIS to visualise the forecasted 2026 landuse patterns and to identify areas of landuse change between 2006 and differences between scenarios.

Protected areas:
A GIS layer containing the locations of all legally protected sites (National Heritage Areas (NHAs), Special Areas of Conservation (SACs) and Special Protected Areas (SPAs)) and sites proposed for protection (proposed NHAs (pNHAs)) was overlaid on the scenario maps. To identify which sites would be threatened and quantify the impact of forecasted development a 1km buffer was created around the protected areas and cell counts for each landuse type within this buffer were calculated, aggregated and converted to area values as above.

Coastal Development:
When the scenario outputs were first viewed, coastal areas seemed to be forecast for particularly heavy development. To investigate this further a 2km coastal buffer was created. Cell counts for each landuse type within this buffer were calculated, aggregated and converted to area values as above. The buffer outputs from the four scenarios were contrasted in MS Excel. The number and type of protected areas within this buffer were found. The flooding...
history of coastal towns which were forecast to experience pronounced development were reviewed using the Office of Public Works (OPW) National Flood Hazard Mapping website (http://www.floodmaps.ie).

**Results:**

**Changes in landuse share:**
As would be expected development was greatest in the scenarios which had the highest 2026 populations. New *Built* was generated primarily from the conversion of *Agriculture*, with *Semi-natural and green urban* being much less affected. The area of *Semi-natural and green urban* converted to *Built* was 1% or less of the area of converted *Agriculture* in all scenarios. M0F1R has a projected increase in *Built* landuse area of 18,096 hectares; M0F1T, M2F1R and M2F1T have greater projected increases by approximately 7,000, 14,000 and 21,000 hectares respectively, i.e. for each additional 200,000 people projected to live in the study area by 2026, approximately 7,000 hectares of *Agriculture* is converted to *Built*.

**Areas with heavy urban development:**
Several areas were identified that undergo development in every scenario. Significant expansion occurs in the peripheral towns of Celbridge, Rathcoole, Clonee, Swords and Malahide, a continuation of current trends (Williams and Shiels, 2002). Also of note is the pronounced development around the coastal settlements such as Rush, Balbriggan, Malahide and Portmarnock north of the city and Bray, Greystones and Wicklow south of the city (Figure 2).

In addition to the above, under the M2F1 scenarios an unbroken strip of coastal urban fabric stretches from Malahide in the north to Bray in the south. The towns of Lusk and Rush merge; Swords, Malahide and Portmarnock form a ring of coastal development (Figure 3), encircling a pocket of agricultural land and isolating this area from both the wider countryside and the coast. Also of note is the isolation of the Phoenix Park from the wider countryside. In 2006 this area is connected by the Liffey river valley (Figure 1), under the M2F1 scenarios this area is forecasted to be engulfed by development by 2026.

**Impact on protected sites:**
The most heavily impacted sites remained constant across all scenarios, these being the Tomnafinnoge Wood, Royal Canal, North Dublin Bay, and Knocksink Wood. Other heavily affected sites include Loughshinny coast, Barmeath Woods, Liffey Valley and Feltrim Hill. Sites with legal protection (NHAs, SPAs & SACs) and non-protected sites of recognised ecological and/or heritage value (pNHAs) were also affected (Table 5).
Figure 1. Landuse in the GDR in 2006. The Liffey river valley is circled.
Figure 2. Forecast landuse in the GDR in 2026 under the M0F1R (left) and M0F1T scenarios (right). Note the expansion of Rathcoole, Celbridge, Clonee and Rush, and the merger of Swords and Malahide.

Figure 3. Forecast landuse in the GDR in 2026 under the M2F1R (left) and M2F1T scenarios (right). Areas isolated from the wider countryside by development are circled.
Table 5. Protected sites forecasted as impacted by development. The area of vegetated land lost in hectares (ha) within 1km of the sites is listed by scenario.

<table>
<thead>
<tr>
<th>Site name</th>
<th>Designation</th>
<th>M0F1R</th>
<th>M0F1T</th>
<th>M2F1R</th>
<th>M2F1T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tomnafinnoge Wood</td>
<td>SAC</td>
<td>-632</td>
<td>-784</td>
<td>-900</td>
<td>-1204</td>
</tr>
<tr>
<td>Royal Canal</td>
<td>pNHA</td>
<td>-452</td>
<td>-592</td>
<td>-1084</td>
<td>-1128</td>
</tr>
<tr>
<td>North Dublin Bay</td>
<td>pNHA</td>
<td>-112</td>
<td>-408</td>
<td>-612</td>
<td>-900</td>
</tr>
<tr>
<td>Knocksink Wood</td>
<td>pNHA</td>
<td>-200</td>
<td>-404</td>
<td>-460</td>
<td>-592</td>
</tr>
<tr>
<td>Loughshinny Coast</td>
<td>pNHA</td>
<td>-156</td>
<td>-216</td>
<td>-364</td>
<td>-516</td>
</tr>
<tr>
<td>Barrow Valley At Tankardstown Bridge</td>
<td>pNHA</td>
<td>-160</td>
<td>-184</td>
<td>-228</td>
<td>-292</td>
</tr>
<tr>
<td>Kilpatrick Sandhills</td>
<td>SAC</td>
<td>-156</td>
<td>-168</td>
<td>-232</td>
<td>-220</td>
</tr>
<tr>
<td>Liffey Valley</td>
<td>pNHA</td>
<td>-144</td>
<td>-220</td>
<td>-236</td>
<td>-276</td>
</tr>
<tr>
<td>Buckroney-Brittas Dunes And Fen</td>
<td>SAC</td>
<td>-144</td>
<td>-124</td>
<td>-196</td>
<td>-256</td>
</tr>
<tr>
<td>Barmeath Woods</td>
<td>pNHA</td>
<td>-144</td>
<td>-208</td>
<td>-188</td>
<td>-228</td>
</tr>
</tbody>
</table>

Coastal Development:
In 2006 25.6% of land within 2km of the coast consisted of Built. All scenarios forecast an increase in this percentage; Built comprised 30.5%, 32.7%, 35.4% and 37.7% of the 2km buffer in M0F1R, M0F1T, M2F1R and M2F1T respectively. Almost a quarter (24.8%) of all protected sites fell within the coastal buffer, though there were differences between types (Table 6).

Table 6. Number and type of protected sites within 2km coastal buffer.

<table>
<thead>
<tr>
<th></th>
<th>Total within study area</th>
<th>Number within 2km coastal buffer</th>
<th>Percentage within 2km coastal buffer</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPA</td>
<td>44</td>
<td>15</td>
<td>34.1</td>
</tr>
<tr>
<td>SAC</td>
<td>83</td>
<td>24</td>
<td>28.9</td>
</tr>
<tr>
<td>NHA</td>
<td>5</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>pNHA</td>
<td>219</td>
<td>48</td>
<td>21.9</td>
</tr>
<tr>
<td>Total</td>
<td>351</td>
<td>87</td>
<td>24.8</td>
</tr>
</tbody>
</table>

Coastal flooding:
As noted above all scenarios forecast pronounced development around the coastal settlements of Rush, Balbriggan, Malahide, Portmarnock, Bray, Greystones and Wicklow. The OPW have records of flooding in all the areas over a variety of timescales (Table 7.)

Discussion:
This work clearly underlines the need for a change in the spatial planning of development in the Greater Dublin Region. The scenarios presented here explore a continuation of the trends of development within the GDR over the past 16 years (Scott et al., 2006). The results
highlight that if current trends of urban development driven by private interest continue, significant negative environmental effects can be expected. While more pronounced in the M2F1 scenarios, in all scenarios development disperses widely across the study area, formerly separate towns merge and coastal regions are subject to particularly high growth, even though these regions are particularly sensitive to urban development.

**Potential effects of development trends on biodiversity and protected sites:**
The forecasted dispersed development in the GDR would likely result in habitat loss and fragmentation, particularly in the M2F1 scenarios, with all the associated consequences of population isolation, local extinctions and altered community structure (Soulé *et al.*, 1988, Forman and Alexander, 1998, Fernandez-Juricic and Jokimaki, 2001, Fahrig, 2003, Shochat *et al.*, 2006). Areas of ecological importance are forecast to be affected by development in all scenarios (Table 5). Although the importance of these areas are recognised in County Development Plans (Dún Laoghaire Rathdown County Council, 2004, Kildare County Council, 2005, Meath County Council, 2007), the proximate nature of the modelled development means that Local Authorities will have to be vigilant in monitoring and enforcement of regulations and legislation to ensure the integrity of the sites.

Furthermore in all scenarios, but particularly in the M2F1 scenarios, development along the coast is intense. Increased development is simulated to occur adjacent to all coastal protected sites, particularly SPAs. It has been documented that human activity disturbs wildlife in SPAs (Burton *et al.*, 2002a, Burton *et al.*, 2002b, Northern Ireland Executive, 2003, Burton *et al.*, 2006, Holm and Laursen, 2009) and the forecast development would in all likelihood increase disturbance in these areas. Beyond the borders of the protected sites disturbance can be expected to be more intense. Given that the European Court of Justice has already ruled that the Irish Government has already failed to meet its obligations under both the Birds and Habitats Directives (EU Commission v. Ireland, 2010) any increase in disturbance could be expected to incur additional censure from the EU which Ireland can ill afford at present. By identifying sites that may be pressured by future development action can be taken to create appropriate conservation and management plans before development pressure adversely affects these sites.

### Table 7. Flooding events recorded by the OPW

<table>
<thead>
<tr>
<th>Town</th>
<th>Flooding events listed by OPW</th>
<th>Recurring events</th>
<th>Timeframe of events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rush</td>
<td>9</td>
<td>4</td>
<td>2000-2004</td>
</tr>
<tr>
<td>Balbriggan</td>
<td>4</td>
<td>1</td>
<td>2000-2002</td>
</tr>
<tr>
<td>Malahide</td>
<td>7</td>
<td>4</td>
<td>2002</td>
</tr>
<tr>
<td>Portmarnock</td>
<td>10</td>
<td>5</td>
<td>1986-2002</td>
</tr>
<tr>
<td>Bray</td>
<td>9</td>
<td>4</td>
<td>1905-2003</td>
</tr>
<tr>
<td>Greystones</td>
<td>6</td>
<td>5</td>
<td>2003</td>
</tr>
<tr>
<td>Wicklow</td>
<td>3</td>
<td>3</td>
<td>N/A</td>
</tr>
</tbody>
</table>
Potential effects of development on ecosystem services:
The dispersed nature of the simulated development in each scenario implies an exacerbation of existing issues. The spread of built across the region would result in the alteration of soil processes such as decreased carbon (C) sequestration and nitrogen (N) cycling (Lehmann and Stahr, 2007, Tratalos et al., 2007, Lorenz and Lal, 2009). Urban land use planning can help to reduce urbanisation effects on biogeochemical C and N cycles; for example, by limiting disturbance to unproductive urban soils while promoting dense plant cover on productive soils, using permeable/semi-permeable materials to avoid total soil sealing and incorporating green-roofs and living walls to mitigate vegetation loss.

In addition to the soil, dispersed development can be expected to affect the air and water. Dispersed development would necessitate car centric transport for the population (Cervero and Gorham, 1995) leading to increased air and water pollution (Forman and Alexander, 1998). As emissions from road traffic are the primary threat to the quality of air in Ireland (EPA (Environmental Protection Agency), 2004), and as all urban areas are forecast to expand in all scenarios, air quality within urban areas could be expected to degrade, all other things being equal. To mitigate these effects an urban aforestation campaign could be enacted as research suggests urban vegetation can ‘scrub’ the atmosphere of pollutants (Nowak, 2006, Bealey et al., 2007, McDonald et al., 2007, Jim and Chen, 2008). Wastewater provision over such a dispersed area would be extremely difficult and expensive, necessitating septic tank use in a large number of dwellings. Even though technology is improving, this higher number of tanks can be expected to increase the rates of groundwater contamination (Yates, 1985, Jamieson et al., 2002).

The intense coastal development merits attention for two reasons. Firstly, it is well known that urbanisation within a drainage basin tends to increase the volume of run-off, increase peak discharge and decrease the time taken to reach peak discharge. Many of the coastal areas that undergo intense development within the simulations are on rivers (e.g. Dublin City, Malahide, Balbriggan, Rush, Bray, Wicklow) and have experienced flood events in the recent past. As extreme weather events are predicted to increase globally (Few, 2003) and nationally (Sweeney and Fealey, 2002), care must be taken to ensure that if development does occur, it incorporates effective drainage systems such as protected buffers along river banks, artificial wetlands for water retention and porous pavement materials to reduce run-off (Booth, 1991, Braune and Wood, 1999, Hood et al., 2007).

Secondly, human settlements on coastal areas can influence the effective sea level rise experienced by those areas (Ericson et al., 2006). The particularly high coastal development merits special attention by Regional and Local Authorities to ensure human activities do not exacerbate the effects of global sea level rise (Church and Gregory, 2001). Furthermore, the OPW reports recent flooding in all coastal towns and as sea levels rise these flooding events can be expected to increase (Bosello et al., 2007).

Potential social and health effects of development:
The development simulated here - i.e. dispersing to a greater or lesser degree across the region - represents a continuation of current unfavourable trends (Scott et al., 2006). These trends imply increased isolation of residents within urban centres from the surrounding natural areas and relatively less green space within the urban centres (Brennan et al., 2009). This could lead
to negative social effects, such as increased crime rates, increased stress, decreased physical activity and decreased longevity (Frumkin, 2001, Kuo and Sullivan, 2001, Humpel et al., 2002, De Vries et al., 2003).

The spread of development across the region would make the provision of services and public transport extremely difficult, and while national and regional planning guidelines have been created to attempt to steer development toward a more consolidated, sustainable settlement pattern, these efforts have had mixed results (Scott et al., 2006).

Commuting in the GDA is already a stressful experience (O’ Regan and Buckley, 2003), with time lost due to congestion costing the economy an estimated €640m (DTO (Dublin Transportation Office), 2001). An increase in car dependency implied by the dispersed nature of the forecasts would likely exacerbate the situation. Furthermore, work has already been carried out that suggests that growth in the several areas across GDA will outpace future wastewater treatment provision (Shahumyan et al., 2009b). Similar deficiencies could be expected for other services such as waste disposal, education, health provision and emergency service response time.

Conclusion:
While the economic growth fuelling this development pattern was regarded as a boon to the country, the consequences of such rapid and developer-led urban expansion have been widely recognised as unfavourable (Williams and Shiels, 2002, European Environment Agency, 2006, Williams et al., 2007). As shown here, the negative consequences are likely to be exacerbated if the fundamental trends in how the development occurs are not guided in a different direction. With the current economic slow-down there is an opportunity to implement more rigorous planning policy to ensure that planning at national, regional and local levels pursues the same agenda and is implemented effectively. As an aid to cohesive planning, tools such as MOLAND are highly valuable in that they allow users to both visualise the results of differing policy choices, in this case maintenance of the status quo, and add an evidence base to policy decisions that has so far been lacking from Irish planning.

The forthcoming planning bill is a step along this path, in that it requires county development plans to set out a core strategy demonstrating that the development objectives in the development plan are consistent with national and regional development objectives set out in the National Spatial Strategy and regional planning guidelines (Government of Ireland, 2009a). Using MOLAND, or a similar tool, it would be possible to simulate the effects of various county development plans upon the region and highlight issues of conflict between county and regional level plans. If such measures were put in place, it could be hoped that development within the GDR will evolve along a more sustainable path.

Acknowledgement
The authors acknowledge the support of the Environmental Project Agency under contract 2005-CD-U1-M1.
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Simulated future development of the Greater Dublin Area


Changing office location patterns and their importance in the peripheral expansion of the Dublin region 1960-2008.

Andrew MacLaran, Katia Attuyer, Brendan Williams

Introduction
During the past four decades, commercial activity in cities in the developed world has tended to decentralise from traditional central business districts (CBD) to suburban and peri-urban locations. This trend has tended to accelerate during recent decades, often associated with the development of purpose-built suburban office parks. Such trends, frequently being accompanied by the dispersal of population to the hinterland of metropolitan regions, have major implications for cities’ development and transportation infrastructure. Peripheral expansion of urban areas, such as that which has occurred in Dublin, can be linked to the evolving spatial patterns of local commercial and residential development and has resulted in the rapid residential development of towns and villages at increasingly greater distances from the city (MacLaran, 2003; Williams, 2007). The continued decentralisation of employment and population to suburban locations along transport lines and the impacts of emerging sub-centres on the urban spatial structure are a major feature of the analysis of the development of major metropolitan areas.

This study explores the role that the shift in service-sector employment has played in reshaping a formerly more compact urban form in the Dublin region towards that of an increasingly dispersed pattern of development. In particular, the paper examines the movement of the office sector towards a number of suburban locations over the period from 1960 to 2008. It outlines the recent transformation of the geography of office development in Dublin from one which focused primarily on a single dominant core during the 1960s until the 1980s, towards one in which numerous and widely-dispersed suburban sites tended to account for a growing proportion of new developments during the 1990s and early 2000s. This has resulted in the rapid development of towns and villages at increasingly more distant locations from major cities and created widening patterns of commuting (Williams & Shiels, 2000, 2002).

Such continued decentralisation of employment and population to suburban locations and the impacts of emerging sub-centres on the urban spatial structure continue to be an important feature of the development of major metropolitan areas. In turn, the common failure to provide adequate public transport infrastructure to serve such emerging suburban and ‘edge-city’ employment nodes, together with the consequent reliance on commuting by car, possess further major ramifications and generates growing demands for costly road improvements (MacLaran and Killen, 2002). A sprawling metropolitan region emerges, characterised by rapid peripheral expansion marked by inadequate and congested commuting infrastructures, requiring rising levels of energy use, resulting in increased levels of pollution and occasioning a reduction in environmental quality.

In the period since 1960, the geography of office development in Dublin has been transformed from one that focused on a single dominant core towards one in which numerous and widely-spread suburban sites have tended to account for a growing proportion of new development, particularly during the 1990s and early 2000s. Facilitated by the growing availability of the motor car, the city has grown more rapidly over the last fifty years than during its previous history. It has been transformed from a relatively compact city to a sprawling metropolis. The residential population was the first to suburbanise, the city’s upper and middle classes opting to distance themselves from the overcrowded and unhealthy tenements of the inner city. They were followed by the poorer classes themselves under programmes of slum clearance and rehousing (see MacLaran, 1993). This was followed from the 1960s by the movement of industrial functions to purpose-built suburban industrial estates and the suburbanisation of retailing (MacLaran & Beamish, 1985; MacLaran, 1993). Only in more recent decades did the suburbanisation of office functions in Dublin take place on a large scale, reflecting a wider international trend towards a restructuring of office sector activities and development in metropolitan areas (Sokol et al, 2008).

Historically, city centres had played the primary role as office locations because of their high degree of accessibility for both workforce and clients, combined with the advantages afforded by the proximate clustering of companies and public-sector operations for personal and business interaction. This was especially true at a time when commuting was more dependent on public transport services, commonly organized on a radial basis to bring workers from residential suburbs to the central business area. Dublin was unexceptional in this regard. Until the 1960s, most of the city’s office functions were overwhelmingly concentrated in the city centre, mainly located in buildings that had originally been developed for residential occupation but that had subsequently been converted to office use. However, with the unfolding of Ireland’s economic expansion of the 1960s, the demand for office space was increasingly met by new purpose-built developments, commencing the first of several development cycles that were to characterise Dublin’s office sector over the next fifty years. This paper examines the shifting geography of modern (post-1960) office development and its impacts in terms of the location of office employment.

Development in the 1960s

Figure 1 depicts the annual completion of office space in Dublin from 1960. During the 1960s, the focus for office development was located in the central-city postal district of Dublin 2 and the high-status inner suburb of Dublin 4 (see Figure 2). These comprised the most prestigious and best preserved parts of Dublin’s townscape. Developed from the early eighteenth to late nineteenth centuries, these areas were already undergoing functional transformation as residential accommodation was increasingly converted to office use. The development of new office buildings accelerated this existing trend towards functional upgrading and by the late 1960s, Dublin 2 and Dublin 4 had become established as the city’s prime office core. Some 45 office developments, comprising 123,048 sq.m. of net floorspace, were completed during the 1960s, 27 being located in Dublin 2, with a further 12 in Dublin 4.

Development in Dublin 2 accounted for 72,471 sq.m. of floorspace, comprising 59 per cent of completed space. Office space built in Dublin 4 represented 37,040 sq.m., some 30 per cent of the total. Thus, during this initial period of modern office development, the construction of office space in suburbia was very limited. It was marked by the construction of Esso House (3,038 sq.m.) in Stillorgan in 1960 and the further development in 1969 of suburban office
Figure 1. The Development of Office Space in Dublin from 1960

Source: CURS TCD/Savills HOK database

Figure 2. Current Dublin Postal Districts

Source: CURS TCD/Savills HOK database
space in Booterstown, though again this was on a very small scale with less than 600 sq.m. being developed. As a result, by the end of the 1960s, the stock of office space in suburbia amounted to just 3,595 sq.m. out of a city-wide total of 123,047 sq.m., representing less than 3 per cent of the total.

Development in the 1970s
During the 1970s, 142 office developments reached completion in Dublin. While their geographical spread did widen somewhat, only 20 per cent of these were situated outside Dublin 2 and Dublin 4. These included the completion of geographically dispersed buildings in the inner-city postal districts of Dublin 1, 7 and 8 fringing the prime office core to the north and west. There were also developments further away in the inner-suburb of Dublin 6. However, by the end of the 1970s, little dispersal had taken place to outer areas, only eight buildings completed during the 1970s being located in the outer suburbs. Although the city’s outer southern suburbs of Stillorgan, Dundrum, Cabinteely, Dún Laoghaire, Leoparstown, Booterstown and Clonskeagh recorded some office development activity, no suburban ‘proto-nodes’ had yet begun to emerge. In the northern outer suburbs, the only office development to reach completion was Raven House (2,098 sq.m.) in Finglas. Despite this increase in suburban development activity, by the end of the 1970s, there was still only 31,600 sq.m. of modern office space located in the outer suburbs, amounting to just 5 per cent of the total stock (591,749 sq.m.).

Development in the 1980s
During the 1980s, development locations began slowly to exhibit an outwards evolution with a growing interest being shown by developers in more peripheral areas. During that decade, a further 382,096 sq.m. of office space was built, with some 46,389 sq.m., amounting to 15.2 per cent of the total, being located in the outer suburbs.

In the early part of the decade, Blackrock and Dún Laoghaire emerged as focal points for new office development. Eleven buildings totalling 15,258 sq.m. were completed in Blackrock, four of which exceeded 2,000 sq.m. (Temple House Blocks 1 and 2, measuring 2,861 sq.m. and 2,508 sq.m. respectively, with Frascati Hall at 2,196 sq.m. and Enterprise House at 2,787 sq.m.). The quantity of space reaching completion in Dún Laoghaire also increased markedly, with 5 developments totalling 8,241 sq.m. being developed, comprising almost twice the amount of space built there during the preceding decade. There was also significant development of isolated buildings across a wide range of outer-suburban locations, for example at Ballybrack, Glenageary and Kill O’ the Grange to the south and at Santry and Swords in the north. Some of the development schemes built during the decade represented the first modern office elements to be developed at locations, which subsequently evolved into important suburban office nodes, such as at Clonskeagh and Sandyford-Leopardstown. Nevertheless, in spite of this increasing geographical breadth of development activity, the city centre remained the dominant office location throughout the 1980s. This trend occurred against a background of increasing dereliction in many parts of the inner city as the local economy declined, reflecting a complex range of economic and social problems in the urban area. (see Figures 3, 4 & 5).

By the end of 1989, the city-wide stock of modern offices totalled 973,845 sq.m. in 365 developments. Figure 6 shows that some 76 per cent of this space was located in the postal
Figure 3. Derelict Sites and Vacant Buildings in Dublin

Source: MacLaran (1993)
Figure 4. Location of Modern (Post-1960) Office Developments in Dublin, 1983

Source: After Malone (1983)

Figure 5: Location of Space Completed, 1980-1989

Source: CURS TCD/Savills HOK database
districts of Dublin 2 and Dublin 4. In spite of thirty years of suburban office development, by the end of the 1980s the stock of suburban space amounted to only 91,905 sq.m., just nine per cent of the total. No suburban district possessed a stock of modern office space which exceeded 20,000 sq.m.. Although the south Dublin suburbs of Dublin 16 and Dublin 18 together had a fairly substantial office stock amounting to 18,967 sq.m., this was geographically widely dispersed over several locations. Very little development had taken place in either the western or northern outer suburbs. Thus, only two areas of significant clustering had emerged, at Blackrock, with a stock of 15,258 sq.m., and Dún Laoghaire with 13,119 sq.m. A further 16 per cent of the stock was located at the inner-city periphery of the prime office core in Dublin 1, 7 and 8 (Figure 6), which comprised a few developments which had been undertaken partly in response to the designated-areas regeneration tax incentives of 1986. However, the bulk of these did not reach completion until the early 1990s.

Development in the 1990s
The 1990s were marked by a dramatic increase in the scale of office-development activity. Rapid economic expansion, especially towards the end of that decade, generated a growing demand for office space to accommodate the expanding services-sector workforce. With 681,579 sq.m. of space being developed in 238 buildings during the decade, the stock of modern office space in the city grew by 70 per cent from 973,845 sq.m. in December 1989 to 1,655,424 sq.m. by the end of 1999. Figure 8 indicates that the geography of office supply also widened considerably during the decade, to an extent which was quite unlike the patterns observed in previous decades as indicated in Figure 7, which indicates the spatial distribution of development over the past five decades.
The distribution of office space depicted in Figure 8 contrasts markedly with that shown in Figure 6. It reveals that during the period 1990-1999, only 21 per cent of the office space that was developed was situated in Dublin 2, with a further nine per cent being located in Dublin 4. In contrast, the suburbs accounted for 48 per cent of the space completed, the remainder being located in the International Financial Services Centre (IFSC) at the Custom House Docks or in the inner-city periphery of the prime office core in Dublin 1, 7 and 8.

Overall, the expansion of development activity was dramatic in suburbia during the 1990s. Although the first part of the decade had been marked by a rising scale of office completions at the urban periphery, the suburbanisation of office development accelerated significantly during the second part of the decade (Figure 9). Between 1995 and 1999, the scale of completions rose to 226,192 sq.m. in the suburbs (not including the more established suburbs of Dún Laoghaire and Blackrock), which represented 54 per cent of the city-wide activity. This resulted in the expansion of the suburban stock to 346,294 sq.m., comprising a near tripling during the 5-year period.

While only six per cent of the total was built in the longer-establish suburban nodes at Blackrock and Dún Laoghaire, the proportion of the city’s stock of modern office space located in these suburbs rose from 2.9 per cent in December 1989 to 4.3 per cent in December 1999. During these years, 23 developments comprising 42,833 sq.m. were completed in these locations, more than doubling the amount of office space there from less than 29,000 sq.m. at the beginning of the decade to over 71,000 sq.m in December 1999. A total of 13 buildings (17,280 sq.m.) were built in Blackrock, including five in Temple Road amounting to 4,900 sq.m. A larger amount of space reached completion in Dún Laoghaire (25,553 sq.m.) with six buildings in the Adelphi Centre comprising 14,125 sq.m.
Figure 8. Location of Space Completed, 1990-1999

Source: CURS TCD/Savills HOK database

Figure 9. Location of Space Completed, 1995-1999

Source: CURS TCD/Savills HOK database
During the 1990s, development also continued apace in places that had shown only embryonic
development during the 1980s, most notably with Clonskeagh and Sandyford-Leopardstown rapidly emerging as significant suburban office nodes in their own right. Indeed, as shown by Figure 7, although there had been some development in the southern suburbs during the previous decades, it was not until the 1990s that the full force of development activity became focused strongly on the city’s southern suburbs.

From having an office stock of just 5,968 sq.m. at the end of 1989, Sandyford-Leopardstown experienced a seven-fold expansion of its modern office space, rising to 42,135 sq.m by the end of 1999. Growth at Clonskeagh was even more dramatic. From a stock of only 4,037 sq.m. at the end of 1989, office space located here increased fifteen-fold to 62,995 sq.m by the end of 1999. As a consequence, by the end of the 1990s, both areas had become office nodes of some significance, the office stock in both Sandyford-Leopardstown and Clonskeagh exceeding the quantity of space located in either Blackrock (32,538 sq.m.) or Dún Laoghaire (38,671 sq.m.).

Scattered developments also continued to reach completion in the outer southern suburbs at locations such as Stillorgan, Cabinteely, Dundrum and Kilmacud, bringing the total area of space completed in the southern suburbs during that decade to over 127,000 sq.m., representing 19 per cent of the city-wide space completed during the 1990s.

Another striking feature of office development activity during the 1990s was the completion of new schemes of significant size in the city’s western and northern suburbs, both of which had remained relatively undeveloped locations for office development at the start of the decade. For example, Dublin’s north suburbs, with a stock of only 3,820 sq.m., had accounted for just 0.4 per cent of the city-wide total in December 1989. However, by late 1999, the northern suburbs accommodated a stock of 79,640 sq.m., a twenty-fold expansion of its modern office space, accounting for 4.8 per cent of the city-wide stock. Activity in the northern suburbs was particularly intense in the second part of the decade with the appearance of an entirely new node in the inner-suburb of Dublin 3. The development of the East Point Business Park, where 63,000 sq.m. were completed, was strongly influenced by the existence of its Enterprise Area status with special taxation incentives and represented the largest increase registered at any suburban node. Elsewhere in the northern suburbs, scattered completions also occurred in Swords and Santry.

Office development also took place at new suburban locations on the western edge of the city, the city’s western suburbs representing the most recently developing office location. At the end of 1989, only 1,300 sq.m. of modern office space had been located in these areas. During the 1990s, offices were completed at a wide range of sites. Proto-nodes appeared at the outer western suburbs of Tallaght, at Baldonnell and along the Nangor Road. In Tallaght and at Park West on the Nangor Road, development was boosted by the availability of fiscal incentives. In Tallaght, between 1993 and 1998, 12 schemes totalling over 27,350 sq.m. reached completion. In 1999 alone, 27,205 sq.m. of office space was completed at Park West Business Park. During the late 1990s, around 16,180 sq.m. of offices were also built at Citywest (Baldonnell, Dublin 24). Smaller schemes also reached completion at a range of locations across the western suburbs including Blanchardstown and Clondalkin. Thus, within a single decade, the stock of office space in the western suburbs increased from just 1,300 sq.m. to 81,398 sq.m., to account for 5 per cent of the city-wide total by the end of 1999.
Development in the 2000s
The early years of the new millennium marked a peak in the scale of office development with 765,292 sq.m. being completed between 2000 and 2004, a quantity which exceeded by 10 per cent the scale of output recorded during the previous 10 years.

The geography of development continued to exhibit a marked trend towards suburbanisation during that five-year period. Figure 10 shows that 63 per cent of the office space completed between 2000 and 2004 was located outside the central city with development focusing on the outer areas of Dublin, especially on the western (23 per cent) and southern outer suburbs (24.5 per cent). In contrast, the longer-established nodes of Blackrock and Dún Laoghaire were marked by a relative slowdown in the scale of development activity, with some 5,000 sq.m. and some 15,000 sq.m. being built in these areas respectively, amounting to only 2.7 per cent of city-wide completions.

For the other suburbs, the period was marked by a major increase in office development, which is unlikely to be matched in the near future. In many locations, the quantity of space reaching completion during 2000-2004 exceeded the total existing stock which had been developed there since 1960. This included Sandyford-Leopardstown, Nutgrove, Santry, Swords, Nangor Road, Citywest and Blanchardstown.

Very few suburban locations that had previously attracted office developments failed to register any increase in their modern office stock during the period (Stillorgan, Booterstown, Ballybrack, and Sutton Cross) and only one new location, City Junction/Malahide Road in the north-east suburbs, emerged as an entirely new development location, with 3,159 sq.m. reaching completion there. The suburban office node that recorded the most intense develop-

Figure 10. Location of Space Completed, 2000-2004

Source: CURS TCD/Savills HOK database
ment of space was at Sandyford-Leopardstown where 134,437 sq.m. was built in 27 schemes. This marked an impressive increase in the scale of development activity compared to the previous 10 years, when just over 35,000 sq.m. had been developed. It also represented over 70 per cent of the total amount of office space completed in the outer southern suburbs during this five-year period. Many of these new blocks were of substantial size and were among the largest office buildings in Dublin; the Atrium I and II buildings each exceeding 13,260 sq.m., while Block E at Central Park was over 20,000 sq.m. in size.

Figure 11. Current Administrative Boundaries of Dublin
Changing Office Locations

The rapid surge in office development was facilitated by the introduction of new zoning categories by the planners of Dún Laoghaire-Rathdown county council, who sought to improve its yield from commercial rates. A fragmented policy approach can be seen as a result of the break up of Dublin county into separate administrative districts, which occurred in the 1990s (see Figure 11). Land that had been zoned for industrial functions and buildings that had accommodated industrial operations were opened to upgrading by being rezoned from industry to office-based industry (Bertz, 2002a). Sandyford’s location near the C-ring M50 motorway and the prospective completion of a light-rail link to the city centre also encouraged office development. By the end of 2004, the area had become one of the most important office locations outside the central area of Dublin, with a stock totalling 175,147 sq.m., surpassing the combined stock of modern office space located in Blackrock and Dún Laoghaire (92,003 sq.m.). However, by the end of 2004, it had become evident that the scale of development had outpaced user-demand, as the area registered a 20 per cent vacancy rate.

Significant additions were also made at a number of locations in the western suburbs. Blanchardstown saw the addition of some 43,143 sq.m to its stock, which had amounted to little over 5,000 sq.m in December 1999. Citywest, located in Baldonnel on the Naas Road leading south-westwards out of Dublin, registered an increase of 31,695 sq.m., almost tripling its office stock in just five years. Considerable activity also took place in Dublin 22, on the Nangor Road, where 51,645 sq.m. was built, more than doubling the amount of development of the previous decade but resulting in a persistently high level of vacancy over the ensuing years. At the end of 2004, 53 per cent of that stock was lying vacant.

As a result of the sharp increase in office completions in the western suburbs, some 11 per cent of the city’s stock was located there at the end of 2004. However, a high proportion (42 per cent) of this space was vacant, the western suburbs accounting for 28 per cent of all the city’s vacant space.

The northern suburbs also registered a much higher level of development activity than previously. Significant expansion took place in Swords, where the completion of 14 buildings totalling 34,597 sq.m. resulted in a five fold increase in the district’s modern office stock. A smaller quantity of space was developed in Santry (7,655 sq.m). By December 2004, the share of the northern suburbs in the city stock amounted to 6.8 per cent.

However, these dramatic changes in the geography of office development in favour of suburban locations were curtailed in the period after 2004 because of rising rates of vacancy. Indeed, in 2004, over a quarter (27.6 per cent) of all suburban modern office space lay vacant and these vacant suburban buildings accounted for almost 64 per cent of all vacancy in Dublin. Peripheral vacancy rates ranged from 18 per cent in the southern suburbs and 33 per cent in the north, to 42 per cent in the western suburbs. In comparison, the vacancy rate for the modern office stock in Dublin 2 was less than eight per cent. With growing international economic instability and rising levels of city-wide vacancy rates, particularly in suburbia, developers reacted by cutting their scale of activity, while financiers and investors swiftly withdrew their involvement in a number of suburban locations. The period after 2004 therefore marked a general scaling down of suburban development.

The total quantity of space which reached completion in Dublin between 2005 and 2007 amounted to 421,403 sq.m., of which only 23.4 per cent was suburban (98,591 sq.m.). Office development activity in the suburbs mainly focused during that time on the southern suburbs
outside Dún Laoghaire and Blacrock. In these southern sububurbs, the location experiencing the largest increase in its stock was Loughlinstown, with 29,238 sq.m. reaching completion. Three buildings, each comprising nearly 10,000 sq.m., accounted for this development at Cherrywood Business Park in Loughlinstown, located approximately 13 km. south of the city centre. There was only one development in an entirely new location, comprising the completion of 7,419 sq.m. of office space in Carrickmines. By the end of 2007, substantial quantities of space (18,172 sq.m.) had also been added at Sandyford-Leopardstown.

Meanwhile, in the northern and western suburbs, the only substantial completion of space had taken place at Citywest (11,243 sq.m.), while smaller amounts had been added to the stock in Swords (5,146 sq.m.), Santry (3,198 sq.m.) and Blanchardstown (5,880 sq.m.).

By the end of 2007, the city-wide stock of modern office space in Dublin had risen to around 2,841,421 sq.m., of which the suburban component comprised some 980,935 sq.m., amounting to almost 35 per cent of the total (Figure 12) and exceeding the quantity of floorspace located in Dublin 2. Thus, by the end of 2007, the geographical distribution of the city’s modern stock had changed considerably. Figure 13 indicates that as late as 1995, over 85 per cent of the office stock had still been located in the city of Dublin. The traditional core of Dublin 2 had accounted for nearly 55 per cent of the total, while the suburbs represented just 15 per cent of the stock.

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**Figure 12. Location of the Modern (post-1960) Office Stock in 2007**

![Diagram showing the location of modern office stock in 2007](source: CURS TCD/Savills HOK database)
Office Take Up and Vacancy

Take-up
The mid- to late-1990s were years of rapid economic growth in Ireland, with rapid expansion of the services sector fuelling the demand for office space in Dublin. As shown in Figure 14, there was a marked increase in the quantity of office space taken up during these years. This period was also characterised by a growing strength of demand for space in suburban locations. Between 1996 and 2000, space taken up in the suburbs grew considerably, both absolutely (Figure 15) and also relatively (Figure 16).

In 1995, the central area (Dublin 1, 2, 4, 7, 8) had accounted for almost 73 per cent of demand. However, this figure had fallen to 64.5 per cent in 1996 and amounted to just 30.9 per cent by 2000. From 1996 to 2000, it was mainly developments in new outer suburban locations (i.e. excluding Blackrock and Dún Laoghaire) that recorded a sharp rise in space taken up. With only 25 per cent of the modern office stock, non-traditional suburban locations accounted for over 65 per cent of the space taken up during 2000. While significant increases in take-up in the northern and southern outer suburbs were recorded from 1996, the increase in space taken up in the western suburbs dated largely from 1998.

However, from 2001 to 2007, there was a marked reduction in the proportion of take-up accounted for by the non-traditional suburban areas. Figure 16 shows that these suburbs still accounted for about 50 per cent of take-up in 2001 but that this figure had fallen to 43 per cent in 2004, with the years 2005 and 2007 marking low points at 33 and 34 per cent. This reduction in the proportion of take-up accounted for by suburbia was also associated with a growing geographical shift in take-up towards the fringe of the office core in 2005 and 2007.
Take up in the inner-suburb of Dublin 4 was particularly strong in 2005 (Figure 15), while the inner-office fringe of Dublin 1, 7 and 8 (excluding the IFSC) accounted for an unprecedented take-up of 76,111 sq.m. in 2007, accounting for 25.6 per cent of all the space taken up during the year.

**Vacancy**

Attention now turns to an examination of office vacancy rates since the 1990s. As shown in Figure 17, from 1993, the quantity of vacant space declined uninterruptedly for a period of six years to reach an historically low level by the end of 1999 when only 31,236 sq.m. of office space lay vacant. This represented less than 2 per cent of the total stock. However, during the early years of the new millennium, the quantity of vacant space increased rapidly as the scale of office development rapidly increased and the levels of take-up failed to match the growing supply. By the end of December 2000, vacancy had almost doubled to 60,000 sq.m. and between 2000 and 2001, the amount of vacant space grew four-fold, increasing further between December 2002 and the end of 2003 to reach almost 430,000 sq.m. Thereafter, slow reductions in vacancy can be noted for 2006 and 2007.

Figure 17 also highlights the fact that, in absolute terms, a majority of the vacant space since 1999 has been located in the suburbs, marking a sharp contrast to the 1990s when most vacancy (and most of the stock) was located in the central city. Thus, in 1990, 65 per cent of the city’s vacant office space had been located in Dublin 2. This declined regularly over the following years and, by the end of 1999, the traditional office core of Dublin 2 accounted for only 19.5 per cent of all vacant floorspace, considerably below its proportionate share of the modern office stock at the time (44.4 per cent).

Despite accounting for between 30 and 35 per cent of the modern office stock, the outer suburbs have accounted for over 50 per cent of the city’s vacant office space since 1999. The

**Figure 14. Location of Space Taken Up, 1990-2007**

![Diagram showing location of space taken up, 1990-2007](Source: CURS TCD/Savills HOK database)
Figure 15. Space Taken Up in Dublin City and Suburbs, 1990-2007

Source: CURS TCD/Savills HOK database

Figure 16. Proportion of Space Taken Up in Major Office Locations

Source: CURS TCD/Savills HOK database
The proportion of all space lying vacant that was located in suburbia peaked at 80 per cent in 2000, fell to 71 per cent in 2002 and decreased further after 2003. By December 2007, the vacant suburban stock accounted for 54.5 per cent of the vacant city-wide space.

By 2001, the scale of development in the suburbs, which reached a peak in that year, had far outpaced the scale of demand by occupiers, which declined significantly after 2000 (see Figure 18). This resulted in rapidly rising vacancy rates in the outer suburbs, the vacancy rate increasing to over 25 per cent in 2001 from just 8.8 per cent one year earlier. Again, during 2002, despite the reducing scale of completions, the scale of development still far outstripped user demand. In 2003, in spite of a considerable fall in the scale of development, the overall vacancy rate in suburbia rose as a consequence of older space returning to the market, peaking at 29.3 per cent.

However, significant geographical variations can be noted, with the more newly-established locations being characterized by the highest rates of vacancy. Suburban vacancy rates were relatively low in the well-established node of Blackrock-Dún Laoghaire (19.3 per cent), while vacancy exceeded 24 per cent in the southern suburbs, 30 per cent in the northern suburbs and were at their highest at 38.5 per cent in the western suburbs (Figure 19).

Finally, sustained demand and a substantial slowdown in construction led to a drop in the overall vacancy rate in the outer suburbs, the vacancy rate stabilising at about 21 per cent in 2006 and 2007, with still important variations remaining between the suburbs.
Figure 18. Completions, Take-Up and Vacancy Rate in the Suburbs

Source: CURS TCD/Savills HOK database

Figure 19. Vacancy Rates in the Suburbs, 1990-2007

Source: CURS TCD/Savills HOK database
For the period 1990 to 2007, wide geographical variations in vacancy rates are apparent between the outer suburbs (Figure 19) and the central city (Figure 20). As depicted in Figure 20, the prime office districts of Dublin 2, Dublin 4 and the IFSC have been constantly characterised by low rates of vacancy. After 1995, when there was a marked suburbanisation of office development and of office take-up, vacancy rates in Dublin 2 were at their lowest. This suggests that the peripheralisation of office development was not a sign of decline of the central city but, rather, is evidence of its strength in that development in suburbia had complemented rather than competed with the traditional core. There was clear evidence of shortages of space in Dublin 2 during the mid- to late-1990s, with local vacancy rates dropping as low as 0.8 per cent in 1999. The vacancy rate rose sharply from 3.9 in 2001 to 7.3 per cent in 2002 but remained stable in the following years at approximately 7 per cent, remaining well below the vacancy rate in other parts of the city.

The outer suburbs present a marked contrast to the low rates of vacancy typifying the central-city office districts. In the suburbs, vacancy rates rose sharply after 2000, followed by a period of levelling off and eventually by a slow reduction (Figure 19). The initial phase of increase in vacancy rates was particularly sharp in the northern suburbs, where the rate rose from just 0.5 per cent in 2000 to over 26 per cent by the end of 2001, when 37,913 sq.m. was available, a majority (67.2 per cent) being located at new developments in Swords. In the following years, clusters of vacant space were found in Swords and in the inner suburb of Dublin 3 at the East Point Business Park.

The western suburbs have regularly displayed Dublin’s highest rates of office vacancy, with rates typically exceeding 30 per cent since 2000. A major cluster of vacant space appeared in the Nangor Road area. From 2002, significant clusters of vacancy also emerged in the

**Figure 20. Vacancy Rates in the City, 1990-2007**

*Source: CURS TCD/Savills HOK database*
Blanchardstown area, with Tallaght and Citywest also characterised by abundant vacant space.

The lowest rates of vacancy in suburbia have tended to be been recorded at the established nodes of Blackrock and Dún Laoghaire. Elsewhere in the southern suburbs, vacancy rates sharply increased between 2000 and 2001 as completions forged rapidly ahead of demand. The vacancy rate fell below 20 per cent only in the last two years, a majority of remaining vacancy being located in the Sandyford-Leopardstown area.

By late December 2007, suburban vacancy rates remained variable, ranging from 8.8 per cent of the stock in Blackrock and Dún Laoghaire to 15.8 per cent elsewhere in the southern suburbs, while vacancy in the northern suburbs stood at 27.8 per cent of the stock and at a third of the stock in the western suburbs.

**Office Employment**

Table 1 presents details on the stock of suburban office space in December 2006, together with prevailing local vacancy. At an occupancy rate of 20 sq.m. per staff member\(^1\), it is possible to estimate the number of office workers accommodated at that time in each of the locations. This suggests that by late 2006, over 34,000 office jobs were located at suburban sites.

More recently available data (Savills & The Centre for Urban and Regional Studies, TCD, 2010) allows for an updating of the overall employment figures in the light of suburban office developments that have reached completion since 2006, subsequent levels of take up and of vacancy. These data show that between January 2007 and December 2009, over 206,350 sq.m. of office space reached completion in suburban Dublin. Table 2 shows that a number of these developments exceeded 10,000 sq.m. in size.

By December 2009, the total stock of modern office space located in suburbia amounted to 1,129,841 sq.m.. However, 340,209 sq.m. lay vacant. At a rate of 20 sq.m. per staff member, the occupied suburban stock of 799,632 sq.m. provided accommodation for almost 40,000 office workers, with the vacant stock permitting an increase of a further 17,000 staff in suburbia in the absence of any further office development there.

**Conclusion**

A major feature of the office development sector in Dublin has been the massive increase in scale of activity since 1990, which represents the most intensive office development boom in the city’s history. The 1990s also witnessed a dramatic surge in office development activity at non-traditional locations, particularly at new suburban sites. With the peripheral growth of office employment, Dublin displays a similar trend to other European and American cities that have seen considerable decentralisation of office activities during recent decades.

Recent years have been characterised by a pause in large-scale suburban development due to the overprovision of space in certain districts, which has resulted in high vacancy

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\(^1\) The approximate floor-space per employee found in CURS TCD/ SavillsHOK surveys.
rates. However, these new suburban nodes now account for a significant share of Dublin’s office space and office employment and a large number of workers commute to these new employment nodes daily, which causes serious congestion problems as they tend to be poorly served by public transport systems (MacLaran and Killen, 2002).

The factors underlying this recent large-scale suburbanisation of office development in Dublin are complex and relate to the rapid pace of economic and employment expansion experienced in the region and the scale of development in Dublin. During the 1990s, the

Table 1. Suburban Office Stock, Vacancy and Estimated Staff Numbers

<table>
<thead>
<tr>
<th>Locations</th>
<th>Stock Dec. 2006 (sq.m.)</th>
<th>Vacant Dec 2006 (sq.m.)</th>
<th>Occupied Dec. 2006 (sq.m.)</th>
<th>Staff Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ashtown Gate, D15</td>
<td>9,807</td>
<td>447</td>
<td>9,360</td>
<td>468</td>
</tr>
<tr>
<td>Ballybrack</td>
<td>255</td>
<td>255</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Ballycoolin Rd., D11</td>
<td>1,531</td>
<td>1,531</td>
<td>77</td>
<td></td>
</tr>
<tr>
<td>Ballyfermot, D10</td>
<td>1,708</td>
<td>1,708</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>Ballymun</td>
<td>10,265</td>
<td>10,265</td>
<td>513</td>
<td></td>
</tr>
<tr>
<td>Blackrock</td>
<td>37,903</td>
<td>2,982</td>
<td>34,921</td>
<td>1,746</td>
</tr>
<tr>
<td>Blanchardstown, D15</td>
<td>54,089</td>
<td>11,776</td>
<td>42,313</td>
<td>2,116</td>
</tr>
<tr>
<td>Booterstown</td>
<td>6,085</td>
<td>1,243</td>
<td>4,842</td>
<td>242</td>
</tr>
<tr>
<td>Cabinteely, D18</td>
<td>8,153</td>
<td>8,153</td>
<td>408</td>
<td></td>
</tr>
<tr>
<td>City Gate Malahide Rd.</td>
<td>3,159</td>
<td>3,159</td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>Citywest, D24</td>
<td>55,938</td>
<td>6,800</td>
<td>49,138</td>
<td>2,457</td>
</tr>
<tr>
<td>Clondalkin, D22</td>
<td>7,526</td>
<td>1,519</td>
<td>6,007</td>
<td>300</td>
</tr>
<tr>
<td>Clonskeagh</td>
<td>68,199</td>
<td>6,547</td>
<td>61,652</td>
<td>3,083</td>
</tr>
<tr>
<td>E. Point, Clontarf, E.Wall</td>
<td>55,186</td>
<td>32,141</td>
<td>23,045</td>
<td>1,152</td>
</tr>
<tr>
<td>Deansgrange</td>
<td>5,496</td>
<td>307</td>
<td>5,189</td>
<td>259</td>
</tr>
<tr>
<td>Dún Laoghaire</td>
<td>55,186</td>
<td>8,576</td>
<td>46,610</td>
<td>2,331</td>
</tr>
<tr>
<td>Dundrum</td>
<td>14,655</td>
<td>1,729</td>
<td>12,926</td>
<td>646</td>
</tr>
<tr>
<td>Finglas, D11</td>
<td>2,098</td>
<td>2,098</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Glenageary</td>
<td>2,104</td>
<td>261</td>
<td>1,843</td>
<td>92</td>
</tr>
<tr>
<td>Kill O’Grange</td>
<td>3,929</td>
<td>3,929</td>
<td>196</td>
<td></td>
</tr>
<tr>
<td>Kilmacud</td>
<td>2,136</td>
<td>2,136</td>
<td>107</td>
<td></td>
</tr>
<tr>
<td>Liffey Valley Office Park</td>
<td>8,686</td>
<td>3,680</td>
<td>5,006</td>
<td>250</td>
</tr>
<tr>
<td>Loughlinstown</td>
<td>36,348</td>
<td>9,616</td>
<td>26,732</td>
<td>1,337</td>
</tr>
<tr>
<td>Naas Rd., Crumlin</td>
<td>23,087</td>
<td>2,299</td>
<td>20,788</td>
<td>1,039</td>
</tr>
<tr>
<td>Nangor Rd., D22</td>
<td>79,288</td>
<td>50,271</td>
<td>29,017</td>
<td>1,451</td>
</tr>
<tr>
<td>Nutgrove/Rathfarnham</td>
<td>17,312</td>
<td>3,170</td>
<td>14,142</td>
<td>707</td>
</tr>
<tr>
<td>Sandyford/Leopardstown</td>
<td>184,146</td>
<td>26,317</td>
<td>157,829</td>
<td>7,891</td>
</tr>
<tr>
<td>Santry, D9</td>
<td>11,714</td>
<td>5,126</td>
<td>6,588</td>
<td>329</td>
</tr>
<tr>
<td>Stillorgan</td>
<td>10,317</td>
<td>10,317</td>
<td>516</td>
<td></td>
</tr>
<tr>
<td>Sutton Cross</td>
<td>929</td>
<td>929</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Swords</td>
<td>48,002</td>
<td>8,439</td>
<td>39,563</td>
<td>1,978</td>
</tr>
<tr>
<td>Tallaght, D24</td>
<td>53,974</td>
<td>7,017</td>
<td>46,957</td>
<td>2,348</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>879,211</strong></td>
<td><strong>190,263</strong></td>
<td><strong>688,948</strong></td>
<td><strong>34,447</strong></td>
</tr>
</tbody>
</table>
Republic of Ireland experienced a period of sustained and exceptional economic growth, with annual growth rates well above those of other O.E.C.D. countries. Ireland’s G.D.P. grew strongly through the 1990s, at an average annual rate of over 5 per cent and at nearly 10 per cent in the closing years of the 1990s (Burnham, 2003). This increase in G.D.P. resulted in a sharp decline in the unemployment rate, which fell from 15 per cent in the early 1990s to 4.3 per cent in 2000. The growth in employment was mainly due to a significant rise in services-sector employment, which grew by 40 per cent between 1988 and 1998 (Travers, 1999). This unprecedented economic growth created a considerable demand for office buildings to accommodate the expanding services-sector workforce.

Moreover, on the user-demand side, a new type of demand for office space emerged, mainly from international clients. Expansion in the services sector led to strong growth in tele-services, with firms providing a range of services from IT-related after-sales support to car-hire reservation operations. Many had little need for central-city locations. However, they required a large amount of floorspace, good telecommunication infrastructure and low rents, which suburbia could offer (Bertz, 2002a). Moreover, suburban municipalities offered good provision of car parking space for employees, which was an attractive feature as the city centre became increasingly congested. At a booming time when companies needed to ensure adequate staffing, issues of access for a workforce that was overwhelmingly suburban in its residential location were given growing consideration. Employers therefore tended to evaluate suburban locations in a favourable light.

The changing planning context in the mid-1990s was also a significant factor. Planning policies proved successful in drawing office development to locations that had not previously experienced office development. The reorganisation of the administration of the metropolis created a fragmented administrative structure and was followed by important planning changes, notably in the locations zoned for office development and in the tightening of certain development controls in the central city. Suburban local authorities, deprived of income following the abolition of residential rates in the late 1970s and a central-exchequer subvention which failed to keep pace with inflation, were eager to attract office and retail developments to generate commercial rates. New zoning categories such as ‘office-based industry’ were introduced which facilitated the rezoning of former industrial areas at the periphery (Bertz, 2002b).

Furthermore, in the central area of Dublin, conservation became more strictly enforced, reducing the number of suitable sites available for office development activity. This situation

Table 2. Large Suburban Office Development Completed 2007-9

<table>
<thead>
<tr>
<th>Completed</th>
<th>Location</th>
<th>Development</th>
<th>District</th>
<th>Size (sq.m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Leopardstown</td>
<td>South Co. Bus. Park, Red Oak Ho.</td>
<td>Dublin 18</td>
<td>10,840</td>
</tr>
<tr>
<td>2007</td>
<td>Loughlinstown</td>
<td>Cherrywood, Bl. G</td>
<td>Co. Dublin</td>
<td>10,265</td>
</tr>
<tr>
<td>2008</td>
<td>Tallaght Cross</td>
<td>The Beckett</td>
<td>Dublin 24</td>
<td>10,379</td>
</tr>
<tr>
<td>2009</td>
<td>East Wall Rd.</td>
<td>The Beckett</td>
<td>Dublin 3</td>
<td>17,849</td>
</tr>
<tr>
<td>2009</td>
<td>Sandyford</td>
<td>1, Central Park (extension)</td>
<td>Dublin 18</td>
<td>18,116</td>
</tr>
<tr>
<td>2009</td>
<td>Sandyford Business Park</td>
<td>The Chase</td>
<td>Dublin 18</td>
<td>16,441</td>
</tr>
</tbody>
</table>
was worsened by the growing competition for available inner-city sites from alternative functions such as hotels and the development of apartments (see Kelly and MacLaran, 2004).

Investment factors also played a significant role. From the 1990s, the strong investment demand for large easily-managed high-quality office buildings was met with a declining degree of availability within the prime office core as a result of site-assembly difficulties presented by highly-fragmented land ownership, increasing levels of protection of the existing buildings and by planning restrictions on the development of large headquarters office developments. These restrictions encouraged the increasing suburbanisation of office development during the boom years of the Celtic Tiger.

The cumulative effect of these factors was a profound change in the geography of office development in the Dublin area and, consequently, of office employment. Proposals for public transportation infrastructure investment relating to this new spatial pattern have been made but, as yet, are not occurring. The process contributed to a major shift in the development and transport/commuting patterns in the Dublin region. As employment patterns became more dispersed and housing costs within their immediate vicinity of became less affordable (see Downey, 2003; Drudy and Punch, 2005), a push occurred in residential demand towards dispersed locations within car commuting distance of Dublin (see Williams and Shiels, 2000, 2002). Effectively, the suburbanisation of employment to new peripheral office nodes had rendered the accessibility of Dublin-based office work far more accessible to long-distance commuters. Indeed, access by car to ‘edge city’ developments such as Citywest or Leopardstown was frequently quicker from places such as Carlow or Arklow than from congestion-clogged inner Dublin or from inner-suburban areas such as Drumcondra, Harold’s Cross or Ranelagh. The resultant shifts in the spatial pattern of employment and residential development will have a significant influence on the long-term development of the region.

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References


Biodiversity in Dublin: A case study approach

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Keywords
urban biodiversity, high density residential development, best practice, Greater Dublin Area

Introduction: Urban biodiversity and its importance
The importance of biodiversity has been recognised at international level and its preservation and management is supported through key international agreements, such as the Rio Convention (Convention on Biological Diversity, 1992), and nationally, through the National Biodiversity Action Plan. In Ireland, at a more local scale, most local authorities (e.g. Dublin City Council, 2008) have developed Local Biodiversity Action Plans to address the key objectives for biodiversity protection and management within their administrative areas.

It is a common perception that biodiversity exists mainly in rural locations and this perception may be supported by the predominance of designated sites (e.g. Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas) in rural areas. Given that approximately 40 per cent of the Irish population lives in rural areas (Orsini & Williams, 2009) the designated sites are indeed very important and their designation allows them particular protection.

However, as Ireland’s population becomes increasingly urbanised, the role and management of urban biodiversity is becoming more important not only due to the encroachment of urban areas into previously undeveloped lands (i.e. urban sprawl) but also the recent trend towards increasing residential densities (Residential Density Guidelines, 1999). These have heightened the role for proper recognition, protection and management of biodiversity in urban areas.

The Greater Dublin Area has come under particular development pressure in recent years with exceptional rates of demographic and economic growth. Between 2002 and 2006 the population grew by 8.2 per cent (CSO, 2006). Allied with this growth, an exponential increase in development rates was observed with housing completions in excess of 22,000 in quarters 1 and 2 of 2006 compared with approx. 13,000 for the same period in 2002 and 6,600 in 2009 (CSO, 2009).
Whilst considerable literature exists on the maintenance and enhancement of biodiversity in urban areas in other jurisdictions (Europe and US), there is a paucity of literature relating to the Irish context, particularly with regard to the relatively new phenomenon of medium to high-density residential developments in Irish settings.

This research takes a case study approach in documenting and evaluating current practice with regard to biodiversity conservation, management and enhancement in urban areas.

**Methodology**

The study used an evidence-based approach to analysing the key principles of habitat protection, creation and enhancement for incorporating biodiversity into medium to high-density urban development. A representative sample of urban case study sites was selected from the administrative areas of Fingal County Council and Dún Laoghaire-Rathdown County Council, County Dublin.

**Case study selection**

Fingal County Council and Dún Laoghaire-Rathdown County Council form part of the Greater Dublin Area (GDA). Until recently, these administrative areas experienced accelerated housing development at increasingly higher densities. Fingal is located to the north and west of the GDA and holds many of the growing suburbs of County Dublin. The administrative area is the fastest growing local authority in housing numbers nationally and has extensive agricultural and greenbelt lands within its boundary, which have come under sustained pressure. Dún Laoghaire-Rathdown County Council lies to the south of the GDA and is constrained by the Dublin and Wicklow Mountains and the Dublin Bay coastline. Both administrative areas represent important growth regions within the GDA, with a mixture of suburban and rural landscapes. While the rate of housing development has declined sharply due to the economic slow-down, both administrative areas have experienced pressure on biodiversity resources and, due to their geographical locations, are likely to do so again as housing demand returns.

Seven sites were selected as case studies from four urban sectors radiating out from the city core that broadly reflect the differing urban environments across both areas (Table 1.1). The four urban sectors considered were (i) Inner Urban; (ii) Inner Suburban; (iii) Outer Suburban and (iv) Outer Town (RIAI, 2002).

**Case study review**

**Table 1.1 Summary of case study typologies**

<table>
<thead>
<tr>
<th>Site</th>
<th>Typology</th>
<th>Built space</th>
<th>Average units per ha</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monkstown</td>
<td>Inner urban</td>
<td>20%</td>
<td>13</td>
<td>Circa 19th century</td>
</tr>
<tr>
<td>Castleknock</td>
<td>Inner suburban</td>
<td>25%</td>
<td>41</td>
<td>1980-2002</td>
</tr>
<tr>
<td>Dundrum</td>
<td>Inner suburban</td>
<td>30%</td>
<td>30-90</td>
<td>1970-2000s</td>
</tr>
<tr>
<td>Ongar</td>
<td>Outer suburban</td>
<td>30%</td>
<td>38</td>
<td>Circa 2002</td>
</tr>
<tr>
<td>Stepaside</td>
<td>Outer suburban</td>
<td>35%</td>
<td>105</td>
<td>Circa 2004</td>
</tr>
<tr>
<td>Swords</td>
<td>Outer suburban</td>
<td>15%</td>
<td>24</td>
<td>Circa 1973</td>
</tr>
<tr>
<td>Lusk</td>
<td>Outer town</td>
<td>30%</td>
<td>28</td>
<td>Circa 2002</td>
</tr>
</tbody>
</table>
The selection took account of the potential for further development and the extent of open space, both private and public. Selection sought a balance between new development areas and more mature neighbourhoods where biodiversity has had an opportunity to become established.

**Biodiversity evaluation**

A set of key urban biodiversity indicators were defined through literature review to describe the biodiversity resources within the selected case study sites. The study used the key biodiversity indicators of habitat type, habitat quality, tree diversity, tree structural diversity and breeding bird diversity. A preliminary assessment of study sites was carried out using aerial photographs. Habitats were recorded in the field to Level 3 of the standard Heritage Council scheme (Fossitt, 2000). Surveys were restricted to accessible areas. Private gardens were not included within the walkover survey. Tree structure diversity was categorised as Young, Semi-mature, Mature or Over-mature. Breeding bird transects were carried out to identify species-richness in each study site. Abundance was measured according to the DAFOR scale: D = Dominant, A = Abundant, F = Frequent, O = Occasional, R = Rare.

Field survey sheets and an Access database were designed for data recording and analysis prior to the field study. Database forms were set up and used as recording sheets to maintain consistent recording of information in the field. Data analysis of biodiversity resources from the described typologies formed the basis for outlining constraints and opportunities for biodiversity management and prescribing best practice methods in the planning and development process.

**Results**

**Case study 1. Monkstown**

The habitat number was low and habitat quality was moderate to low (Table 2.1). The treelines, hedgerows and individual trees were of moderate quality owing to their species-richness, semi-natural character and maturity. Habitats of low value were artificial and composed largely of non-native species. They had low species-richness and low wildlife value.

The diversity of tree species was moderate with a total of 12 species, four of which were native (Table 2.2). The strawberry tree and yew provided an element of rarity within the area. The site had a high proportion of mature trees, indicative of the age of the development. (Table 2.3)

Breeding bird diversity was moderate (Table 2.4). Sixteen species of bird were recorded on site. All bird species recorded, with the exception of the heron and hooded crow, were breeding on site, which was indicative of the high number of mature trees and good cover available. The heron also used the site as a night roost. Its presence was indicative of the site’s proximity to the coast and the availability of mature trees.
Table 2.1 Habitat type and quality

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treelines</td>
<td>Moderate</td>
</tr>
<tr>
<td>Hedgerows</td>
<td>Moderate</td>
</tr>
<tr>
<td>Scattered trees and parkland</td>
<td>Moderate</td>
</tr>
<tr>
<td>Flower beds and borders</td>
<td>Low</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 2.2 Tree diversity

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abundance</th>
<th>Non-natives</th>
<th>Abundance</th>
<th>Non-natives</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>F</td>
<td>Beech</td>
<td>F</td>
<td>Laurel</td>
<td>F</td>
</tr>
<tr>
<td>Holly</td>
<td>F</td>
<td>Cordyline</td>
<td>O</td>
<td>Lime</td>
<td>O</td>
</tr>
<tr>
<td>Strawberry tree</td>
<td>R</td>
<td>Laburnum</td>
<td>O</td>
<td>Norwegian maple</td>
<td>O</td>
</tr>
<tr>
<td>Yew</td>
<td>R</td>
<td>Laurel bay</td>
<td>O</td>
<td>Walnut</td>
<td>R</td>
</tr>
</tbody>
</table>

Table 2.3 Tree structural diversity

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rare</td>
<td>Occasional</td>
<td>Frequent</td>
<td>Rare</td>
</tr>
</tbody>
</table>

Table 2.4 Breeding bird diversity

<table>
<thead>
<tr>
<th>Species</th>
<th>Abundance</th>
<th>Species</th>
<th>Abundance</th>
<th>Species</th>
<th>Abundance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackbird</td>
<td>A</td>
<td>Blue tit</td>
<td>F</td>
<td>Greenfinch</td>
<td>R</td>
</tr>
<tr>
<td>Wren</td>
<td>A</td>
<td>Swift</td>
<td>O</td>
<td>Song thrush</td>
<td>R</td>
</tr>
<tr>
<td>Robin</td>
<td>A</td>
<td>Feral pigeon</td>
<td>O</td>
<td>Hooded crow</td>
<td>R</td>
</tr>
<tr>
<td>Wood pigeon</td>
<td>F</td>
<td>Chaffinch</td>
<td>O</td>
<td>Dunnock</td>
<td>R</td>
</tr>
<tr>
<td>Magpie</td>
<td>F</td>
<td>Great tit</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Starling</td>
<td>F</td>
<td>Grey heron</td>
<td>R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Case Study 2. Castleknock

A total of five habitats were recorded (Table 3.1). The site supported some semi-mature and mature treelines, with moderate species diversity, which were of highest value (Tables 3.2 and 3.3). Other habitats were composed of non-native species with limited wildlife value.

Overall tree diversity was low and most trees were newly planted and immature (Table 3.2 and 3.3). Many of the newly planted trees were natives while the older established trees were non-native species, indicating increased use of more native tree species in planting. Trees were located in clusters throughout the development with mature specimens forming small stands with closed canopies.

Fourteen species of breeding birds were recorded; however, the abundance of individual species recorded was relatively low (Table 3.4). The greatest bird activity was recorded to the south and east of the site where there was a concentration of vegetation in treelines and adjacent back gardens. Here the treelines formed a continuous canopy and extend into the surrounding area.
Table 3.1 Habitat type and quality

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treelines</td>
<td>High - Moderate</td>
</tr>
<tr>
<td>Hedgerows</td>
<td>Moderate</td>
</tr>
<tr>
<td>Scattered trees and parkland</td>
<td>Moderate</td>
</tr>
<tr>
<td>Ornamental or non-native shrub</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 3.2 Tree diversity

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rowan</td>
<td>A</td>
<td>Horse chestnut</td>
<td>F</td>
<td>Cherry</td>
<td>O</td>
</tr>
<tr>
<td>Ash</td>
<td>F</td>
<td>Lime</td>
<td>F</td>
<td>Pine</td>
<td>O</td>
</tr>
<tr>
<td>Birch</td>
<td>F</td>
<td></td>
<td></td>
<td>Sycamore</td>
<td>O</td>
</tr>
<tr>
<td>Aspen</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.3 Tree structural diversity

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>Frequent</td>
<td>Frequent</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 3.4 Breeding bird diversity

<table>
<thead>
<tr>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starling</td>
<td>A</td>
<td>Wood pigeon</td>
<td>O</td>
<td>Greenfinch</td>
<td>R</td>
</tr>
<tr>
<td>Blackbird</td>
<td>F</td>
<td>Collared dove</td>
<td>O</td>
<td>Chaffinch</td>
<td>R</td>
</tr>
<tr>
<td>Magpie</td>
<td>F</td>
<td>Robin</td>
<td>O</td>
<td>Goldcrest</td>
<td>R</td>
</tr>
<tr>
<td>Wren</td>
<td>F</td>
<td>Blue tit</td>
<td>O</td>
<td>Hooded crow</td>
<td>R</td>
</tr>
<tr>
<td>Rook</td>
<td>O</td>
<td>Pied wagtail</td>
<td>R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Case study 3. Dundrum

Habitat diversity was moderate and there were a number of semi-natural habitats mainly centred on the stream (Table 4.1). The woodland and hedgerow habitats formed bankside vegetation along the course of the stream. A mature, well-structured hedgerow occurred on site. It formed a typical A-shape with a wide, dense base and narrowing towards the top. The hedgerow supported several native species, typical of those found in Irish hedgerows. It extended beyond the boundary of the development and formed links into the wider landscape.

Tree diversity was high (Table 4.2). The majority of trees on site were recently planted and immature (Table 4.3). However, mature specimens were located within the woodland and some had been successfully retained within new development.

Breeding bird diversity was moderate (Table 4.4). While many of the species present were typical of urban habitats, some species, including wren, robin, chaffinch and dunnock, were associated with hedgerows.
Table 4.1 Habitat type and quality

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depositing/lowland rivers</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>Broadleaved woodland</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>Treelines</td>
<td>Moderate</td>
</tr>
<tr>
<td>Neutral grassland</td>
<td>Moderate</td>
</tr>
<tr>
<td>Hedgerows</td>
<td>Moderate</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Low</td>
</tr>
<tr>
<td>Ornamental non-native shrubs</td>
<td>Low</td>
</tr>
<tr>
<td>Recolonising bare ground</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 4.2 Tree diversity

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>A</td>
<td>Beech</td>
<td>F</td>
<td>Hornbeam</td>
<td>O</td>
</tr>
<tr>
<td>Alder</td>
<td>F</td>
<td>Chestnut</td>
<td>F</td>
<td>Pine</td>
<td>O</td>
</tr>
<tr>
<td>Birch</td>
<td>F</td>
<td>Field maple</td>
<td>F</td>
<td>Copper beech</td>
<td>R</td>
</tr>
<tr>
<td>Grey willow</td>
<td>F</td>
<td>Lime</td>
<td>F</td>
<td>Grey alder</td>
<td>R</td>
</tr>
<tr>
<td>Rowan</td>
<td>F</td>
<td>Sycamore</td>
<td>F</td>
<td>Holm oak</td>
<td>R</td>
</tr>
<tr>
<td>Sally</td>
<td>F</td>
<td>Cherry</td>
<td>O</td>
<td>Larch</td>
<td>R</td>
</tr>
<tr>
<td>Oak</td>
<td>O</td>
<td>Cypress</td>
<td>O</td>
<td>Walnut</td>
<td>R</td>
</tr>
</tbody>
</table>

Table 4.3 Tree structural diversity

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abundant</td>
<td>Frequent</td>
<td>Occasional</td>
<td>Rare</td>
</tr>
</tbody>
</table>

Table 4.4 Breeding bird diversity

<table>
<thead>
<tr>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood pigeon</td>
<td>A</td>
<td>Blue tit</td>
<td>O</td>
<td>Collared dove</td>
<td>R</td>
</tr>
<tr>
<td>Blackbird</td>
<td>F</td>
<td>Goldfinch</td>
<td>O</td>
<td>Dunnock</td>
<td>R</td>
</tr>
<tr>
<td>Magpie</td>
<td>F</td>
<td>Mistle thrush</td>
<td>O</td>
<td>Jackdaw</td>
<td>R</td>
</tr>
<tr>
<td>Wren</td>
<td>F</td>
<td>Robin</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chaffinch</td>
<td>O</td>
<td>Rook</td>
<td>O</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Case study 4. Ongar

Habitat diversity was low (Table 5.1) and dominated by areas of amenity grassland with immature planted trees within the new development. Some good quality, semi-natural habitat comprising broadleaved woodland had been retained from the pre-existing landscape and incorporated into the development. A substantial area of formerly agricultural grassland surrounded the woodland. It was relatively species-poor and had been allowed to grow tall. The grassland species were allowed to flower and set seed, thus providing habitat and foraging for a range of species and enhancing its wildlife value.
Tree diversity was high with a total of nineteen species recorded, seven of which were native (Table 5.2). Young trees were abundant within the new development, while mature specimens were located along the periphery (Table 5.3).

Bird diversity was high (Table 5.4). However, bird calls and sightings from within the site were rare. This is attributed to the lack of suitable habitat within the site. The mature broadleaved woodland located to the southeast of the site and the boundary treeline hosted a high diversity of birds.

**Table 5.1 Habitat type and quality**

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadleaved woodland</td>
<td>High - Moderate</td>
</tr>
<tr>
<td>Treelines</td>
<td>High - Moderate</td>
</tr>
<tr>
<td>Dry meadows and grassy verges</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Scattered trees and parkland</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Low</td>
</tr>
</tbody>
</table>

**Table 5.2 Tree diversity**

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>A</td>
<td>Lime</td>
<td>D</td>
<td>Common walnut</td>
<td>R</td>
</tr>
<tr>
<td>Birch</td>
<td>A</td>
<td>Horse chestnut</td>
<td>A</td>
<td>Copper beech</td>
<td>R</td>
</tr>
<tr>
<td>Hawthorn</td>
<td>A</td>
<td>Sycamore</td>
<td>A</td>
<td>Larch</td>
<td>R</td>
</tr>
<tr>
<td>Oak (Pedunculate)</td>
<td>F</td>
<td>Beech</td>
<td>O</td>
<td>Lilac</td>
<td>R</td>
</tr>
<tr>
<td>Elder</td>
<td>O</td>
<td>Willow</td>
<td>O</td>
<td>Scots pine</td>
<td>R</td>
</tr>
<tr>
<td>Silver birch</td>
<td>O</td>
<td>Beech</td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holly</td>
<td>R</td>
<td>Beech</td>
<td>R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 5.3 Tree structural diversity**

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abundant</td>
<td>Occasional</td>
<td>Abundant</td>
<td>Rare</td>
</tr>
</tbody>
</table>

**Table 5.4 Breeding bird diversity**

<table>
<thead>
<tr>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magpie</td>
<td>A</td>
<td>Greenfinch</td>
<td>O</td>
<td>Wood pigeon</td>
<td>O</td>
</tr>
<tr>
<td>Wren</td>
<td>A</td>
<td>Blue tit</td>
<td>O</td>
<td>Song thrush</td>
<td>R</td>
</tr>
<tr>
<td>Rook</td>
<td>A</td>
<td>Swallow</td>
<td>O</td>
<td>Collared dove</td>
<td>R</td>
</tr>
<tr>
<td>Jackdaw</td>
<td>F</td>
<td>House martin</td>
<td>O</td>
<td>Mistle thrush</td>
<td>R</td>
</tr>
<tr>
<td>Chaffinch</td>
<td>F</td>
<td>Goldfinch</td>
<td>O</td>
<td>Goldcrest</td>
<td>R</td>
</tr>
<tr>
<td>Blackbird</td>
<td>F</td>
<td>Hooded crow</td>
<td>O</td>
<td>Pied wagtail</td>
<td>R</td>
</tr>
<tr>
<td>Dunnock</td>
<td>O</td>
<td>Starling</td>
<td>O</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Case study 5. Stepaside
Habitat diversity was high with a total of ten habitat types recorded within the study area (Table 6.1). Some of these were semi-natural habitats that had good species diversity, good structure and are therefore were rated as high biodiversity value. They included the stream, mature treelines and broadleaved woodland and were located along the boundary of the site. These habitats were remnants of the previous landscape and they reflected similar habitats within the surrounding landscape. A stream was incorporated into the development and fitted with a mammal ledge to allow for the passage of otter. The site had also incorporated some scrub and hedgerow internally from the original landscape. These were of moderate species-richness and moderate to poor structure. The hedgerow was retained in isolation and was not connected to the network of hedgerows in the wider landscape, which reduced its value as a corridor for movement. A pond, which lacks fringing vegetation, provided some habitat and a valuable source of water for animals, especially birds. These habitats were rated as moderate to low in value. The site included a Sustainable Drainage System that collected run-off water from around the site and channelled it via grassed collection systems into the pond area. This provided a more sustainable means of surface water collection and added biodiversity value by creating new habitats.

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stream</td>
<td>High</td>
</tr>
<tr>
<td>Treeline</td>
<td>High</td>
</tr>
<tr>
<td>Mixed broadleaved woodland</td>
<td>High - Moderate</td>
</tr>
<tr>
<td>Scrub</td>
<td>Moderate</td>
</tr>
<tr>
<td>Pond</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Scattered trees and parkland</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Immature woodland</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Hedgerow</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Ornamental non-native shrubs</td>
<td>Moderate - Low</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 6.2 Tree diversity

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abu</th>
<th>Natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>F</td>
<td>Rowan</td>
<td>O</td>
<td>Sycamore</td>
<td>F</td>
</tr>
<tr>
<td>Elder</td>
<td>F</td>
<td>Salix sp.</td>
<td>O</td>
<td>Beech</td>
<td>O</td>
</tr>
<tr>
<td>Downy birch</td>
<td>O</td>
<td>Oak (pedunculate)</td>
<td>R</td>
<td>Pine</td>
<td>R</td>
</tr>
<tr>
<td>Hazel</td>
<td>O</td>
<td>Wych elm</td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holly</td>
<td>O</td>
<td>Lime</td>
<td>F</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tree species diversity was moderate (Table 6.2) and there was an abundance of immature trees within the development, with semi-mature and mature specimens retained along the
boundaries of the site (Table 6.3). There were a higher proportion of natives to non-natives, which was unusual among the developments and indicated a greater use of native species in the planting scheme.

Breeding bird diversity was moderate (Table 6.4). The high quality, semi-natural habitats were largely located along the edge of the development and bird activity was greatest in that area.

**Table 6.3 Tree structural diversity**

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>Frequent</td>
<td>Frequent</td>
<td>Rare</td>
</tr>
</tbody>
</table>

**Table 6.4 Breeding bird diversity**

<table>
<thead>
<tr>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackbird</td>
<td>A</td>
<td>Mallard</td>
<td>O</td>
<td>Magpie</td>
<td>R</td>
</tr>
<tr>
<td>Rook</td>
<td>A</td>
<td>Robin</td>
<td>O</td>
<td>Mistle Thrush</td>
<td>R</td>
</tr>
<tr>
<td>Starling</td>
<td>F</td>
<td>Swallow</td>
<td>O</td>
<td>Pied Wagtail</td>
<td>R</td>
</tr>
<tr>
<td>Blue tit</td>
<td>O</td>
<td>Wood pigeon</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chaffinch</td>
<td>O</td>
<td>Goldfinch</td>
<td>R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Case study 6. Swords**

Habitat diversity was high within the site (Table 7.1). The development was located adjacent to the Ward River Valley Park, which provided the main source of high quality habitats within the study area. Habitats of highest value were the semi-natural habitats including oak-ash-hazel woodland, broadleaved woodland, mature treelines and river. In addition, such a large area of high quality semi-natural habitat is generally rare within the urban landscape. Habitats within the housing development were low quality and limited to amenity grassland and treelines.

Tree diversity was high within the study area (Table 7.2). This was largely owing to the tree-species richness and the abundance of mature woodland along the river. However, trees were also numerous within the development and, with time, these will mature and improve in value. Mature, native treelines were distinguished from other treelines in the study area. There was good tree structural diversity within the overall site, which supported a range of age groups from young to over-mature (Table 7.3).

Breeding bird diversity was high, with a total of 24 species recorded (Table 7.4). This likely resulted from the diversity, quality and maturity of habitats on site. The occurrence of grey wagtail and moorhen was associated with the river. Blackcap, bullfinch and mistle thrush were associated with the mature woodland.
### Table 7.1 Habitat type and quality

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oak-ash-hazel woodland</td>
<td>High</td>
</tr>
<tr>
<td>(Mixed) broadleaved woodland</td>
<td>High</td>
</tr>
<tr>
<td>Eroding/upland rivers</td>
<td>High</td>
</tr>
<tr>
<td>Treelines</td>
<td>High-Moderate</td>
</tr>
<tr>
<td>Marsh</td>
<td>Moderate</td>
</tr>
<tr>
<td>Drainage ditches</td>
<td>Moderate</td>
</tr>
<tr>
<td>(Mixed) broadleaved woodland</td>
<td>Moderate</td>
</tr>
<tr>
<td>Hedgerows</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Moderate-Low</td>
</tr>
<tr>
<td>Flower beds and borders</td>
<td>Low</td>
</tr>
<tr>
<td>Scattered trees and parkland</td>
<td>Low</td>
</tr>
<tr>
<td>Treelines</td>
<td>Low</td>
</tr>
</tbody>
</table>

### Table 7.2 Tree diversity

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common alder</td>
<td>O</td>
<td>Common lime</td>
<td>F</td>
<td>Black poplar</td>
<td>R</td>
</tr>
<tr>
<td>Ash</td>
<td>O</td>
<td>Field maple</td>
<td>O</td>
<td>Cherry</td>
<td>R</td>
</tr>
<tr>
<td>Downy birch</td>
<td>O</td>
<td>Horse chestnut</td>
<td>O</td>
<td>Common whitebeam</td>
<td>R</td>
</tr>
<tr>
<td>Hazel</td>
<td>O</td>
<td>Italian alder</td>
<td>O</td>
<td>Crack willow</td>
<td>R</td>
</tr>
<tr>
<td>Silver birch</td>
<td>O</td>
<td>Norway maple</td>
<td>O</td>
<td>Cypress</td>
<td>R</td>
</tr>
<tr>
<td>Wild cherry</td>
<td>O</td>
<td>Pine</td>
<td>O</td>
<td>Grey poplar</td>
<td>R</td>
</tr>
<tr>
<td>Elm</td>
<td>R</td>
<td>Sycamore</td>
<td>O</td>
<td>Larch</td>
<td>R</td>
</tr>
<tr>
<td>Common rowan</td>
<td>R</td>
<td>Apple</td>
<td>R</td>
<td>Spruce</td>
<td>R</td>
</tr>
<tr>
<td>Pedunculate oak</td>
<td>R</td>
<td>Beech</td>
<td>R</td>
<td>Sweet chestnut</td>
<td>R</td>
</tr>
</tbody>
</table>

### Table 7.3 Tree structural diversity

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent</td>
<td>Abundant</td>
<td>Frequent</td>
<td>Occasional</td>
</tr>
</tbody>
</table>

### Table 7.4 Breeding bird diversity

<table>
<thead>
<tr>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackbird</td>
<td>A</td>
<td>Robin</td>
<td>F</td>
<td>Moorhen</td>
<td>O</td>
</tr>
<tr>
<td>Blue Tit</td>
<td>A</td>
<td>Starling</td>
<td>F</td>
<td>Rook</td>
<td>O</td>
</tr>
<tr>
<td>Magpie</td>
<td>A</td>
<td>Blackcap</td>
<td>O</td>
<td>Swallow</td>
<td>O</td>
</tr>
<tr>
<td>Wood Pigeon</td>
<td>A</td>
<td>Coal Tit</td>
<td>O</td>
<td>Swift</td>
<td>O</td>
</tr>
<tr>
<td>Wren</td>
<td>A</td>
<td>Collared Dove</td>
<td>O</td>
<td>Bullfinch</td>
<td>R</td>
</tr>
<tr>
<td>Chaffinch</td>
<td>F</td>
<td>Grey Wagtail</td>
<td>O</td>
<td>Goldfinch</td>
<td>R</td>
</tr>
<tr>
<td>Great Tit</td>
<td>F</td>
<td>Jackdaw</td>
<td>O</td>
<td>Hooded Crow</td>
<td>R</td>
</tr>
<tr>
<td>House Sparrow</td>
<td>F</td>
<td>Mistle Thrush</td>
<td>O</td>
<td>Song Thrush</td>
<td>R</td>
</tr>
</tbody>
</table>
Case study 7. Lusk
Habitat diversity was low and habitat quality was moderate to low (Table 8.1). A hedgerow was the only semi-natural habitat on site. This had a moderate to high diversity of hedgerow plants but it was partially severed.

Tree diversity was moderate (Table 8.2). Most trees on site were newly planted or semi-mature. Mature trees were rare (Table 8.3). Immature trees generally support a limited amount of wildlife, mostly birds and some invertebrates.

Breeding bird diversity was low (Table 8.4). The lack of mature vegetation was reflected in the limited variety and number of bird species recorded on site. There were no substantial areas of mature vegetation adjacent to the development that could act as a core habitat for species to disperse from into the surrounding new developments. This will affect the potential for biodiversity to expand in the area over time. The hedgerow supported the main concentration of bird species that were recorded in the area. Although the hedgerow was unconnected to the wider landscape and had limited potential as a corridor, it acted as a small habitat patch or stepping stone for mobile species such as birds. The adjacent gardens were immature and supported only amenity grassland, which had limited value for wildlife.

Table 8.1 Habitat type and quality

<table>
<thead>
<tr>
<th>Habitat types</th>
<th>Habitat quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hedgerow</td>
<td>Moderate</td>
</tr>
<tr>
<td>Scattered trees and parkland</td>
<td>Moderate - low</td>
</tr>
<tr>
<td>Treeline</td>
<td>Low</td>
</tr>
<tr>
<td>Amenity grassland</td>
<td>Low</td>
</tr>
<tr>
<td>Flower beds and borders</td>
<td>Low</td>
</tr>
</tbody>
</table>

Table 8.2 Tree diversity

<table>
<thead>
<tr>
<th>Natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
<th>Non-natives</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>F</td>
<td>Lime</td>
<td>F</td>
<td>Pine</td>
<td>R</td>
</tr>
<tr>
<td>Silver birch</td>
<td>F</td>
<td>Apple</td>
<td>R</td>
<td>Rowan*</td>
<td>R</td>
</tr>
<tr>
<td>Rowan</td>
<td>F</td>
<td>Larch</td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wild Cherry</td>
<td>R</td>
<td>Norway maple</td>
<td>R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wych elm</td>
<td>R</td>
<td>Norway spruce</td>
<td>R</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

Table 8.3 Tree structural diversity

<table>
<thead>
<tr>
<th>Young</th>
<th>Semi-mature</th>
<th>Mature</th>
<th>Over-mature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dominant</td>
<td>Rare</td>
<td>Rare</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 8.4 Breeding bird diversity

<table>
<thead>
<tr>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
<th>Species</th>
<th>Abu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wren</td>
<td>F</td>
<td>Greenfinch</td>
<td>O</td>
<td>Swallow</td>
<td>O</td>
</tr>
<tr>
<td>Blackbird</td>
<td>O</td>
<td>Robin</td>
<td>O</td>
<td>Wood pigeon</td>
<td>O</td>
</tr>
<tr>
<td>Blue tit</td>
<td>O</td>
<td>Rook</td>
<td>O</td>
<td>Song thrush</td>
<td>R</td>
</tr>
</tbody>
</table>
Table 9.1. Summary of case study biodiversity characteristics

<table>
<thead>
<tr>
<th>Case study area</th>
<th>Number of habitats per case study area</th>
<th>Habitat quality ratio High: Medium: Low</th>
<th>Number of tree species per case study area</th>
<th>Tree species Native: Non-native ratio</th>
<th>Tree structural diversity in order of greatest frequency Young: Semi-mature: Mature: Over-mature</th>
<th>Number of bird species per case study area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monkstown</td>
<td>5</td>
<td>0:3:2</td>
<td>12</td>
<td>4:8</td>
<td>M/S/Y/O</td>
<td>16</td>
</tr>
<tr>
<td>Castleknock</td>
<td>5</td>
<td>1:3:1</td>
<td>9</td>
<td>4:5</td>
<td>Y/S/M</td>
<td>12</td>
</tr>
<tr>
<td>Dundrum</td>
<td>8</td>
<td>2:3:3</td>
<td>21</td>
<td>7:14</td>
<td>Y/S/M/O</td>
<td>13</td>
</tr>
<tr>
<td>Ongar</td>
<td>5</td>
<td>2:2:1</td>
<td>19</td>
<td>7:12</td>
<td>Y/M/S/O</td>
<td>20</td>
</tr>
<tr>
<td>Stepaside</td>
<td>10</td>
<td>3:6:1</td>
<td>13</td>
<td>9:4</td>
<td>Y/S/M/O</td>
<td>13</td>
</tr>
<tr>
<td>Swords</td>
<td>12</td>
<td>4:5:3</td>
<td>27</td>
<td>9:18</td>
<td>S/Y/M/O</td>
<td>24</td>
</tr>
<tr>
<td>Lusk</td>
<td>5</td>
<td>0:2:3</td>
<td>12</td>
<td>5:7</td>
<td>Y/S/M</td>
<td>9</td>
</tr>
</tbody>
</table>

Discussion

Adding biodiversity value to a new or existing development.

Habitats of highest biodiversity value are those that support native flora and fauna in natural or semi-natural communities. Habitats are termed ‘semi-natural’ where the habitat is composed of native species but where there is a degree of human intervention, such as grazing or mowing (European Union, 1992). Natural and semi-natural habitats are valued above artificial or heavily modified habitats because they support a complement of native plant and animal species that have developed in balance with each other and reflect the abiotic environmental conditions present at that site. Natural and semi-natural communities are becoming increasingly rare in the wider landscape (NPWS, 2008) due to land use modification primarily associated with agriculture and urbanisation.

The space available for biodiversity, and the quality of that available space, is often diminished through urbanisation (European Commission, 2004). It is for this reason that effort is focused on minimising the potential impacts of development by identifying practical means of protecting, enhancing and creating habitats within new and existing development. The objective of this work is therefore to find means of assimilating or recreating habitats within the urban environment that most closely resemble their natural or semi-natural counterparts and thereby represent a more significant contribution to the biodiversity resource within the wider landscape.

The habitats of highest biodiversity value within the study areas are those that were incorporated into developments from the pre-development landscape or that have had sufficient time to mature and develop into valuable habitat. Mature woodland, treelines and river habitats achieve high value ratings within this study. These habitats were retained as existing features in the Dundrum, Ongar, Stepaside and Swords case studies. Woodland and trees in particular can take many years to re-establish following construction. Once incorporated, they add increasingly high biodiversity value to the sites and limit the duration
of construction impact on wildlife. Bird species use mature trees and hedgerows for cover and are more likely to return to a site if there is suitable habitat available.

The most common habitat types of moderate biodiversity value within the case studies are hedgerows, treelines, scattered trees and parklands. These habitats are predominantly young or immature and have the potential to achieve a high biodiversity rating with time. Other habitats of moderate biodiversity value that occur infrequently are neutral grassland, dry meadow and grassy verge, scrub, pond, marsh and drainage ditch. These semi-natural habitats commonly occur within the wider landscape and provide habitat for a variety of species. However, they are rarely incorporated or created within developments. They also have the potential to provide ‘stepping-stones’ and corridors for species movement within the landscape.

Habitats of low biodiversity value offer good potential for enhancement. Amenity grassland is the most common habitat found within all study areas and is of very limited biodiversity value. Flower beds and borders and ornamental non-native shrubs were also common habitats of low biodiversity value. These habitat types have high potential for enhancement through alternative species composition and management.

Traditional landscape design relies on planting new trees, ornamental shrubs, flower beds and borders and amenity grassland. There is potential to diversify development design by protecting and creating a diversity of habitat types. Maintaining larger open spaces with high habitat diversity, which are allowed to develop and mature over time, can maximise the potential for biodiversity value. A mosaic of grassland, scrub, woodland and wetland creates the greatest species-richness and structural diversity.

The early consideration of biodiversity resources is of greatest importance when incorporating biodiversity into development. A basic habitat assessment is required to identify biodiversity features on site. This process helps determine the viability of the development at an early stage by identifying major constraints, such as protected sites. In the event that no major constraints are identified, it will identify features, such as trees, woodland or watercourses, that require early consideration in the design phase and that present opportunities for biodiversity enhancement within the proposed development. A number of key elements should be identified within the landscape, including existing areas of low biodiversity value suitable for development, existing areas of biodiversity value and existing linear features with potential as wildlife corridors. The footprint of the development should be designed to avoid impacts on areas of high biodiversity value. Areas of semi-natural habitat should be incorporated into the development where possible. Extensive areas of heavily modified habitat, such as brownfield sites, improved agricultural grassland and arable land, have a low biodiversity value and are generally most suitable for development.

Woodlands and trees
Woodlands with complex, mature structure are of greatest biodiversity value. They take decades or centuries to develop and are therefore not easily recreated. Newly planted areas will take more than 30 years to begin to resemble mature woodlands. Woodlands typically consist of layered vegetation, starting with the upper canopy of mature trees. An understorey of shrubs and ground flora, which is specially adapted to shade and moisture, develops
beneath this. Poorly structured woodland can be diversified by creating an understorey of native shrubs within the woodland that mimics its natural structure or, more simply but slowly, by removing any management, such as mowing and clearing, beneath the existing tree canopy. By not over-managing or tidying the area, the understorey and ground flora will evolve naturally with the other components of woodland structure, such as leaf litter, dead wood, fungi and microorganisms. Design should seek to maintain mature specimens and clusters with the view to replicating the natural structure of high quality woodland. The Swords case study provides an example of high quality, semi-natural woodland adjacent to the development.

The Stepaside and Castleknock case studies show a high proportion of native species used in new planting schemes. Using native species is preferable as it increases the distribution of native habitats and native trees support a greater variety of associated fauna. The choice of tree species will need to be cognisant of the location, and tree planting schemes should use species appropriate to the environmental conditions of the site, including soil conditions, availability of space and aspect. The eventual size of the individual trees in relation to the green space and surrounding buildings must be taken into consideration. Native species, such as ash, silver birch, downey birch, rowan, wild cherry and occasionally wych elm, are used in new planting throughout the case studies. Many of these are suitable for streets and confined places. Large open areas can support large specimens such as oak.

Many new developments have poor tree structural diversity, as the majority of individual trees are young or semi-mature. This will improve over time as trees mature. Monkstown is an example of a mature development where tree structural diversity is good, and individuals occur across the range of age classes from young to over-mature, with the highest abundance in the mature age class. Mature specimens will generally host a high level of biodiversity. In natural woodland conditions, over-mature trees will fall and create new spaces for young seedlings and saplings. However, in heavily managed conditions, and where public safety and perception are important, this is unlikely to occur naturally. Where it is not feasible to allow large quantities of deadwood to remain, cut boughs and logs could be left to decompose naturally in certain areas, in an effort to recreate woodland conditions. New planting will be required, as natural regeneration of seedling and saplings is unlikely to occur under intensively managed conditions. The Monkstown case study also provides an example of how rare native trees, such as the strawberry tree and yew, can be grown successfully in urban environments, enhancing species richness and increasing the stock of native species that have now become rare within the wider landscape.

**Hedgerows and shrubs**

Many sites support hedgerows. The Dundrum case study provides an example of mature, species-rich hedgerows with good structure incorporated into an urban development. Hedges of native species, including hawthorn, hazel and blackthorn, provide an alternative to common urban hedge species, such as grizalinia or beech, that have very limited wildlife value. Less common species, such as yew, holly and spindle, can also be used, or interspersed with more common species to enhance diversity.

Many of the sites support ornamental non-native shrubs. These are labour intensive and expensive planting regimes. There is potential for substituting native shrubs for ornamental and non-natives. Native species have the advantage of being adapted to the Irish climate and
conditions and are more likely to thrive. Using shrubs on the edge of wooded areas to grade into other habitats, such as grassland, can improve structural diversity. Where appropriate, the diversity of species can be broadened to include non-native wildlife-friendly species. Many non-native species are valuable for wildlife but should be used in a limited capacity. They produce copious nectar and provide essential cover for nesting, roosting and hibernating wildlife. However, it is vital that advice is sought to ensure that no invasive species are used. With careful planning, a planting scheme can be devised to produce flowering and fruiting through the year. This provides an almost continuous food source for wildlife. Allowing leaf litter to accumulate encourages the presence of invertebrates that live in the soil underneath. As many species live in the leaf litter below as they do in the branches and leaves above. Avoid the use of mulch, which prohibits birds from foraging in the soil for invertebrates.

**Grasslands**
The most widespread habitat within the study areas was amenity grassland, which is created using standard ryegrass mixes. These mixes typically contain very few species and are mostly non-native. The management of amenity grassland is typically intensive mowing, creating a short, homogenous sward of very limited biodiversity value. Amenity grassland creates an impression of well-maintained, open green space in urban areas and is appropriate in certain situations. However, its dominance in built areas reduces the potential extent of other, more diverse habitats within the limited open space of the urban environment.

The alternatives to amenity grassland are to replace some of it with other habitats described above, or to create more species-rich grassland through reseeding or management. The key to establishing species-rich grassland is creating and maintaining low nutrient levels in the soil. Soils that have nutrients added through artificial fertiliser take a long time to deplete and support the growth of only a few vigorous herbs. Reuse of top-soil from grasslands with moderate to good species-richness during landscaping will encourage natural vegetation to redevelop.

Other methods of creating a more species-rich sward include the use of wildflower seeds, of local provenance where possible. Use of hay from nearby wildflower meadows provides a good source of seeds but these are hard to obtain in large quantities.

Moderate quality grasslands can be diversified over time through good management. The Ongar case study is an example of how a grassland with moderate species-richness can be enhanced by allowing areas to grow tall during the summer months. This allows existing flowers to grow and set seed. It also provides habitat and a food source for birds and invertebrates such as butterflies. Grass cuttings should be collected after mowing to help lower the nutrient levels in the soil over time and help improve species diversity. Chemicals such as herbicides, pesticides and fungicides should be avoided where possible as these reduce species diversity and interrupt the natural flow of nutrients in the ecosystem.

A verge of un-mown grassland on the edge of more intensive grasslands can enhance species and structural diversity. In the Dundrum case study, many more species occur in the un-mown grass verge than in the adjacent amenity grassland. Altering the mowing regime in certain areas will create structural diversity in grassland areas. Other options involve leaving certain areas un-mown for periods during the summer season or maintaining a strip of tall grass at the base of hedgerows to create habitat diversity.
Low intensity managed areas can create the impression of neglect among the public. Where public perception is an issue a swathe can be cut around or through tall grass or wildflower areas to show that the area is being managed and not abandoned. In addition the use of interpretive signage can be used to show that the management is part of a local biodiversity initiative.

Alternative uses of amenity grasslands can also be incorporated into developments. A valuable alternative is the implementation of Sustainable Drainage Systems in new sites such as Stepaside. SuDS are described further below.

**Wetlands**

Water is vital for all life forms. In urban areas where hard surfaces predominate, there can be a lack of available water for species. Water features can dramatically enhance the biodiversity value of the site by creating habitat for wetland plants and attracting wildlife such as birds and invertebrates. Watercourses should be maintained as close to their natural state as possible. In the Swords case study, the river shows a high level of naturalness where there is a mixture of open banks and over-hanging bankside vegetation. Where planting is required, species should be native and vegetation should form a gradient from herbaceous emergent species at the water’s edge to taller woody species on the bank. The threat posed by invasive species has been cited as one of the principal causes of biodiversity losses globally (Millennium Ecosystem Assessment, 2005). It is important to ensure that invasive species are not used in terrestrial or aquatic planting schemes. Watercourses and ponds provide an easy conduit for invasive species to spread and extra care should be taken in relation to planting near waterbodies. Maintaining a buffer of semi-natural vegetation around the perimeter of the pond or along the bank of the watercourse will help prevent run-off from adjacent areas, particularly amenity grassland, entering the water. Excess nutrients cause a build-up of nutrients and eventually eutrophication, which lead to lower oxygen levels in the pond and lower the diversity of plant and animal species that can survive within it.

Culverting of watercourses should be avoided where possible. Where unavoidable, stream crossings should use good culverting design and construction. The Stepaside case study is an example of a new culvert incorporating a wide mammal ledge where species such as otter can pass through safely.

It is important to avoid building on floodplains and to incorporate these features into the design as flood protection and water management features where appropriate. The Swords case study shows an example of how retained floodplain can provide an important landscape element that provides excellent biodiversity value while enhancing the amenity value of the site.

Artificial wetlands such as those used in Sustainable Drainage Systems (SuDS) provide an opportunity to combine effective water management and habitat creation. Built-up areas are traditionally drained using underground pipe systems, which are designed to prevent flooding locally by conveying the water away as quickly as possible. This can alter the natural flow patterns and can lead to problems of flooding elsewhere in the catchment. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as Sustainable Drainage Systems (SuDS). The Stepaside case study provides an example of a SuDS system incorporated into a high-density urban development. In addition
to treating run-off from the site, the grassed swales convey surface water run-off and provide an alternative use for amenity grassland; and ponds that receive run-off from the development prior to discharge to a watercourse act as valuable biodiversity features. The management of surface water run-off from development has become a significant feature of landscape planning in recent time and is likely to grow in importance as climate patterns produce increased rainfall at high intensity. Swales and other areas of permeable surfaces allow rainfall to percolate into the ground and help reduce the overall effects of intense rainfall events.

**Connecting to the wider landscape**

The spatial arrangement of habitats can contribute to the biodiversity value of the site. Trees planted in small clusters, such as in the Dundrum and Castleknock case studies, form closed canopies when mature, thereby simulating a woodland canopy. Insects and birds in particular will respond well to this and make use of closed canopy and cover (Walters, 2007). Alternatively, the linear arrangement of trees into treelines can provide corridors for the movement of species and connect habitat patches in a fragmented landscape.

Maintaining and creating linear strips, or corridors, for wildlife movement using semi-natural habitats including watercourses, hedgerows and treelines will help maintain connectivity with the surrounding landscape. Treelines and hedgerows provide important links to the surrounding landscape. The Stepaside and Lusk case studies provide examples of severed hedgerows that were incorporated into developments. These provide an opportunity for enhancement by re-establishing these landscape connections. Transport corridors such as roads, railways, tramlines and canals can be used as wildlife links when appropriately landscaped with good quality semi-natural vegetation.

The corridors and stepping-stones of greatest value are large areas that support high quality semi-natural habitats. ‘Stepping stones’ can be created using patches of habitat. These are patches of similar habitat close to each other but that are not physically connected. For example, five or six small patches of woodland in the same area can provide a means of movement for some species that do not need continuous cover.

A linear feature designed to help maintain connectivity may have a second function as a buffer zone. Buffer zones can be used to protect habitats or species sensitive to disturbance. Buffer zones are most frequently used along rivers and around other waterbodies.

**Green buildings**

Buildings themselves can provide habitat for wildlife. A number of design features can be added to enhance the potential for biodiversity, such as incorporating green roofs and green walls, which provide habitat and a food source for certain wildlife. Other features such as bat boxes and bird nest boxes can be used as prescribed by a qualified ecologist to compensate for the loss of habitat or enhance the potential of the site. A wide range of artificial structures is available to encourage different species, which can be attached to the outside of buildings. Building design can be adapted to incorporate artificial boxes or voids for use by crevice nesting birds and bats. There is potential for incorporating bat and bird boxes as standard features in underground areas where warm, dry and dark conditions predominate. Features such as ledges, which are sometimes used by kestrels, brick gaps or specialised bricks in building, and gaps between roof tiles or specialist roof tiles, can promote nesting and roosting.
Good garden design, which arranges gardens so that they form a connecting line (back-to-back and side-to-side) and create linkages with adjacent public green space helps to maximise the connection between green spaces.

**The economic value of biodiversity enhancement**

Semi-natural habitats require minimal maintenance. This has two benefits. Firstly, a habitat that is near its natural condition has greater biodiversity value. Secondly, it is less expensive and less time consuming to maintain. It is often more cost-effective to incorporate existing landscape features such as trees, streams or ponds at the outset of the development rather than recreate them at a later stage. Adding existing landscape features to the development is likely to cut down on expensive landscaping and the use of exotic species. The use of native species in landscaping may also be cheaper, as native species are adapted to environmental conditions and are more likely to succeed. This reduces the failure rate of new planting and the need for replacement planting at a later stage. Less intensive management practices are also cheaper because they require less intervention through mowing, reseeding and the use of chemicals.

Studies have indicated that trees in residential areas can increase property values by 6 per cent and 15 per cent (Johnston & Newton, 2004). Shoppers may be willing to pay up to 11 per cent more on leafy streets (University of Washington, 1998).

**Conclusion**

Biodiversity is a limited natural resource that is impacted through urbanisation. Sensitive development and habitat management can protect and enhance biodiversity resources within the urban environment. Mature woodland, mature treelines and riverine habitats had the highest biodiversity value within the case studies recorded. Habitats with moderate biodiversity value, including hedgerows, scattered trees and parklands, occurred frequently and had good potential for enhancement through supplementary planting and mature development with time. Other semi-natural habitats that support biodiversity within the wider landscape, such as semi-natural grasslands, scrub, ponds, marsh or drainage ditches, occur infrequently within the case studies. The most widespread habitat found on all sites is amenity grassland, which has low biodiversity value. Flower beds and borders and ornamental non-native shrubs were also common habitats of low biodiversity value. These habitat types have potential for enhancement through alternative species composition and management. All of the case studies have the potential to support higher levels of biodiversity through diversifying existing habitats or allowing them to mature. The biodiversity value of a site can be enhanced through a number of measures: retaining significant features of biodiversity value at the outset of the development; allowing trees and woodland to mature; diversifying traditional planting schemes to incorporate more native and wildlife-friendly species; diversifying management, such as the use of alternative mowing regimes; and creating a mosaic of habitats within a site.

**Acknowledgements**

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Regional governance and the challenge of managing socio-economic change

Deiric Ó Broin

1. Introduction
The primary purpose of the chapter is to examine the position of Dublin in a set of widely-shared and influential ideas about the emergence of a new urban era in developed economies, and on the particular governance challenges facing Dublin. The chapter itself is broken into six parts. The first provides a brief introduction to the concept of a ‘New Conventional Wisdom’ (Gordon and Buck 2005: 5) about cities and city regions1 and the impact of this new paradigm on public policy discourse (section 2). This is followed by a short review of three key components of the New Conventional Wisdom: competitiveness and competition (section 3), social cohesion (section 4), and urban governance (section 5). Section 6 examines the situation of Dublin within the New Conventional Wisdom paradigm. The final part discusses the potential governance arrangements for Dublin as a consolidating city-region in what is, and is likely to remain, a very open economy (Smith, 2005: 150).

2. Cities and the New Conventional Wisdom
Gordon and Buck (2005) contend that the start of the twenty-first century saw a renewed optimism about cities, in essence, “a shift from seeing them as essentially problematic residues of nineteenth-and early twentieth century ways of organizing industrial economies towards the idea that they could again be exciting and creative places in which to live and work”, (2005: 6). An important element of their contention is that the origins of this shift in thinking lie in social, economic and political changes necessitated by a “qualitatively different economic environment” (ibid.) rather than a change in thinking about the benefits of

1 City-regions have attracted considerable attention in developed economies over the course of the last 20 years. These combinations of an urban core or cores with a semi-urban and rural hinterland linked to the core by functional ties are becoming “increasingly regarded by certain scholars and policy makers as (a) the motors of economic activity in a globalised world, (b) the most adequate geographical units for the experimentation with and implementation of new modes of economic governance, and (c) more fundamentally, the ideal scale for public policy intervention” (Rodriguez-Rose, 2009:50).

2 The term is credited to the Canadian economist John Kenneth Galbraith. In The Affluent Society, he observes, “It will be convenient to have a name for the ideas which are esteemed at any time for their acceptability, and it should be a term that emphasizes this predictability. I shall refer to these ideas henceforth as the conventional wisdom” (1958: 18). Of particular interest for Galbraith was the limited association between convenience and/or acceptability and some form of objective truth. He notes that difficult and complex economic and social theories are mentally tiring, therefore “we adhere, as though to a raft, to those ideas which represent our understanding” (ibid.)
urban living or improvements in the economies of large cities. These changes are flagged by “repeated reference to the imperatives of (economic) competitiveness, (social) cohesion and (responsive) governance” (ibid.). It is acknowledged that these changes are not specifically ‘urban’ and they are not necessarily linked to a resurgence of cities. However, it is argued that in this particular context, and taken together as a set, they have been understood as implying a much increased importance for cities in securing “societal success” (ibid.). This is the core of the New Conventional Wisdom, a set of widely shared ideas about “the emergence of a new urban era in advanced economies” (Gordon and Buck, 2005: 5), which relates this to a set of pervasive forces in a globalised economy:

(a) Cities are seen as crucial to the achievement of competitiveness, social cohesion and responsive governance at a societal level;

(b) Competitiveness, cohesion and effective governance have become vital to the survival of cities, individually and collectively;

(c) This set of economic, social and political concerns is understood to be interdependent and mutually reinforcing, rather than competing values to be traded off against each other.

It is important to note that the purpose of the chapter is not to interrogate the suppositions underlying the New Conventional Wisdom but rather to examine the impact of the new paradigm on public policy discourse, particularly its employment at transnational level and the effect of this at national and city level.

It is suggested that the employment of the key components of the New Conventional Wisdom by such organisations as the Organisation for Economic Co-operation and Development (OECD) and the European Union (EU) has had a significantly larger impact on Irish public policy discourse than other similar states because the Irish state’s institutions are inclined to look to such bodies for policy guidance (O’Hearn, 1998: 55). This reflects an interesting aspect of the Irish public policy formulation process, i.e. the relatively weak structured links between indigenous higher education and research institutes (which could, and occasionally do, play a useful filtering and localisation role) and the state’s policy formulation processes (Garvin, 2004: 179, Kirby, 2008: 4, Munck and Ó Broin, 2009: 154), and the state’s inclination to seek public policy guidance from non-indigenous sources, in particular the OECD (National and Economic and Social Development Office (NESDO), 2009: 19).

As noted above, the OECD has been a particularly important source of influence on public policy debate as it pertains to cities, e.g. Cities for Citizens: The Role of Metropolitan

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3 An interrogation of the key concepts could sensibly start with the formulation of the concepts themselves. It is noted by a number of leading thinkers in the area that they lack precision and don’t provide an adequate basis for either serious public policy initiatives or academic analysis (Turok, 2005, Gordon et al, 2004 and Kjaer, 2009). This, to a certain extent, misses the point, it is suggested that it is the very lack of precision that has facilitated their widespread acceptance.
Governance (2001a), Devolution and Globalisation: Implications for Local Decision-Makers (2001b), Competitive Cities in the Global Economy (2006) and Competitive Cities: A New Entrepreneurial paradigm in Spatial Development (2007). The concepts contained in these documents are reflected in much of the Irish public policy discourse over the course of the past decade. For example, variations of “(there) are close links between social and economic development, such that policies to support social cohesion may also increase investment attractiveness and business competitiveness,” (OECD, 2001a: 209) and “(the) governance structure of large cities need to be reformed in order to provide adequate frameworks for meetings the challenges of today such as sustainable urban development, increasing competitiveness in a global economy, strengthening social cohesion and nurturing local democracy,” (OECD, 2001b: ii) can be found in the National Competitiveness Council’s Our Cities: Drivers of National Competitiveness (2009) and the NESDO’s Ireland At Another Turning Point: Reviving Development, Reforming institutions and Liberating Capabilities (2009) and the Dublin Local Authorities’ (DLA) Economic Development Action Plan for the Dublin City Region (2009).

3. Cities, Competition and Competitiveness

With regard to the concepts of competition and competitiveness, in this context the economic environment is conceptualised as one in which most kinds of protection from competition have been eroded, through technological change, improvements in communications, and “new instabilities in both tastes and the international economic order” (Gordon and Buck, 2005: 10). Turok notes that competitiveness represents the “fundamental of prosperity in an increasingly market-driven economy” (2005: 25). Unfortunately, as Turok contends, competitiveness is a very difficult concept to define and measure “because it is multifaceted and not directly observable” (ibid.). However, despite such difficulties, competitiveness “has become a powerful mantra in economic and spatial policy during the last decade” (Turok et al, 2004: 14). As such, it is used in a variety of ways and contexts and, as Bristow observes, it “retains a seemingly unshakeable hold over policy thinking and practice” (2009: 26). Internationally, it is accepted that certain factors underpin the competitive success or failure of cities, regions and states (Moulaert 2000: 16-17). For example, it is clear that “some cities have consistently prospered, maintaining or increasing their share of national employment and population” (Moore and Begg, 2004: 93). Other cities have struggled to transition successfully to new economic environments and have lost jobs, skills and industries while failing to attract new investment (Savitich and Kantor, 2002: 2-3, Euchner and McGovern, 2003: 93).

The New Conventional Wisdom that has come to dominate so much of the public policy discourse contends that competition is a much more immediate and pervasive fact of life. Not only is it more all-encompassing, it is suggested that it is a qualitatively different process than heretofore. Rather than pursue greater efficiencies in serving existing markets, the central economic imperative is to compete and build competitiveness through a search for new opportunities and distinctive sources of advantage in conjunction with a pervasive “anxiety about competition from other places” (Massey, 2007: 174). Indeed, the New Conventional Wisdom contends that cities and city-regions have to be “more competitive to survive in the new marketplace being forged by globalisation and the rise of the information technologies” (Bristow, 2009: 26). Competitiveness has, in effect, become “a natural law for economic development and policy” (ibid.).

In addition, the model predicts a renewal of the importance of place-based external economies and the value of face-to-face relations. As Savitch and Kantor observe, at least for some cities,
the increasingly knowledge-intensive nature of economies has “accelerated face-to-face and informal contact. It has increased an appetite for conferences, seminars, and annual meetings” (2002: 15). Furthermore, businesses are constantly searching for that “extra edge that comes from personal contact” (ibid.). As Sassen notes, for a limited number of cities, those integrated into transnational economic networks, urban assets and urban economic performance matter more for national economic outcomes (2006: 76-78).

4. Cities and Cohesion
Social cohesion, like competitiveness, becomes a key component of the New Conventional Wisdom because the social structures of the previous socio-economic environment, i.e. clear divisions between public/private and economic/social roles, can no longer be counted on to ensure the conditions for competitive success. For example, Parkinson and Boddy observe that the term ‘cohesion’ has “been used in a variety of ways in different contexts” (2004: 4). At one level it is used in an effort to capture the idea of the processes and networks that underpin the activities of successful societies and economies. These include common values, attitudes and social norms. For example, lack of cohesion may be manifest in “a lack of attachment to paid work, restricted social contacts, attitudes to education, substance abuse or a propensity to crime” (Parkinson and Boddy, 2004: 5). Certain forms of social success contribute to economic success, for example, certain social networks, the nature of informal organisational life and the degree of social trust.

In addition, there are questions about how possible it is for old expectations about employment security and some consensus on fairness and legitimacy to continue to be met in the new circumstances of the ‘flexible’ economy and the individualisation of many social relations (Sassen, 2006: 155). This individualisation of such social relations, for example the decline of trade unions’ influence in many developed economies, is often accompanied by what Sassen terms “the informalization of a growing range of economic activities in today’s large cities” (2006: 161). These processes undermine the type of social cohesion envisaged as a foundation for successful cities because they tend to become evident in terms of the breakdown of residential community, family fragmentation and a decline in civic associations (Kirby, 2005). Despite such concerns, social cohesion is perceived to be a key ingredient in the state’s efforts to develop the new ‘smart economy’, i.e. an economy that “combines the successful elements of the enterprise economy and the innovation or ‘ideas’ economy while promoting a high quality environment, improving energy security and promoting social cohesion” (DLA 2009: 6).

5. Cities and Governance
The New Conventional Wisdom suggests that changes in competitiveness, competition and social cohesion have a number of significant implications for “systems of government and economic regulation” (Gordon and Buck 2005: 12). The first relates to the blurring of boundaries between the public and private spheres and the second relates to the scaling of the relevant economic arenas, as these have moved both up and down from the state.

With regard to the former, a very significant development has been the externalisation of many firms’ functions, particularly in the areas of training and continuing professional development. In the Irish case a number of state-funded agencies and quasi-public agencies have become increasing involved in the provision of bespoke training, e.g. Skillnets, PLATO, Chamber Business School, FÁS. One could arguably include most universities and institutes of technology in this category as well. For example, a significant number of higher education
institutions deliver programmes designed solely to meet external accreditation by private, external organisations, including the Irish Planning Institute, the Institute of Chartered Accountants of Ireland, the Institute of Bankers in Ireland, and the Society of Chartered Surveyors. This has allowed private organisations to transfer their training costs to the public. In addition, traditional forms of standardised public provision/regulation are perceived to be insufficiently flexible for the new fluid environment. As a result there is a requirement for new forms of public-private and quasi-public partnerships to be established to pursue a more entrepreneurial path (Davies, 2007: 201).

In relation to the scaling of relevant economic arenas, a key contention of the New Conventional Wisdom is that globalisation has led to a blurring of boundaries between supranational, national and local control functions. This has involved both a pressure to allocate decision-making power upwards, for example monetary, trade and environmental regulations (Savitch and Kantor, 2002: 2), and downwards to cities, for example competition for FDI and market shares in internationally traded services (Tsukamoto and Vogel, 2007: 16). Implicit in this perspective is that major factors on the road to the cohesive and competitive city are (a) finding the appropriate administrative scale at which to formulate and implement industrial, social and infrastructural policies, and (b) devising the appropriate partnership mechanism with the relevant private stakeholders. As a consequence, governance is purported to be an answer to how the imperatives of competitiveness and cohesion are to be pursued and balanced, when neither state nor market can assure this (Kjaer 2009:141). Hambleton outlines a model of governance that requires senior managers in local public institutions to “adopt an outward-looking approach, and crucially, to engage with the economic and other interests which influence the current and future wellbeing of the locality” (2003: 151).

6. Dublin and the New Conventional Wisdom

As stated above, the primary purpose of the chapter is to examine the position of Dublin in a set of widely shared and influential ideas about the emergence of a new urban era in developed economies. The purpose of the preceding sections is to draw out, as coherently as possible while sidestepping the numerous subtleties and disagreements within the literature, a narrative and its key components. Having done so, it is possible to examine Dublin within the New Conventional Wisdom paradigm and assess its situation.

A number of critical issues arise when examining Dublin as a city-region in comparison with so many of the counterparts offered in the literature. These include:

(a) Dublin is not only the capital city of a modern EU member state, it is the largest city on the island and possibly the only city of relevant scale for the inclusion into the international network of city nodes discussed in the relevant literature. As the IDA observes, “frequently competition for Foreign Direct Investment comes

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4 It is important to note that the National Economic and Social Council’s The Developmental Welfare State (Report 113) published in May 2005 and the National Economic and Social Development Office’s Ireland At Another Turning Point: Reviving Development, Reforming Institutions and Liberating Capabilities both express similar sentiments. The latter contends “new forms of cross-fertilisation between the economy, society and public governance are increasingly evident, enhancing the ability to learn and innovate,” (2009: 7).
not from other countries but from city regions with populations in excess of one million people. Dublin is the only recognised city region in Ireland that meets this criteria,” (2009:8);

(b) As a consequence to (a) it is not in direct competition with other Irish regions for Foreign Direct Investment as it was in the recent past (O’Hearn 1998: 27);

(c) It is the engine of the Irish economy and there is some discussion as to whether it is fully embedded into the wider Irish economy or in the process of disembedding from the national economy and taking a place in a different economic environment (Punch et al, 2007: 50). What is Dublin’s place in a “new geography of centres and margins” (Sassen, 2006: 193)?

(d) It is a city largely governed by national rather than local/regional stakeholders, despite the fact that there are a myriad of local public stakeholders and more proposed. Is it a case of too many local cooks and not much broth to spoil?

(e) Clarifying the boundaries of the city-region raises a number of interesting political and socio-economic questions. When the City is discussed, is it the boundaries of the City Council, the Dublin Metropolitan Area, the Greater Dublin Area or a Functional Urban Region being discussed (Williams, 2006: 3-4)?

(f) What coherent evidence underpins the claim that Dublin is a cohesive and competitive city? To develop the argument of Dr. Craig Barrett, former CEO and Chairman of Intel, without low corporation tax and English as our lingua franca in what ways is Dublin more competitive than Helsinki, or Barcelona or Copenhagen?5

Given these issues, it is suggested that while all cities have unique characteristics, Dublin’s unusual economic position vis-à-vis the rest of the state (Punch et al 2007: 46), the recent and current economic and regulatory regime, its institutional arrangements and track record in creating public institutions, and its political culture, poses challenges that the remedies outlined in the New Conventional Wisdom paradigm may find difficult to surmount.

7. Governance in an evolving city-region
Savitch and Kantor contend that the “combination of economic, demographic, technological, and political change is cumulative, and will continue to impact the social order. No society encapsulates this transformation more than urban society. Cities are the crucibles through which radical experiments become convention,” (2002: 3). In this context, it is argued that for innovative solutions to be formulated and implemented three distinct concerns need to be addressed:

(a) National-local institutional relationships are more important in Dublin than most cities;

(b) The relationship between governance (processes) and government (public institutions) is more fluid in Dublin;

(c) The relative lack of importance of the local/regional public and their elected representatives.

5 At the Global Irish Economic Forum in Farmleigh in September 2009, Dr. Barret was reported to have said that there were fourteen reasons why Intel came to Ireland almost 20 years before, but only one remained: the Irish rate of corporation tax.
With regard to the relationships between Dublin’s public institutions and national public institutions, the majority of the issues arise from the historic weaknesses of local government in Ireland and their lack of autonomy (Callanan and Ó Broin, 2007: 497), the “cultural domination of national politics and government in Irish society” (Keogan and Callanan 2003: 503), and the fact that local governments are largely excluded from the planning and delivery of public services such as health, education and policing. In addition, the Irish state has engaged in a process of “agencification” (McGauran et al., 2005: 8), particularly at local level (Ó Broin and Waters, 2007), but there is “no overall government or public sector position on agency formation” (Quinn, 2008: 14). As a result, the institutional landscape is littered with a plethora of recently established, very weak and poorly aligned quasi-public agencies. Furthermore, the focus of national agencies on Dublin is likely to remain, if only because they tend to be based in Dublin. In conjunction with the fact that Dublin remains the seat of the national government, it is likely that national agencies will retain more than a passing interest in the affairs of the city and its governance. Whether these take the form of a national Minister of Transport criticising the City Council’s choice of road signage or involvement in the city-region’s waste management policies, national stakeholders will be involved in the governance of the city-region in a way that won’t happen in either Cork or Waterford.

In terms of the fluidity of governance relationships in Dublin, it is suggested that this arises due to an interesting congruence of events. First, the lack of clarity over what constitutes Dublin has meant that a large number of stakeholders have had to be involved in certain consultative exercises. Taken in conjunction with the corporatist-oriented political culture in the state, this has led to a form of dialogue between stakeholders in different parts of the city-region and at different levels. From Traders Associations in small suburban towns to the Dublin Chamber of Commerce, national business representative associations, trade union organisations, community groups, voluntary organisations and education institutions, public institutions have engaged with a variety of civil society actors and publics in a relatively significant manner. A particularly interesting aspect of this process is that it lacks a specific institutional framework, in particular one provided for by statute. As a result, components of Dublin’s public institutions are engaged in a continuous conversation with multiple stakeholders at multiple levels without any obvious democratic or legitimacy dividend (McGuirk 2000).

In addition to the ongoing inter-sector dialogue it is important to note the very significant overlap of views and personal interaction between public servants in key positions. Smith notes the openly avowed declaration that public servants tend to share “a set of implicit values” (2005: 181) and a “high level of consensus in the overall policy approach” (ibid.). As such, while Irish efforts to develop linkages between institutions may lack momentum, networked individuals are prominent.

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6 The Report of Special Group on Public Service Numbers and Expenditure Programmes (McCarthy/An Bord Snip Nua) recommended the abolition of a number of agencies and the abolition of a tier of local government and the merger of local authorities. In addition, the Department of Community, Rural and Gaeltacht Affairs has engaged on a “Cohesion Process”, which has seen a number of local development agencies merge and seen the merger to two separate funding programmes: the local Development Social Inclusion Programme and the Community Development Programme. However, it is contended that these efforts don’t constitute a rational and coherent programme of public agency management.
In relation to the role of democratically elected public representatives, it is important to acknowledge the relative lack of importance of local/regional public and their representatives. This is a particular problem for Dublin, in comparison to other cities and city-regions. The Irish system of local or sub-national government, in addition to lacking any coherent and effective regional tier, ensures that locally-elected public representatives in Ireland play a much reduced role in the policy formulation and decision-making processes than their European counterparts, and the ability of citizens to influence both the policy formulation and decision-making processes beyond casting their ballot is very narrow (Ó Broin and Waters, 2007). This lack of status and power for citizens and their elected representatives arises from a combination of factors, the most prominent being the highly centralised nature of the Irish state. As Adshead and Tonge observe, that centralisation is equated with efficiency and the “preference for functional efficiency, even at the expense of democratic accountability, is a trait that has characterised local government in Ireland since its foundation” (2009: 160).

This trait is perhaps best exemplified by the ‘managerial’ system of local administration. This system constitutes a major difference between Ireland and other EU member states and has been the subject of substantial debate since its introduction in 1929. Despite recent proposals, including a Green Paper, to introduce directly elected mayors, the system remains largely unchanged. Yet the managerial system has had substantial impact on the ability of local citizens, through their elected councillors, to drive a particular policy agenda. In essence, it has resulted in a democratic deficit where many decisions and policies are initiated and implemented by a non-elected manager. Decision-making in Irish local governments can be broadly divided into two categories:

(a) Reserved functions refer to those made by the elected representatives of the council;

(b) Executive functions refer to those carried out by the county/city manager.

For many citizens, the main conclusion from an analysis of the workings of local government is that the power of initiative lies with the manager and the majority of decisions made by the local government tend to lie in his/her domain (Adshead and Tonge, 2009: 174). This is not to demean or underestimate the work carried out by managers, but it remains problematic that managers are, to a significant extent, insulated from the democratic deliberations of elected councillors. This has added to the public perception that local governments are an “invisible layer of government” (Keogan and Callanan, 2003: 503) with little relevance to people’s daily lives, rather than a flexible and “adaptive tier” of government (Quirk, 2003). Linked to this perceived lack of a robust democratic counterweight to managerial power is a question of the relevance of local government. For example, the various local governments in the Dublin city-region are only tangentially involved in such vital services as health, welfare, enterprise, education, training and policing. In addition to the lack of a robust democratic counterweight

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7 There is also the added complication of an increasing knowledge gap between professional staff and elected representatives. Nalbandian notes that while there are several ways for professional staff to accumulate competence at a faster rate than elected representatives and to systematically convey learning from one generation to the next, there is no comparable systematic way for one generation of elected representatives to learn from another (2009: 192-193).
in the city-region’s local governments, the public agencies operating in the area also lack political counterweights in all public agencies.\(^8\)

In this context, the question remains: is it possible for a Dublin, as an evolving city-region in an open economy, to meet the challenges that are likely to arise in the coming years? The contention of this paper is that it has the potential to, though not through the solutions promulgated by the New Conventional Wisdom. As Healy notes, “each place is different, and has its own trajectory and potentials. There is no predetermined pathway to building effective institutional capacity,” (1999: 192). In relation to developing the Dublin’s institutional capacity, it is important to acknowledge that it is highly unlikely that:

(a) The “cultural domination of national politics and government in Irish society” (Keogan and Callanan, 2003: 503) is going to change. National public agencies, government departments, TDs, Ministers and the Taoiseach are probably going to make contributions to the city-region’s public policy formulation and implementation processes;

(b) Local/regional institutional structures will improve in the short to medium term, including the proposal for a directly elected mayor. This is not to suggest that reforms are not worthwhile but rather recognition that the Irish record of significant and radical reform of public institutions, particularly local public institutions, is poor.

It is suggested that the more likely avenues for success are to develop a shared strategy between the four local governments, other relevant public agencies, including higher education institutions, and private organisations that builds on the existing strengths of interpersonal and inter-institutional relationships and shared knowledge. This may involve a systematic process to facilitate greater interaction between staff in public, private and other institutions and agencies for varying periods of time. The recent establishment of the Creative Dublin Alliance is a very positive development and, along with other such initiatives, it is providing the parameters for substantive collaboration between a number of diverse stakeholders.

In this context, it is suggested that the most fundamental challenge facing the formulation and implementation of public policies is to build public support, recognition and legitimacy for these processes. What is required is an approach that embraces democratic renewal and embeds public policy in some form of citizen-involved public deliberation. The region is littered with consultation efforts that embitter and further marginalise citizens from their local public institutions.

A fundamental rethink is necessary. Without a public policy process that has the support and involvement of the city-region’s citizens and communities, the policies formulated to address challenges such as climate change, the shift to the low carbon economy, reorganisation of the global financial system, the restructuring of the city-region’s economy and demographic

\(^8\) In terms of democratic accountability, one of the more interesting consequences of the establishment of the Health Service Executive was the removal of much maligned elected representatives from its deliberations. As a result, many citizens who heretofore relied on elected representatives to advocate on their behalf have lost a voice in their health service.
changes are unlikely to be effective. There has to be a recognition that stimulating active citizen participation in local government, complex and uncomfortable as it can be, is crucial and will have “profound implications” for public servants and elected representatives (Hambleton, 2007: 167).

However, if the city region’s stakeholders, citizens and communities can keep the social relations between key institutions fluid and focused on the success of the city-region while trying to improve region’s institutional architecture and build citizen support and legitimacy, Dublin could develop the social, civic and institutional capacity to thrive.

References


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1 Understanding what drives participation among its citizens will enable the city-region to develop more appropriate mixes of intervention and the right range of opportunities and encouragements. Social science research identifies a number of factors as to why people participate in local civic life. For example, citizens participate when they can, when they have the resources necessary to organise, mobilize and make their argument and when they think they are part of something. They like to participate because the arena of participation is central to their sense of identity and their lifestyle. They participate when they are enabled and encouraged by an infrastructure of good civic organisations that provides different pathways to participation. People participate when they are directly mobilised or asked for their opinion. Finally, people participate when they experience the system they are seeking to influence as responsive (Stoker 2005, 15-18).


