Title:

The emergence of green infrastructure as promoting the centralisation of a landscape perspective in spatial planning – the case of Ireland

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Abstract:

The 'landscape' approach to planning and design has long since advanced a social-ecological perspective that conceives ecosystems health and human well-being as mutually constitutive. However, conventional public sector organisational arrangements segregate and discretely administer development issues, thereby militating against the holistic viewpoint necessary to redress the entwined nature of complex planning issues. The emergence and continuing evolution of green infrastructure (GI) thinking seeks to redress this problem by promoting interdisciplinary collaboration to deliver connected and functionally integrated environments. This paper reflects upon the ongoing development and institutionalisation of GI in Ireland as a means to critically evaluate 'if', 'why' and 'how' GI thinking promotes the centralisation of landscape principles in public sector planning. Drawing on a review of local authority practices and interviews with local authority officials, the paper traces and explains the concept's growth from the 'rebranding' of ecological networks to its current manifestation as a new mode of collaborative planning for multifunctional environments. This material is then employed to discuss the potential benefits and barriers encountered by GI planning more generally. Lessons are subsequently extrapolated for the advancement of landscape principles through innovative GI planning practices in other jurisdictions.

1 Introduction

Planning policy furnishes the framework for the future use of land. Therefore, it is inherently related to the fate of landscapes and the direction of landscape research. Consequently, a mainstay of activity for many of those engaged with the field of landscape research and practice has been the promotion of more holistic thinking in planning policy formulation to account for the complexities of social and ecological interactions (Ahern et al., 2014; Benson and Roe, 2007; Selman, 2012). The emergence of 'social-ecological systems' thinking in spatial planning debates represents a recent turn in efforts to acknowledge this complexity and reorient thinking towards a more holistic perspective on the fundamental entwining of social and natural environments (Davoudi et al., 2012; Folke et al., 2010; Folke et al., 2003; Walker et al., 2006). As such, thinking in terms of social-ecological systems signifies the potential to centralise in planning policy those social-ecological relationships that have occupied much landscape research. Planning theorists in particular have seen promise in this perspective and have recently focused attention on locating ways to enhance the 'resilience' of such systems to a variety of environmental, political and institutional stressors (Wilkinson, 2012b). This has entailed a flurry of thinking on how the goals and objectives of planning can be adjusted to better account for social-ecological systems and how the resilience of such systems can be advanced (Cumming, 2011; Davoudi et al., 2012; Scott, 2013). Nevertheless, there remains a paucity of examples to illustrate what planning for social-ecological resilience might look like in practice and what forms of planning activity are required for its realisation (Wagenaar and Wilkinson, 2013). In essence therefore, there exists a lacuna in our understanding of how the holism of a landscape perspective may be effectively integrated into spatial planning practice.

This paper seeks to address this knowledge gap by reflecting upon the development and institutionalisation of the 'green infrastructure' (GI) approach in Ireland as a means to critically evaluate 'if' and 'how' it promotes the centralisation of a landscape perspective in planning practice. As such, this paper contributes to debates on substantive issues in landscape research concerning how planning activity should be conducted in a more self-reflective, responsive and holistic manner (Forester, 2013; Rydin, 2007). GI is an emerging and continually developing concept whose meaning is often dependent on who is employing

it and the context in which it is deployed (Lennon and Scott, 2014). Use of the GI concept in Ireland is no different (Lennon, 2014). Consequently, this paper will trace the rise, evolution and institutionalisation of the GI concept in Ireland as a means of exploring its potential to position landscape concerns at the heart of planning practice. Ireland supplies an exceptionally good case study in which to trace the emergence, evolution and integration of this more holistic perspective in planning due to its particular administration and demographic attributes. Specifically, county and city development plans constitute the principal policy guidance document for land use planning at the local level in Ireland. These documents are produced under strictly prescribed timelines that require their review and adoption every six years. Giving more localised effect to the policies of these development plans are local area plans which are required to be reviewed every six years, subject to some dispensations[i]. As a result, it is feasible to trace the progression and transformation of a new planning policy concept throughout the comparatively frequent and recurring plan review process. Thus, the next section details the research methods adopted in gathering and analysing the empirical data used in this paper to trace the emergence and evolution of the GI concept in Ireland. The subsequent section discusses the theory of 'social-ecological resilience'. This is then employed to inform the scrutiny of the emergence of GI in Ireland conducted in the ensuing section. Following this, the paper presents an illustrative case study analysis of how a GI approach may give form to social-ecological resilience thinking in planning policy. The paper concludes by drawing lessons from the Irish experience on how a GI approach may help centralise a landscape perspective in spatial planning.

2   Research Methods

This paper draws on the complementary and sequentially related research methods of documentary analysis and interviews. The documentary analysis entailed the scrutiny of one hundred and fifty-three Irish policy documents identified as relevant to the study and assembled as an 'archive' (Foucault, 1972). This archive included plans, strategies and studies produced by a spectrum of national, regional and local governmental authorities, quasi-autonomous non-governmental organisations and non-governmental organisations. The contents of the archive spanned the period from the first mention of GI in 2002 to November 2013 when it was considered that sufficient information had been collated and

analysed to facilitate progression to the next stage of the research process. In particular, the examination of documentary material conducted enabled the confident determination of which planning authorities were leaders in advocating the GI approach. Two local planning authorities were identified, namely, Fingal County Council and Dublin City Council. This procedure allowed the research team to locate a series of potential interviewees who it was considered beneficial to consult in seeking to understand the processes that facilitated the emergence, evolution and institutionalisation of the GI approach in each of the identified planning authorities.

A series of interviews were subsequently conducted between December 2013 and March 2014. A total of seventeen people were interviewed. Fifteen of these were local authority officials and two were consultants who had recently worked closely with these authorities in formulating local area plans that promoted a GI approach through both land use policy and design specification. The interviewee selection process was based upon the level of involvement of the interviewees in the development of recent planning and design guidance that explicitly advanced the GI approach. This selection process was also grounded in a desire to represent a broad array of disciplinary perspectives in order to explore potential variations of opinion between different disciplines regarding the benefits of the GI approach. Those interviewed included, policy and development management planners, ecologists, landscape architects, drainage and transportation engineers, a heritage officer[ii], urban designers and those in local authority management positions. The interview duration was on average 1 hour 15 minutes. The interviews were conducted in a semi-structured format as this enabled 'openness to change of sequence and forms of questions in order to follow up the answers given and the stories told by the subjects' (Kvale, 1996, 124). Nevertheless, to ensure research consistency and that all issues relevant to the investigation were appropriately addressed (Bryman, 2008), the content of each interview was framed by a master interview guide that posed a series of 'essential questions' (Berg, 2004). Additional interviewee-specific questions were carefully tailored to reflect the particular position and potential insight of each interviewee.

This investigative process enabled the research team to establish that although both Dublin City Council and Fingal County Council invest much effort in promoting the GI concept in their respective planning activities, Fingal County Council is more advanced in progressing landscape scale social-ecological resilience. Consequently, in seeking to balance the constraints of space restrictions with a desire to ensure an adequate level of 'richness' (Geertz, 1973) in the analysis of data, this paper's detailed examination of local level planning focuses upon the attributes and activities of Fingal County Council. Hence, drawing on material from nine of the interviews, the paper explores 'how' the officers of Fingal County Council have sought to overcome the limitations of traditional planning approaches by innovatively employing the GI concept in developing policy and design ideas for the urban fringe of Dublin City. This is undertaken by investigating the central processes and perspectives deployed to integrate a more holistic and contextually sensitive landscape perspective into spatial planning activities. However, to fully appreciate how this has been achieved, an understanding of social-ecological resilience is first required. Thus, the next section outlines the central tenets of social-ecological resilience and reviews debates surrounded the concept.

3 Social-Ecological Systems and Resilience

Humanity is most often conceived as acting upon ecological systems rather than constituting an element of such systems (Coates, 1998; Goudie, 2009). Through this lens, management of ecological systems is seen to entail governance of a world external to, but influencing the wellbeing of society. However, since the early 1970s, there has emerged a growing awareness that human and ecological influence are profoundly interconnected and therefore inseparable (Folke, 2006). Now a perspective frequently evident across a range of disciplines, this view contends that many of the problems in natural resource management stem from a failure to acknowledge these inextricable connections (Folke et al., 2010). Thus, envisaging a world comprising complex and inter-linked 'social-ecological systems' is thought to better reflect human-environment relations. In this sense, humanity is conceived as a constituent in a system with compound interdependent feedback loops that determine the system's overall dynamics (Glaser et al., 2012). Accordingly, the concept reflects the principles grounding much landscape research by emphasising humans 'as' and 'in' nature

rather than separate to and above nature (Ingold, 2000; Wylie, 2005). Furthermore, in keeping with the perspectives advanced by pioneers of the landscape approach such as McHarg (1969) and Spirn (1984), these social-ecological systems are understood to operate at multiple interrelated spatial and temporal scales. Each system is considered a semi-autonomous structure nested within a hierarchy of systems (Steiner, 2002, 2008). Hence, each system comprises a subsystem of another system in the hierarchy, and in turn, contains a number of subsystems within itself (Gunderson and Holling, 2001). The interactions across these system scales are thought fundamental in shaping the dynamics at any particular focal scale (Teigão dos Santos and Partidário, 2011). From this perspective for example, a neighbourhood, municipal park, city, river catchment and state may all represent interrelated subsystem levels in a broader social-ecological system.

In recent years, research concerning social-ecological systems has increasingly been strongly associated with the concept of 'resilience' (Ahern, 2011; 2013; Collier et al., 2013; Pickett et al., 2004; Teigão dos Santos and Partidário, 2011). Thus, appreciating how landscapes may be influenced by planning's turn to this view of human-environment interactions necessitates attention to debates on the meaning and potential applications of 'resilience' thinking. Resilience is essentially a heuristic for thinking about change management. Fundamental to the concept is an assumption of non-linear dynamics in complex, nested and interrelated hierarchical systems (Eraydin and Taşan-Kok, 2012; Folke, 2006). The term emerged in the context of systems ecology where it was used to describe the ability of ecosystems 'to absorb changes of state variables, driving variables, and parameters, and still persist' (Holling, 1973, p.17). Subsequent to its initial use, the expression has been employed across a range of disciplines from psychology (Norris et al., 2008) and regional economic development (Dawley et al., 2010; Pendall et al., 2010), to national security (Lentzos and Rose, 2009) and urban planning (Evans, 2011; Wilkinson, 2012b). However, it is its use within the ambit of social-ecological systems planning and management that primarily concerns this paper. Many of those employing the term seek to use it to help shift planning towards a more adaptable activity that is responsive to disturbance. In such instances, use of the concept in planning is assigned a normative content. In particular, those employing the term envisage that management for greater resilience opens up

desirable pathways for development in a world where the future is difficult to predict (Barr and Devine-Wright, 2012; Plieninger and Bieling, 2012a).

Much contemporary debate concerning the use of resilience in planning centres on the distinction between 'equilibrium' and 'evolutionary' interpretations of the concept (Scott, 2013). The former understanding has its roots in disaster management and concerns a 'survival discourse' that focuses upon the ability of a system to 'bounce back' towards 'business as usual' following a catastrophe (Shaw and Maythorne, 2013). However, this perspective has received criticism concerning the appropriateness of seeking system persistence rather than adaptation when a crisis emerges (Davidson, 2010). In contrast to equilibrium based approaches, 'evolutionary resilience rejects the notion of single-state equilibrium or a 'return to normal', instead highlighting ongoing evolutionary change processes and emphasising adaptive behaviour' (Scott, 2013, p.600). This interpretation focuses on resilience as enabling transformation of social-ecological dynamics such that disturbance supplies the stimulus for re-invention and thereby ensures strength through continuing reflection and adaptability (Erixon et al., 2013). Hence, an evolutionary interpretation of resilience entails a more radical and optimistic perspective that embraces the opportunity to 'bounce forward' (Shaw and Maythorne, 2013). It seeks to supplant a desire for stability with the acceptance of inevitable change such that it inverts conventional modes of thought by 'assuming change and explaining stability, instead of assuming stability and explaining change' (Folke et al, 2003, p.352). Here, thinking in terms of resilience is thought to encourage flexible responses to the constraints of land use and landscape planning (Ahern, 2013; Erixon et al., 2013), adaptability to broader environmental and economic disturbance (Fünfgeld and McEvoy, 2012; Haider et al., 2012; Pike et al., 2010), and a capacity for positive institutional evolution (Scott, 2013; Shaw, 2012; Teigão dos Santos and Partidário, 2011). It is from such perspectives that the concept is seen to help inform human-nature interactions, most prominently through theorising about social-ecological resilience.

In this context, social-ecological resilience is a framing device that merges the concepts of 'social-ecological systems' with 'evolutionary resilience' to inform planning for human-

nature relationships in changing contexts. In essence, it seeks to provide a means for considering 'how to innovate and transform into new more desirable configurations' (Folke, 2006, p.260). Social-ecological resilience thus amalgamates a descriptive viewpoint with an analytic perspective and normative position. Accordingly, those advocating this approach see it as both a scientific discipline and a governance discourse (Wilkinson, 2012a). Thinking on social-ecological resilience may thus be seen as displacing discourses of 'sustainable development'. Although Scott (2013, p.601) notes how many authors conceive it 'as a means to further elaborate (rather than replace) sustainable development', there is a fundamental difference between traditional approaches to sustainable development as conceived in and Irish context and the more dynamic focus of social-ecological resilience. This centres on divergent perspectives regarding the process of transition towards a more sustainable future. For example, in its 'key principles', the national 'Planning Policy Statement' that sets the strategic framework for spatial planning in Ireland states that,

> *Planning must proactively drive and support sustainable development,*
> *integrating consideration of its economic, social and environmental aspects*
> *at the earliest stage to deliver the homes, business and employment space,*
> *infrastructure and thriving urban and rural locations in an economically*
> *viable manner that will sustain recovery and our future prosperity.*
> (DoECLG, 2015, 2)

This interpretation of sustainable development focuses on locating an optimal development path and then pursuing such a course in advancing a knowable trajectory towards 'future prosperity'. Hence, this interpretation of sustainable development assumes an ability to predict and plan for a state of sustainability that is durable, stable and normalised. However, in keeping with contemporary debates in landscape research (Plieninger and Bieling, 2012b), enhancing the resilience of social-ecological systems involves a more holistic approach to embracing change that emphasises ongoing adaptation (Walker and Salt, 2006). It promotes continuous experimentation (Evans, 2011) and accommodates the trial of novel ideas (Ahern, 2011). Consequently, thinking in terms of social-ecological resilience presents a more dynamic perspective than conventional understandings of sustainable development in Irish planning by reconfiguring the basic principles guiding thought and action. GI can be understood as a way to give practice-based form to abstract theoretical concepts concerning

social-ecological resilience. In doing so, the GI approach can be seen as a means of centralising in planning practice the holistic perspective of much landscape research that conceives ecosystems health and human well-being as inherently entwined and mutually constitutive. Addressing such challenges requires a sea-change in land-use governance in terms of the more effective integration of the ecological dimension alongside traditional planning concerns, implying a shift in institutional and organisational arrangements to reflect interdisciplinary collaboration. In the next section we chart the emergence and evolution of green infrastructure in spatial planning debates in Ireland as a means of providing a holistic social-ecological framework for spatial guidance and land use management.

4   Planning for Social-Ecological Resilience in an Irish Context

4.1   The Emergence of GI

The initial thrust behind attempts to introduce the GI concept into Irish land use planning practice stemmed from a desire to remedy the perceived problem of ecosystem attrition consequent on habitat fragmentation from increasing urban-generated development in rural localities. Thus, the first formal reference to GI in an Irish policy context occurred with reference to ecological networks[iii] in a study commissioned by the Irish Environmental Protection Agency (EPA) (Tubridy and O Riain, 2002), to inform the then upcoming National Spatial Strategy (NSS) (DoEHLG, 2002). GI was here equated with ecological networks and metaphorically explained by reference to more familiar forms of 'grey infrastructure' (transport and drainage infrastructure). With a focus on scientific principles firmly rooted in landscape ecology (Forman and Godron, 1986; Jongman and Pungetti, 2004; Wiens, 2007), GI was presented in this study as a solution to ecosystems fragmentation by creating a series of ecological 'corridors' and linking habitat 'core areas' (Tubridy and O'Riain, 2002, vii). In this sense, the initial interpretation and promotion of GI in Irish planning policy debates focused primarily on ecological issues with little consideration allocated to social-ecological relationships beyond the perceived detrimental influence of society on ecosystems integrity. However, the NSS when finally adopted in November of 2002 made no specific reference to the value of the ecological network ('green infrastructure') approach or its relevance to strategic planning. Instead, the NSS advocates the development of a 'Green Structure' through regional and county level plans and strategies. Rather than foregrounding a

concern for the conservation of biodiversity via an ecological network (i.e. GI) planning approach, the NSS 'Green Structure' approach seeks to balance polycentric urban development with a coordinated strategy for the containment of urban sprawl. Consequently, this 'Green Structure' approach shows preference for development concerns with a comparative paucity of consideration given to social-ecological interactions.

Initial progress at local authority level was piecemeal. In September 2004, South Dublin County Council adopted its County Development Plan for the period 2004-2010 (SDCC, 2004). The plan outlined an intention to deliver 'a Green Structure Plan for the county to identify green linkages and to allow for the intensification of use of existing and proposed amenity networks' (SDCC, 2004, 32), emphasising the increased use of current and proposed 'green linkages' for amenity purposes rather than habitat connectivity. A few months later in January 2005, Galway City Council adopted its development plan for the 2005-2011 period (GCC, 2005). The recreation amenities provision policies of this plan were not included in an individual or 'community' chapter as was the normal format for such documents at the time, but rather were grouped with policies on biodiversity conservation in a chapter entitled 'Natural Heritage, Recreation and Amenity'. Tacitly suggesting that the existing integration of natural and semi-natural areas for recreational use was poor (GCC, 2005, Section 4.1), the plan sought to facilitate better integration by building on a framework presented in the previous Galway City Development Plan (1999-2005) for the establishment of a 'green network'. The 2005-2011 City Development Plan outlined how such a network offered the means by which to combine and coordinate the protection of natural heritage areas and facilitate the provision of open space for recreational purposes. One of the primary methods advocated for realising the green network was the creation of 'greenways', defined as 'pedestrian and cycle ways separated from road traffic' (GCC, 2005, Section 4.3). This presentation of the Council's green network 'greenways approach' as a means for the provision of transport, recreational and habitat connectivity echoes the language, if not necessarily the content, of both the 'green structure plan' of the South Dublin County Development Plan 2004-2010 and the ecological networks/green infrastructure approach of the 2002 EPA study. However, as opposed to the EPA study, this evolving approach

increasingly sought to accommodate the social-ecological multifunctional potential of green spaces.

Adopted two months after the Galway City Development Plan, the Dublin City Development Plan 2005-2011 (DCC, 2005), echoes this shift towards a more multifunctional perspective on public open space. Indeed, Chapter 11 of the plan entitled 'Recreational Amenity and Open Space' envisaged that open space would furnish '...green chains or networks, which allow for walking and cycling and facilitate biodiversity' (DCC, 2005, 84). Policies contained in this plan are indicative of an inchoate change in how biodiversity conservation was conceived. This change comprised an interpretation of biodiversity as something, which like recreational amenities, can be enhanced via proactive planning, rather than simply protected by reactive designations. This change thus extends the turn towards an acknowledgement of the importance of social-ecological interactions in planning by seeking to enhance the potential positive synergies between such interactions through conscientious policy development.

4.2   The (Re)Emergence and Evolution of 'GI'

By 2008 the desire to promote positive social-ecological interactions via multifunctional green space planning had emerged as a clearly identifiable discourse in Irish planning guidance documentation, notably in Dublin City Council (DCC, 2005; DRA and MERA, 2004; FCC, 2005a; GCC, 2008). The same year also witnessed the publication of the Green City Guidelines (2008). These assert a social-ecological perspective on green space provision. In quoting Girling and Kellett (2005), these guidelines provide the first mention of GI in an Irish planning document since the EPA National study in 2002 (UCD et al., 2008, 10). However, the EPA study equated GI with the concept of an ecological network in which biodiversity protection was foregrounded on the basis of the intrinsic value of nature. In contrast, these guidelines reflect the post-2002 evolution of 'networked' concepts of land use governance by repositioning policy approaches to ecosystems from reactive protection by site designation to proactively planning for their enhancement as something of multifunctional 'value' in facilitating urban development in a manner that ensures 'our standard of living' (DoEHLG, 2008, 5) and 'well-being' (DCC, 2008, 9).

In September 2009, the Draft South Dublin Development Plan 2010-2016 (SDCC, 2009) was placed on public consultation display, and subsequently adopted in October 2010 (SDCC, 2010). Whereas the previous development plan for the area (2005-2010) promoted a 'Green Structure' that conceived a networked approach as primarily providing recreational amenities, this plan, adopted five years later, equates 'linked' and 'interconnected' open space provision as catering both for 'recreational needs' and the provision of 'valuable wildlife corridors'. Furthermore, such provision is seen as forming 'a significant green infrastructure in the County' (SDCC, 2010, 95). Thus, GI as a networked approach to planning is once again represented as a network of multifunctional land uses serving social and ecological requirements. Echoing the approach adopted by the Galway City Development Plan 2005-2011 (GCC, 2005), it is conceived that these 'green networks' will,

> *...function as long distance walking and cycling routes as well as ecological corridors such as canals. Green networks are vital to the maintenance and facilitation of ecological corridors such as those found along major transport routes. Their main function is to link parks and other 'green' infrastructure.* (SDCC, 2010, 96)

The suggestion here is that the function of green networks 'is to link parks' for recreational and biodiversity uses, whereas GI is perceived as something broader than these links. As such, it is implied that 'GI' subsumes recreational amenities and ecological corridors, but also includes additional land uses. Furthermore, Section 4.3 of the plan states that the Council's aim for 'Landscape, Natural Heritage and Amenities' is that this 'well defined and linked' (SDCC, 2010, 246) approach necessitates the development of,

> *...a strategy for the creation of a Green Infrastructure for the County, promoting a balance between the protection of areas of high amenity, the facilitation of recreational use, and the provision of a network of sustainable wildlife corridors throughout the County.* (SDCC, 2010, 246)

'Areas of high amenity' are here considered in terms of landscape aesthetics and referenced to a citation from Section 10 of the Planning and Development Act 2000-2007 (Oireachtas, 2000) regarding the onus on local authorities to '...include objectives relating to the preservation of the character of the landscape...'(SDCC, 2010, 246). Thus, the plan seeks to

include 'the protection of areas of high amenity' with the existing pairing of recreational and ecological conservation land uses within its green infrastructure approach. This exposition indicates an evolving interpretation of the GI approach as a broadened landscape scale perspective on planning for social-ecological interactions that seeks to enhance a 'multifunctional resource' through careful planning, design and management. Additionally, the composite elements of GI are seen as nested within scalar hierarchies ranging in landform typologies and ownership attributes from 'Areas of high amenity' through to a 'network of sustainable wildlife corridors throughout the County' as well as 'allotments and private gardens'. In this sense, the GI concept increasingly served as a mechanism through which to integrate the perspectives and scalar lens of landscape research into mainstream planning practice.

4.3   The Institutionalisation of GI

In April 2010, Fingal County Council issued for public consultation display its Draft County Development Plan 2011-2017 (FCC, 2010). This was subsequently adopted a year later in April 2011 (FCC, 2011). The plan includes three detailed GI maps in addition to the zoning, transport, architectural and archaeological maps normally associated with such documents. Chapter 3 of this plan is entitled 'Green Infrastructure'. The insertion of the GI chapter prior and adjacent to the subsequent conventional 'Physical Infrastructure' chapter signals an interpretation of GI as a strategically important concept binding together the various economic, physical, environmental and social objectives of the plan. The plan identifies numerous social and environmental challenges requiring redress and presents GI as a means by which to meet all these through advancing a holistic social-ecological perspective by providing,

> ...space for nature (or biodiversity) and the natural systems which regulate temperature, reduce storm flows, provide us with clean water and air, and a multitude of other benefits or ecosystem services free of charge. High-quality accessible parks, open spaces and greenways provide health benefits for all...By providing a high-quality environment in which to live and to work green infrastructure helps to attract and to hold on to the high-value industries, entrepreneurs and workers needed to underpin the knowledge economy. In addition it is increasingly being recognised that

> *green infrastructure is a vital component in building **resilient communities capable of adapting** to the consequences of climate change.* [Emphasis added] (FCC, 2011, 91)

By specifying the 'vital' role played by GI in 'building resilient communities capable of adapting', the FCC County Development Plan advances the concept of resilience in its primary policy framework concurrent with promoting GI as the mechanism by which to facilitate such resilience. In doing so, the plan equates resilience with adaptive capacity rather than a preservation of the status quo, thereby promoting an 'evolutionary' form of social-ecological resilience.

By the summer of 2010, the GI planning policy concept appeared to be in wide circulation among a community of planning practitioners and allied professionals, with its representation evident in both regional (DRA and MERA, 2010) and local level planning policy guidance (DCC, 2010). GI was given further prominence by Fáilte Ireland[iv] (FI, 2010), in a published document on how to maximise the tourist potential of historic towns, while reference to the GI concept in a document produced by the Heritage Council (HC, 2010) regarding the formulation of a National Landscape Strategy for Ireland, indicates a broadening perception of the approach's relevance for an array of social-ecological issues at the landscape scale. This proliferation of interpretations and references to GI continued into 2011. One of the first among these was a proposed variation to the Dún Laoghaire Rathdown County Development Plan (DLRCC, 2011) issued for public consultation in January and subsequently adopted in September of 2011. This variation presented a recreation and amenity interpretation of GI in the context of a high density urban environment. Subsequent months saw reference made to GI within planning documentation with respect to flood risk management (SCC, 2011), long distance walking and cycle routes, as well as with regard to ecological corridors (ATC, 2011). GI was also referenced in connection with the assessment and protection of landscape character (DoAHG, 2011). Table 1 summarises and illustrates these shifting representations of green infrastructure in Irish spatial planning practice. The next section explores how employing the GI approach has helped planners and allied professionals bridge the gap between strategic policy and local practice in centralising at the

local planning level the social-ecological perspective advanced by those working in the field of landscape research.

Timeframe	Green infrastructure as ...	Key focus
Early 2000s	*...ecological networks*	• Ecological corridors • Linking habitats
	...green structure	• Urban growth management • Strategic greenbelts
Mid 2000s	*...green linkages*	• Amenity purposes
	...a green network or greenways	• Protection of natural heritage areas • Provision of greenspace for recreation
	...green chains or networks	• Multifunctionality • Proactive biodiversity enhancement
Late 2000s	*...multifunctional networks*	• Network of multifunctional land uses serving social and ecological requirements • Landscape scale perspective • Multi-scalar
2010s	*...essential infrastructure*	Incorporating above + • Promoting resilience and adaptation • Environmental risk management (e.g. flood risk)

Table 1: Evolution of GI in Irish spatial planning practice

5   From Strategic Policy to Local Practice

Fingal County Council (FCC) is broadly recognised as having pioneered the innovative deployment of GI planning for enhancing social-ecological resilience in Ireland (Lennon, 2013; 2014). It does so in an effort to reduce tensions between growth management and environmental protection. This entails a holistic perspective on planning that endeavours to augment the potential for social-ecological synergises that furnish quality of life

enhancements while concurrently advancing ecological conservation. Such an approach also seeks to facilitate adaptation to both predictable change and unforeseen events. Thus, the GI approach advanced by FCC aims to promote an 'evolutionary' perspective on planning for the resilience of social-ecological systems.

The area administered by FCC encompasses a transition of land uses from the urban-suburban continuum extending from Dublin City to a rural coastal and agricultural landscape containing numerous European nature conservation sites designated under the provisions of the EU Birds and Habitats Directives. Realising resilience in this context is guided by a strategic approach to GI planning that advances a series of policy formulation principles. These are namely; a collaborative approach, advancing a multifunctional perspective on land use planning, as well as promoting functional and spatial connectivity. The operationalisation of these principles are evidenced in innovative and interlinked local area plans for the contiguously located Baldoyle-Stapolin (FCC, 2013a) and Portmarnock South (FCC, 2013b) areas. These plans employ a GI approach to holistically frame and integrate policy initiatives concerning landscape aesthetics, biodiversity, sustainable urban drainage, archaeology and built heritage, as well as open space and recreation. Through a detailed and iterative environmental assessment process, both documents negotiate the development constraints posed by various conservation designations (SPA, SAC, Shellfish Waters) in a manner that sensitively accommodates both urban expansion and environmental protection. Included in the plans are new residential areas integrated with parkland, sustainable urban drainage schemes, non-motorised transport routes and spaces for 'urban farming' that are specifically designed to assist community development. A key feature of these plans is thus how they work synergistically in facilitating high quality urban extensions to the Baldoyle and Portmarnock urban areas while concurrently protecting the ecological integrity of the Baldoyle Estuary. Thus, examining how FCC has developed and deployed the aforementioned series of policy formulation principles in seeking to realise social-ecological resilience in both its strategic planning objectives and the production of these local area plans furnishes insight into how the employment of a GI approach in planning practice helps centralise a landscape perspective in land use governance.

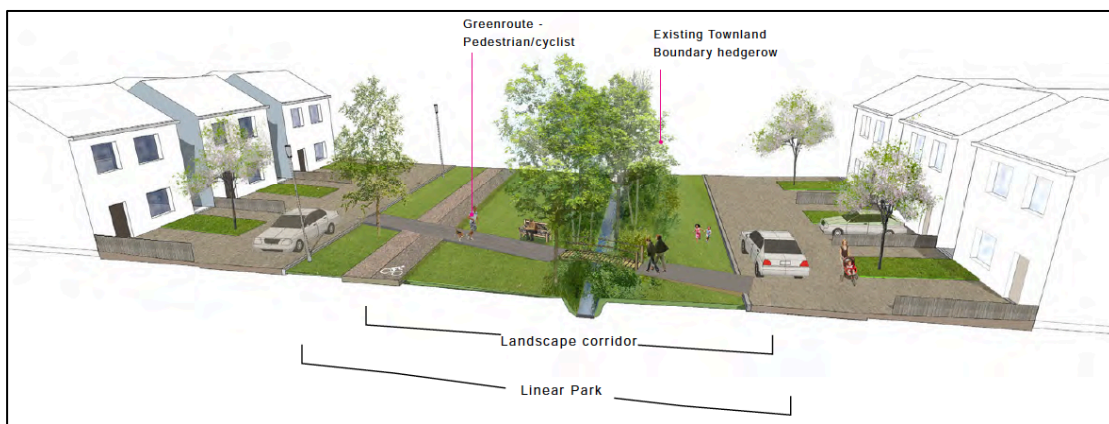Fig 1: Baldoyle-Stapolin Local Area Plan, GI Context (source: FCC, 2013a)

Figure 2: Linear multifunctional park concept outlined in Portmarnock Local Area Plan (source: FCC, 2013c)
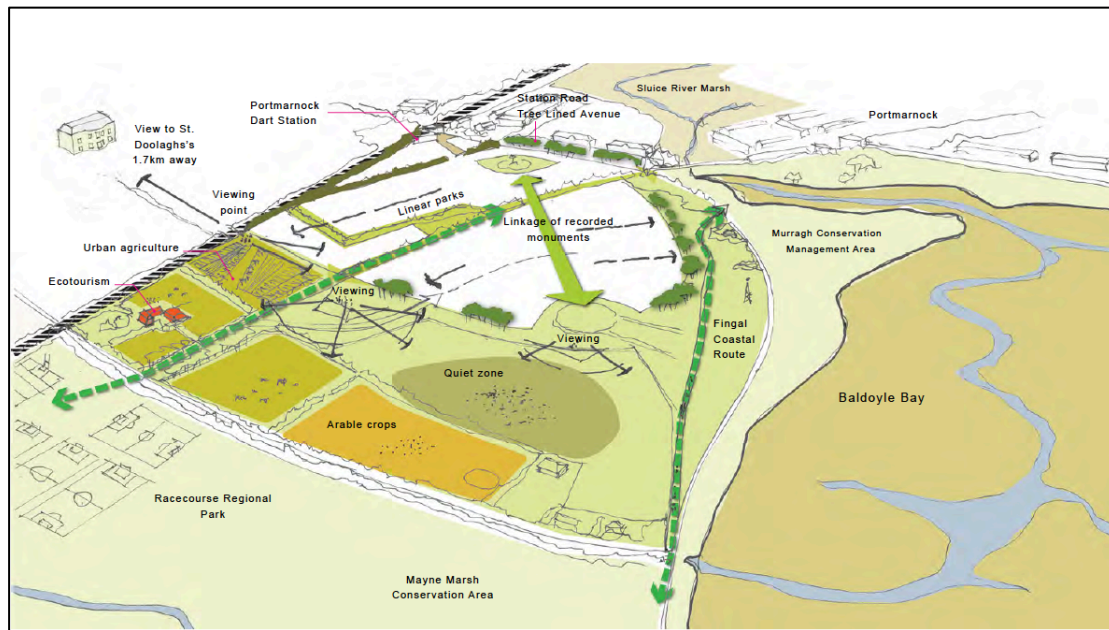
Figure 3: GI concepts outlined in introduction chapter of Portmarnock Local Area Plan (source: FCC, 2013c)

5.1   Collaborative Approach

FCC is a relatively new organisation having been formed in 1994 when three new local authorities were created following the dissolution of Dublin County Council (Oireachtas, 1993). Professional staff within the council who were interviewed indicated their belief that this comparative youth stimulates an organisational identity wherein functional roles have not yet become 'sedimented' (Peters, 2005; Scott, 2008) and innovative possibilities are positively received. As noted by one interviewee, 'Fingal does innovative things. We like new thinking. We like to be able to say that about ourselves' (Interviewee A8). Such a willingness to experiment has been identified by both Ahern (2011; 2013) and Evans (2011) as essential attributes in seeking to advance social-ecological resilience. Reinforcing this identity as a dynamic local authority, FCC has undertaken a self-initiated reorganisation of its disciplinary divisions. This reorganisation was instigated with the intent of facilitating greater collaboration between the array of council professions deemed pertinent to land use planning activities. In essence therefore, it was initiated to redress the 'silo mentality' in traditional planning activities 'whereby different departments of a local authority work

separately from each other – and occasionally in conflict with each other' (Kambites and Owen, p.490). A central element of this administrative reorganisation was the merging of several previously discrete departments into a newly created 'Planning and Strategic Infrastructure' division. This new division includes strategic planners, drainage engineers, traffic planners, parks professionals, the biodiversity officer and the heritage officer, formerly distributed in different departments. This root and branch administrative reorganisation facilitated communication and collaboration by professionals who previously had little contact beyond formal cross-departmental channels (Interviewees A5, A6 and A7). Positive working relationships soon emerged and synergies developed as ill-formed presumptions and mutual suspicions dissipated and cooperative planning efforts evolved. As noted by one interviewee,

> *I think 'Planning and Strategic Infrastructure' makes sense. Because in the past like we would have had the Planning Department planning for things, and other Departments then delivering major infrastructure, but now you have kind of those things being thought about in a more integrated way...So the reorganisation helps I suppose in terms of making it more possible for people to come together, to talk together. So we're not as silo'ed as we were...And now I think there is much more realisation that the silos are less fixed, and so people are much more willing to talk horizontally across the organisation.* (Interviewee A8)

Thus, the administrative reorganisation of FCC has advanced the potential of the local authority to plan 'in a more integrated way' by facilitating collaborative effort by a spectrum of professionals drawn from an array of theoretical backgrounds, practices and opinions (Benedict and McMahon, 2006, p.40). Such increased 'horizontal' communication and working arrangements has helped promote more comprehensive and efficient responses to a multitude of complex planning issues by enabling concerted action in achieving seemingly disparate goals such as flood control and habitat conservation (EC, 2012; FCC, 2011; Novotny et al., 2010). GI has facilitated this by presenting a 'centring concept' that various professions can 'buy into' (Interviewee A8) in forging interdisciplinary collaborative working arrangements. Exemplifying FCC's openness to innovative ideas and new working relationships, it is noted that collaborative activity around the GI concept initially emerged

from council officers (planners, parks professionals, and the heritage officer) and not by way of instruction from senior management (Lennon, in-press).

In reflecting on the production of Baldoyle-Stapolin and Portmarnock South local area plans, those involved in overseeing policy formulation stress the role of the GI concept in focusing a diversity of practice backgrounds on potential synergies (Interviewees A1, A2, A3 and A4). In this way, GI helped stimulate collaborative engagement between professionals, and between the council and other agencies. As noted by one planner involved in the plan production process, 'Whether that is with your other Departments, or whether it was the other Agencies, it's all about collaboration' (Interviewee A4). This collaborative approach is reflected in the way the plans seek a multifunctional perspective on spatial planning, wherein each parcel of land is seen to offer the potential to serve a combination of functions, such as biodiversity conservation and flood risk management or recreation and drainage.

Moreover, the drive for innovative collaboration advanced by FCC in the development of these local area plans also involved working with local community groups through meetings and 'plebiscites' over issues of recreational need and access (Interviewee A5), as well as in the monitoring the effectiveness of policy implementation. An illustrative example of such broader collaboration is the efforts by FCC to cultivate a partnership with local nature conservation NGOs to both inform policy formulation and monitor its performance. As conveyed by one interview involved in such collaborative initiatives,

> *We do a lot of work with the local NGOs because they have a lot of local knowledge...they're looking at the site for years. While a consultant comes in one or two days, makes an assessment, [and says] there's nothing there. Well they [NGOs] can say no, wait a minute; last winter there was loads of them, loads of these birds or animals and plants, whatever, they're just not here this year for whatever reason and it's more to kind of capture that and I think it requires basically a lot more interaction between nature conservation groups and the local authority.* (Interviewee A2)

5.2 Multifunctionality

The significance of land use multifunctionality in the GI policy advanced by FCC is illustrated by the central 'aim' of the council's GI approach outlined in its development plan:

> *Create an integrated and coherent green infrastructure for the County which will protect and enhance biodiversity, provide for accessible parks and open space, maintain and enhance landscape character including historic landscape character, protect and enhance architectural and archaeological heritage and provide for sustainable water management by requiring the retention of substantial networks of green space in urban, urban fringe and adjacent countryside areas to serve the needs of communities now and in the future including the need to adapt to climate change.* (FCC, 2010, p.89)

This strategic level policy direction formed a departure point in the policy formulation process for the Baldoyle-Stapolin and Portmarnock South local area plans. Here, local level policy reflects the recalibration of planning practice from traditional approaches that foster single function land uses towards a multifunctional approach that facilitates social-ecological integration. This was conveyed in the reflections of one planner involved in producing these plans when noting,

> *What I think we're doing then is we're trying to provide this framework, which can be bought into by all the different parties, and which can help sustain our biodiversity, which can help make places better. It gives [us] our open spaces, our movement and all the rest. All those things that we want. ...So whereas before, while we might have been trying to do it, we didn't have this big overview, we did it a little, we wanted our park and maybe we had our habitat conservation there. And we had a cycle path over there, but we didn't put it all into that frame. So, that I suppose is maybe how I'd see it, as kind of changing the traditional.* (Interviewee A1)

In comparison with conventionally produced local area plans in Ireland, these plans are atypically detailed in the provision of design guidance. It was felt that this was necessary to ensure the proper implementation of the relatively novel GI concept being advocated (Interviewee A6). Consequently, the plans detail mowing regimes, direction on how Sustainable Drainage Systems should be incorporated into the design of the public realm, and guidance on public lighting so as not cause undue interference to nocturnal animals.

This multifunctional perspective on land use planning also extends into the policy construction phases of the local area plans. Here, FCC seeks to promote the use of development sites through the temporary use of undeveloped areas for social and ecological enhancement. As recounted by a council officer involved in the production of these plans,

> *What we were suggesting to the developers [is] that they make all of the land accessible, except for the area that was the subject of the current phase of development, as opposed to putting up hoardings and fences. And what you do then is you cut your paths through it for cycling and walking, and then the rest of it you turn over to something like wild flower meadows or short rotation biomass, or something like that*

> *...and using the model like short rotation woodland or wild flower meadow, you can say to a farmer "you've got to cut these paths seventeen times a year, and for that we'll allow you to take the hay off that area". Or we say, "fence off, you know with stock proof fencing, Phase B, and the Council will graze it with an attractive set of rare breeds, or something like that". So you can create something that is attractive, sustainable, and easy to manage, as an interim to the final development of the site. (Interviewee A6).*

5.3   Connectivity

The collaborative approach that facilitates multifunctional synergies has also facilitated more attention to spatial and functional connectivity between land uses in local policy formulation and implementation. Prior to the advocacy of a GI planning approach, FCC had advanced habitat connectivity via ecological networks (FCC, 2005b). Such networks render otherwise fragmented ecosystems biologically coherent by facilitating species movement and genetic exchange (Opdam et al., 2006; Pungetti and Romano, 2004). Although promoting spatial and scalar integration, these networks focused primarily on 'ecological' connectivity. Consequently, this wholly ecological focus failed to fully reflect the social dynamics intrinsic to social-ecological systems thinking. However, following greater acquaintance with GI theory and the consequent advocacy of a holistic approach to planning, FCC has sought to advance a more functionally integrated network of key sites that meet several social objectives while concurrently maintaining ecosystems integrity. This GI network is given

graphic representation in a series of planning maps accompanying the County Development Plan that identify key sites of conservation and amenity value linked via a series of multipurpose corridors. A key aspect of planning this GI network has been the use of spatial data analysis in identifying opportunities for enhanced connectivity. Using such evidence, efforts are made to produce comprehensive maps of GI assets from which to formulate site-specific initiatives that consolidate the broader GI network. However, Kambites and Owen (2006, p.488) advise that if such cartographic exercises are 'not set within an effective planning process, the mapping of green infrastructure, albeit a vital component of the process, remains little more than a technical exercise'. Accordingly, FCC officers express an understanding that mapping GI assets is a means to an end rather than an end in itself. In this sense, the maps employed to assist planning policy formulation form tools which aid rather than replace critical engagement with a GI planning approach. Engaging with this approach ultimately requires promoting synergistic social-ecological integration by focusing on how the multifunctional potential of GI networks can be sensitively realised. As noted by one interviewee when reflecting on FCC's GI planning approach,

> *It's [GI] basically trying to link up your key ecological features which are amenity features, your water features and the likes of that...*
>
> *...most of the important major conservation in the county is within this network so if you're going to do any development near it, whether it's amenity or whether it is roads or water or housing, these are the key features that need to be protected and it's more to see how can we work with you to incorporate that. If you build a housing estate and the river runs through that, how can we design the flood plain at the river in such a way that it will actually suit everybody. So it is still an amenity space, but wildlife can live there too...it's trying to combine those different things.* (Interviewee A2)

This approach is reflected within the Baldoyle-Stapolin and Portmarnock South local area plans. Here connectivity is promoted both within the plan lands and with contiguous land uses. Such a perspective is given prominence in the 'Overarching Green Infrastructure Strategy' for the Baldoyle-Stapolin Local Area Plan which states,

> *This LAP seeks to create a green infrastructure network of high quality amenity and other green spaces that permeate through the plan lands*

> *while incorporating and protecting the natural heritage and biodiversity*
> *value of the lands.* (FCC, 2013a, p.18)

Illustrated in this strategic objective is a desire to integrate both the biological focus of ecological networks with the social concerns of greenways to deliver multifunctional connectivity (Austin, 2014; Benedict and McMahon, 2006; Rouse and Bunster-Ossa, 2013). In this sense, FCC has sought to employ a broad based collaborative approach to facilitate multifunctionality and connectivity across the urban-rural interface in a sensitive ecological context wherein there exists significant pressure for urban expansion. The council has endeavoured to do so by deploying a GI planning approach to centralise the holistic perspective of landscape research that promotes social-ecological resilience in acknowledging the mutually constitutive nature of ecosystems health and human well-being.

6 Conclusion

GI has increasingly become an established policy discourse at regional and local levels of the planning hierarchy in Ireland since 2008. The emergence, ongoing evolution and widening institutionalisation of the GI approach indicate a growing centralisation of landscape perspectives in Irish planning practice. However, GI specific planning guidance at a national level is conspicuous by its absence. Consequently, the GI planning approach in Ireland is primarily employed at the local authority level with a more strategically GI informed landscape approach evident in some, but not all, regional guidance. In this sense, county and city level development plans have emerged as the primary vehicle through which GI guidance is formulated and a holistic social-ecological (landscape) perspective on resilience planning is integrated into land use policy. The strategic direction provided by such policy is then given site base application in local area plans wherein the details on how to deliver social-ecological resilience is developed. Nevertheless, there are variations in the interpretation and application of the GI concept between local authorities. Several local authority plans demonstrate a prioritisation of GI for biodiversity protection, but seek to partially advance a more multifunctional approach to conservation by including recreational open space provision within policies concerning natural heritage management (KCC, 2012). However, many of those local authorities employing the GI concept exercise it as an extension rather than a transformation of traditional approaches to environmental

conservation (MCC, 2013; MNCC, 2013). In such instances, GI may be conceived as a re-branding of single use 'ecological-networks' akin to that advanced in the study commissioned by the EPA in 2002 (Tubridy and O Riain, 2002). Envisaging GI in such a manner confines it to biodiversity conservation. Consequently, these interpretations risk eroding the holistic social-ecological perspective of GI that seeks to advance the synergistic multifunctional potential of land uses. Here, issues like flood management, accessible green space provision and non-motorised transport may be perceived in a disjointed fashion as a restricted GI approach is formulated to accord with existing administrative delineations. This phenomenon can be witnessed in the sustained configuration of development plans wherein 'natural heritage' is confined to a distinct plan chapter that is frequently disengaged from other issue-specific policies, such as 'drainage' and 'transport'. In the absence of a section at the beginning of a plan to first outline how a GI approach structures subsequent chapters and polices (FCC, 2011), maintaining the conventional structure of plans in this fashion reinforces existing administrative compartmentalisation and reduces the transformative potential of the GI concept to facilitate the synergistic integration of land uses and the promotion of social-ecological resilience. To date, this phenomenon seems most pronounced in Irish rural local authorities whose capacity to fully engage a proactive multifunctional GI planning approach may be hampered by resource constraints such as a skills deficit, low staffing and restricted budgets.

In contrast, FCC has been to the fore in Ireland in seeking to advance the GI planning approach. At the heart of the FCC's activities is a drive to enhance collaborative working arrangements to encourage a more responsive and effective holistic approach to the complexities of planning for social-ecological resilience. This paper's review of FCC's efforts to promote such a perspective illustrates how the theory of GI has been used as a 'centring concept' (Interviewee A8) that stimulates inter-disciplinary working to enable the formulation of an 'organizational strategy that provides a framework for planning conservation and development' (Benedict and McMahon, 2006, p.15). With a focus on improving the multifunctional potential of connected local and landscape scale environmental assets (Davies et al., 2006; Lafortezza et al., 2013), such a GI approach supplies 'the "umbrella" for disciplines to unite' (Wright, 2011, p.1011) and consequently

promotes 'increased dialogue between planners, developers, and policy-makers' (Mell, 2010, p.241).

However, we caution this with an awareness that the history of planning is littered with the carcases of failed 'blueprints' (Ostrom et al., 2007) that proposed a universally applicable solution to delivering on the promise of sustainability (Baker and Eckerberg, 2008; Owens and Cowell, 2011). Indeed, continuing dispute on how planning should seek to advance more sustainable forms of governance indicates ongoing failure in the search for a single means to resolve persistent divergence between environmental protection, economic development and social equity (Allmendinger, 2009; Carter, 2007; Torgerson and Paehlke, 2005). This issue is intensified in an Irish context wherein there is an 'implementation deficit' as the planning practice of GI policy formulation largely awaits the planning practicalities of translation into evaluable material change. Thus, we do not claim that GI furnishes a panacea for the multitude of problematic issues encountered in planning practice. Rather, what this paper demonstrates is that progressing a landscape perspective in planning necessitates an openness to new ideas and new ways of working wherein cognizance of knowledge limitations promotes "learning to manage by managing to learn" (Bormann et al, 1994, 1). Key to this is overcoming the "silo approach to planning" through "a transformation of the structural context and factors that determine the frame of reference" for planning activity (Pahl-Wostl, 2009, 359). Accordingly, integrating a more landscape informed holistic perspective on social-ecological resilience requires the 'recognition that multiple sources and types of knowledge are relevant to problem solving' (Armitage et al., 2008, 96). This foregrounding of inclusivity resonates with other moves in planning theory that seek to ground planning in a more 'collaborative' ethos (Agger and Löfgren, 2008; Healey, 2003; Innes and Booher, 2010) as a means to resolve conflict through cooperation and the accommodation of difference (Forester, 1999; Umemoto and Igarashi, 2009). In this sense, a planning perspective better attuned to landscape research requires collaborative learning (Goldstein, 2009), and experimentation (Ahern, 2011), wherein social-ecological 'systems' are seen to be co-produced and co-evolve with forms of locally grounded scientific-administrative knowledge (Evans, 2011).

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[i] Section 19 of the Planning and Development (Amendment) Act 2012 specifies that this review interval can be deferred subject to provisions specified in the Act regarding deferral time limits and the justifications for seeking a deferral.

[ii] Working on a broad definition of 'heritage', these officers help coordinate and provide input to numerous council activities ranging from natural environmental issues through to landscape and archaeology, as well as built and cultural heritage matters. As such, their activities frequently interact with the local planning policy development process.

[iii] Defined by Tubridy and O Riain, (2002, 1) as, 'a network of sites. Its constituents are: 'core areas' of high biodiversity value and 'corridors' or 'stepping stones', which are linkages between them. In contrast to species or site based conservation, the ecological network approach promotes management of 'linkages' between areas of high biodiversity value, between areas of high and low biodiversity value, between areas used by species for different functions, and between local populations of species. 'Corridors' or linking areas can support species migration, dispersal or daily movements.'

[iv] Ireland's National Tourism Development Authority