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The coexistence of biodiversity and amenity in urban landscapes.

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Abstract

Amenity is a longstanding component of town planning and municipal governance.

Biodiversity is a far more recent concept, yet interpreting the conservation mandate in a local context is a significant challenge for landscape and urban planners. This paper explores the concepts of amenity and biodiversity and investigates their compatibility in an urbanising world. Their historical expression in law and urban planning is considered, and empirical research on the links between human wellbeing, green environments and biodiversity is reviewed. We argue that amenity is an underutilised vehicle for achieving biodiversity goals in line with new urban greening paradigms because of its longstanding currency with planning professionals. However, conflict between biodiversity and amenity can arise in practice, depending on a city's social-ecological context. These challenges can be overcome through setting clear objectives, utilising scientific evidence, engaging with local communities and

ensuring landscape policy is sufficiently flexible to accommodate local needs and characteristics.

Key Words

Biodiversity, Amenity, Planning, Local government, Landscape aesthetics, Conservation.

1. Introduction

Urban greening has become a priority for landscape planners and designers throughout the world (Tzoulas, Korpela, & Venn, 2007). The installation of green infrastructure such as street trees, parks, reserves, vegetated corridors and green roofs is promoted for a range of social and ecological benefits such as improving air quality, enhancing biodiversity and mitigating the urban heat island effect (Benedict & McMahon, 2006; Tzoulas et al., 2007).

While there is growing strong scientific evidence regarding such activities, a significant challenge is how landscape practice and policy frameworks might be utilised to promote them (Sandström, Angelstam, & Khakee, 2006). Integration of amenity enhancement and biodiversity conservation might provide the key.

Amenity is an ancient notion related to health, wellbeing and enjoyment of life. It emerged as a central plank in early land-use planning and remains a feature of urban planning law and policy today. In contrast, the term biodiversity arose as a scientific concept in the mid 1980s and is now a core environmental issue (Pimm & Raven, 2000; Jeffries, 1997). Despite their different origins, both terms have begun to interact closely in land-use planning practice with the rise of the recent urban greening movement (see Benedict & McMahon, 2006). However,

despite this interaction, there has been no thorough review of the concept of amenity as it relates to emerging urban greening objectives.

Increasing global urban development threatens both the amenity and biodiversity of urban landscapes (Seto, Güneralp, & Hutyra, 2012; Vlahov & Galea, 2002). The expansion of cities has contributed directly to the loss of biodiversity through the transformation and homogenisation of some of the most biologically rich habitats on earth (Grimm et al., 2008; McKinney, 2006). Yet metropolitan areas are also known to support rich biodiversity, with many taxa responding favourably to urban environmental conditions (Aronson et al., 2014; Schwartz, Jurjavcic, & Brien, 2002). The influence of urbanisation on human health and wellbeing is also complex. Although cities offer many social and economic opportunities, built urban environments are also known to pose threats to public health and well-being (Vlahov & Galea, 2002).

Along with the present need for further insights into how urbanisation affects biodiversity and human well-being, there is a need for research on how this knowledge is utilised in landscape practice. Currently, there is limited critical analysis of how landscape decision-makers approach the dual goals of amenity provision and biodiversity conservation in urban landscapes. In this article, we explore whether the well-established but elusive notion of amenity provision in planning practice has potential to help conserve biodiversity through the promotion of green infrastructure. In particular, we pursue the following two research questions: (1) Are biodiversity enhancement and amenity provision compatible in theory and practice? (2) If so, how can the two be enhanced simultaneously?

To address these questions, this paper explores the interactions between amenity and biodiversity, with particular reference to planning and landscape management. First, the terms are explained with particular regard to issues of scale. Second, the relationship between the two concepts in practice is considered on historical and legal grounds. Third, the compatibility of amenity and biodiversity is explored based on a review of literature from multiple disciplines. Finally, we outline challenges and opportunities related to how amenity can support more contemporary concepts of urban greening and provide guidance for planners seeking to combine the two. While the focus of this article is primarily on developed countries, many of the principles to be discussed are also applicable in the developing world where future urban growth will result in significant challenges to biodiversity conservation and amenity augmentation alike.

2. Key Concepts

In order to explore the relationship between amenity and biodiversity in theory and practice, it is necessary to outline their definitions and uses individually. The interactions between the concepts are then explored in greater detail in sections 3 and 4.

2.1 Amenity

In the context of early town and country planning, a UK Ministerial Report in 1951 described amenity as “the hardest-worked word in planning language” (Minister of Local Government and Planning, 1951, p. 138). The reason for this is the sheer breadth of the concept, leading to a lack of “precise formulation” (Stein, 2008, p. 188). Amenity is defined in a specialist law

dictionary as “the features and advantages of a locality or neighbourhood which it is considered desirable to preserve or encourage such as beauty or tranquility” (Bates, 1997, p. 11). Bonyhady (2000, p. 223) sees its vestiges in early urban parks based on “aesthetics, public health and public morality”. This means that an ‘amenity’ might include a facility such as a sportsfield, car park or ablutions block (Kelly, 2006), which may or may not be considered as eye-catching. Here we focus on the meaning of amenity as related to the pleasant and attractive elements of a place, with particular emphasis on visual quality.

Amenity is determined through human experience, namely sounds, temperature, smell and visual perception. As Itami states (1994, p. 14), “affection for landscapes” must relate to the interface between human interest and their surroundings. Yet visual aesthetics are particularly important for determining in attempting to determine the level of amenity of a landscape since humankind is far more dependent on sight than any other sense (Tuan, 1974). Amenity is also essentially relevant at the local scale. For example, a dense assemblage of colourful trees in a front-yard can be enjoyed by the householder and pedestrians walking by yet will be unfamiliar to those from several suburbs away. Amenity thus differs from the spectacular and globally famous, such as the Grand Canyon, Iguazu Falls or Uluru. It relates to neighbourhood scenery rather than icons.

2.2 Biodiversity

The loss of biodiversity is one of the most important contemporary environmental issues (Pimm & Raven, 2000). The term biodiversity is found in scientific documents, tourist brochures and the law. Concern for its protection has arisen from a compendium of elements including international agreements, domestic statutes, policy instruments, community

demands and specific incidents. Yet throughout this panoply the term is often poorly defined if not at all, partly due to the fact that the concept is large and expansive, encompassing multiple biological constructs (Ives, Taylor, Nipperess, & Davies, 2010). The *United Nations Convention on Biological Diversity* of 1992 (CBD), defines biological diversity (or 'biodiversity') as:

"[T]he variability among living organisms from all sources...and the ecological complexes of which they are a part; this includes diversity within species, between species and of ecosystems" (United Nations 1992, see article 2).

Scale is critical in delineating biodiversity. By including within the definition the notion of diversity *within* individual species (i.e. genetic diversity) through to broader ecosystems, it is immediately evident that biodiversity exists at all scales and in all environments. The UN definition implies that promoting biodiversity could refer equally to protecting vegetation communities within a region, sustaining a viable population of a small mammal species, or maximising macroinvertebrate species richness in local urban streams. Accordingly, while biodiversity can exist at the same spatial scale as amenity, it goes far beyond this. Biodiversity can be measured both for the whole earth and a single quadrat on a forest floor.

While biodiversity has been the focus of rigorous scientific study, its enormous popularity in scientific literature since the 1990s is largely due to its connection to a political agenda of nature protection (Ghilarov, 1996). Given this history, Ghilarov (1996, p. 306) stresses that "justifications from the spheres of ethics and aesthetics must be used much more broadly" in future studies of biodiversity.

3. Amenity and Biodiversity in Landscape Practice

The importance of the urban environment, especially its visual aspects, to the wellbeing of city residents, became acutely pronounced in British law when the state sought to prevent post-Dickensian urban squalor by land regulation. The aim of “securing amenity” was introduced by the *Housing and Town Planning Act* of 1909 (see section 54(i)), the UK’s first planning statute. Its main rationale was to improve housing for the poor alongside “healthy and aesthetically uplifting environments for the working classes” (Booth & Huxley, 2012, p. 280; see also Sutcliffe, 1988). This Act permitted local authorities to prepare ‘town planning schemes’ where amenity, convenience and sanitation could be listed as planning objectives under zoning provisions.

Today, amenity remains a key planning consideration in many parts of the world. UK planning statutes and policies have highlighted amenity as a key planning consideration, and have influenced many jurisdictions including Australia’s six states (Fogg, 1985). The UK National Planning Policy Framework, for example, states that “local planning authorities should plan positively to enhance the beneficial use of the Green Belt, such as looking for opportunities to provide access; to provide opportunities for outdoor sport and recreation; to retain and enhance landscapes, visual amenity and biodiversity; or to improve damaged and derelict land” (Department for Communities and Local Government (UK), 2012, p. 19).

Although central to urban planning in the UK, green belts and green spaces have become elastic expressions used in disparate ways across the globe (see, for example, Aruninta, 2012; Jan, Hsieh, Ishikawa & Sun, 2012; Colesca & Alpopi, 2011).

Despite widespread use of the term amenity in planning policy, it is often poorly defined or not at all (Parker & Doak, 2012). In Australia, adverse impact on amenity usually arises during the development assessment stage (Stein, 2008). For example, the community may complain about the removal of trees to make room for a larger structure. If the local authority has sufficient political power, it may insist upon the realignment of the building in order to salvage the trees or, more bravely, refuse the application. To regulate amenity on private land, strong plans are needed that are supported by local politics. In contrast, governments have greater power to plan and manage their *own* lands. For example, local authorities might promote a desired neighbourhood character through selection of street trees or management of green community spaces.

A consistent theme of the application of amenity in policy and practice is the importance of green spaces and features. After European cities expanded beyond their armoured walls in the 16th Century, vegetation became a vital consideration in urban planning as a means of enhancing the pleasantness of urban settlements, to the point where street trees became common in the 19th Century (Botkin & Boveridge, 1997). City amenity was severely impinged upon during the Industrial Revolution before green planning paradigms emerged. One key response was America's City Beautiful movement, about which Szczygiel (2003, p. 107) refers to "monumental; wide tree tree-flanked boulevards and large civic spaces". A vital contributor was Frederick Olmsted Snr who designed iconic parklands such as Central Park in New York (together with Calvert Vaux) and the Emerald Necklace in Boston (see also Wilson, 1989) for scenic and recreational purposes. Olmsted's son, Frederick Olmsted Jnr, transposed the City Beautiful into a "city planning movement" containing "technical proficiency, fact finding and cool, detached professionalism" (Peterson, 2003, p. 210). The

City Beautiful movement flowed to other parts of the world by influencing various city and town plans in cities in, for example, the Philippines, China, Europe, Canada, New Zealand and Australia (Freestone, 2007). In Britain, however, Freestone (2007, p. 28) refers to greater attention to “municipal housing schemes than civic splendour”.

If Olmsted sought to have urban parks integrated into monumental city planning, Briton Ebenezer Howard sought to have cities planned in the context of the countryside within which they were situated. His emphasis was more socially-based, focusing on a new form of pleasant suburbia (Freestone, 2010). Howard established the ‘garden city’ movement, whereby urban growth was to be concentrated in satellite towns outside a central city, separated by green countryside and connected by road and rail. By highlighting central gardens, a grand avenue and treed boulevards together with hygienic housing and restricting industry to the urban periphery (Armytage, 1961), urban amenity was vital. His influential treatise *Tomorrow, A Peaceful Path to Real Reform* of 1898, replaced by *Garden Cities of Tomorrow* in 1902, became the “overriding principle” underlying early UK planning laws (Sandercock, 1975, p. 14). It led to freshly designed townships including Letchworth and Welwyn in England, the Woodbourne neighbourhood in Boston, USA, and Daceyville, a suburb of Sydney, Australia (Freestone, 1989). Vernon (2006) depicts Canberra, Australia’s artificial capital established on treeless pastureland, as reflecting both the city beautiful and garden city movements, with an emphasis on the latter (Ignatieva, Stewart & Meurk, 2011). While it has been portrayed “an overgrown garden city” (Brown, 1952; see also Freestone, 2013), it has developed into a tree-lined low-density ‘bush capital’ with coordinated parklands surrounded by low mountains, presenting a high level of amenity for residents and visitors alike. Of course, all city places are not only disparate in nature but represent diluted

translations of Howard's original idyllic plans. A principle element, however, is the amenity of private yards and local open space, including street verges and town squares.

Planning specifically for biodiversity is a relatively recent phenomenon. Any biodiversity benefits stemming from the planning paradigms discussed above have emerged as a by-product, since they were driven by the therapeutic benefits of green features rather than biodiversity conservation *per se*. With the rising environmental consciousness of western society in the 1960s and 1970s, the ecological health and maintenance of biodiversity within cities eventually became goals in themselves. This was later expressed by the introduction of conservation land zonings and investment in ecological management and restoration projects.

During the last ten years, there have been a number of legal and practical advances towards the protection of biodiversity in cities around the world. In 2007, the Local Action for Biodiversity Project was established by ICLEI with an aim of enhancing biodiversity conservation at the local scale through connecting authorities and citizens from around the world. In 2008, the Conference of the Parties of the CBD met in The Hague (COP 6) and officially recognised the importance of biodiversity conservation in urban environments. This meeting was followed by the establishment of URBIO – a network of researchers and practitioners who meet to develop solutions to urban biodiversity conservation challenges. During the tenth meeting of CBD Conference of the Parties (COP 10) in Nagoya, Aichi Prefecture, Japan, a series of global biodiversity targets were established. These 'Aichi targets' include themes such as mainstreaming biodiversity across government and society and enhancing benefits to people from biodiversity and ecosystem services.

The Aichi targets were not specific to urban landscapes, but during the same meeting it was decided that an assessment of the links and opportunities between urbanisation and biodiversity be prepared. The result was the Cities and Biodiversity Outlook project: the first assessment of how urban land use trends will affect biodiversity at a global scale (see Elmqvist et al., 2013). Another significant development in advancing the objectives of the Biodiversity Convention in urban landscapes is the City Biodiversity Index, otherwise known as the Singapore Index (SCBD, 2012). A panel of experts developed this self-assessment tool to enable cities to evaluate their biodiversity conservation performance based on a series of indicators related to (i) native biodiversity in the city, (ii) ecosystem services and (iii) governance and management.

Many novel planning approaches have emerged that accommodate new priorities about biodiversity conservation in urban landscapes. Yet these planning paradigms typically encompass a broader suite of objectives rather than simply focusing on biodiversity conservation alone. Many concepts and paradigms include ‘urban greening’, ‘low impact development’ (Muller, Werner & Kelcey, 2010), ‘urban ecosystem services’ (Elmqvist et al., 2013), ‘biophilic urban design’ (Beatley, 2011) and the ‘Ecopolis’ concept (Downton, 2009), all of which relate to the concomitant promotion of ecological health and human wellbeing. Since the 2000s, the concept of green infrastructure has been keenly adopted by planners and urban designers as a way of integrating biodiversity goals with human benefits in urban landscapes. Essentially a contemporary equivalent to the early green planning paradigms, green infrastructure has emerged as a solution to the challenge of sustainability posed by urban growth (Benedict & McMahon, 2006). Interestingly, Parker and Doak (2012) consider green infrastructure to incorporate the more ancient objective of amenity enhancement

alongside other sustainability concerns. Timothy Beatley introduced the concept of ‘biophilic urban design’ (Beatley, 2011) as a way of translating the biophilia hypothesis (Wilson, 1984) into the context of urban planning and design. Although deliberately broad in its definition, Biophilic cities are those that enable urban dwellers to experience a closer connection with and knowledge of nature (Beatley, 2011). The Ecopolis concept is focused on establishing cities that sustain both human culture and the planet (Downton, 2009), having its roots in the extension of the Garden Cities movement in the Soviet Union in order to create comfortable conditions for living (Ignatieva et al. 2011).

In the context of all of these new sustainability-based urban planning approaches, is planning for amenity *passé*? Does it retain any relevance for urban landscapes of the 21st century and, if so, how can it assist in achieving new biodiversity conservation goals? These questions are explored below, firstly by looking at empirical evidence of the overlap between biodiversity and amenity and, secondly, by considering challenges and opportunities of utilising amenity in planning practice.

4. Amenity and biodiversity: a complex relationship

Relationships between aesthetics and ecology are complex and commonly misunderstood (Paul H. Gobster, Nassauer, Daniel, & Fry, 2007). Thus, in exploring the empirical, theoretical and practical relationships between amenity and biodiversity, a review of a broad range of literature was conducted. This literature was derived from (1) key titles and scholars known to the authors, (2) select key word searches (e.g. amenity, aesthetics, biodiversity,

conservation, urban, planning) in Google Scholar, Scopus and academic library catalogues, (3) key citations within articles, and (4) personal communication with colleagues.

Modified or natural green areas have consistently been related to aesthetic preferences (e.g. Kaplan & Kaplan, 1989; Purcell & Lamb, 1994; Hartig, 1993) and are commonly listed as people's favourite places (e.g. Korpela, Hartig, Kaiser, & Fuhrer, 2001). Furthermore, vegetation has been proven to soothe urban noise such as traffic (Fang & Ling, 2003), help mitigate the urban heat island effect (Memon, Leung, & Chunho, 2008) and enhance the use of green spaces (Smardon, 1988). Collectively, these visual and non-visual amenity values of green spaces have been shown to increase property prices nearby parks (Crompton, 2005). A number of theories to explain preference for green or natural areas have been proposed, including the biophilia hypothesis (Wilson, 1984), information processing theory (Kaplan & Kaplan, 1989), prospect-refuge theory (Appleton, 1975) and stress reduction theory (Ulrich, 1979).

Public health and wellbeing have been shown to be enhanced by the pleasant and attractive qualities of green spaces and features (Keniger, Gaston, Irvine, & Fuller, 2013). For example, improved access to and interaction with natural or green open spaces increases rates of physical activity and related physical health benefits such as greater longevity (Giles-Corti et al., 2005; de Vries, Verheij, Groeneweggen, & Spreeuwenbuerg, 2003; Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006). Moreover, the aesthetic quality or overall 'greenness' of public open spaces has been related to the cardiometabolic health of urban residents and lower stroke mortality (Hu, Liebans, & Ranga, 2008; Paquet et al., 2013).

Strong evidence for psychological benefits related to green spaces has also surfaced. Views of

natural or green scenes are proven to restore attention fatigue (Kaplan & Kaplan, 1989; Hartig, Evans, Jamner, Davis, & Garling, 2003), reduce stress (Ulrich et al., 1991; Nielsen & Hansen, 2007), increase positive emotions (Ulrich et al., 1991) and strengthen people's capacity to deal with challenges and crises (Kuo, 2001). Benefits of green space appear to be especially pronounced for children, with Wells (2000) finding that contact with nature contributes to a higher sense of self worth and improved cognitive function. These matters readily demonstrate the far-reaching community benefits of amenity-rich green spaces.

Recent research has begun to explore whether biodiversity *per se* contributes to the pleasantness of a place. For example, a survey in the UK found that the diversity of flora and fauna was valuable for two thirds of people (Irvine et al., 2010), while an analysis of Danish citizens found that over half of respondents identified the experience of flora and fauna as a significant motivation for urban park visitation (Schipperijn et al., 2010). A small number of studies have tested for empirical relationships between specific aspects of biodiversity and amenity. Lindemann-Matthies, Junge, & Matthies (2010), for example, found a preference for greater species richness in images of simulated grasslands. Neighbourhood satisfaction in Australian towns was positively related to vegetation cover, species intensity and abundance of birds (Luck, Davidson, Boxall, & Smallbone, 2011). Fuller, Irvine, Devine-Wright, Warren, & Gaston (2007) found a positive relationship between plant species richness and the psychological wellbeing of park visitors. However, Dallimer et al. (2012) discovered that *perceived* rather than *actual* richness contributed to these psychological benefits. In their study of visitors accessing riparian reserves in Sheffield, England, significant positive relationships were observed between the number of plant, butterfly and bird species that people had thought were present at the site.

There is evidence, however, that ecological quality can be at odds with aesthetic preference. For example, Tyrväinen, Silvennoinen, & Kolehmainen (2003) found that residents of Helsinki preferred images of actively managed urban forests over those of greater ecological integrity containing a complex understorey and woody debris. Similar results were found by Qiu *et al.* (2013), where negative preferences of park visitors related to habitats of high species richness and complex vegetation. These results were complicated by the fact that participants with ecological knowledge appreciated different park features from lay people.

The writings of two landscape ecologists are useful in making sense of this growing body of research. Nassauer (1995) purported that ecological quality is not readily recognisable to the eye and that healthy ecosystems require the presence of ‘cues to care’ if they are to be appreciated. Further, Gobster (1999) argued for the existence of an “ecological aesthetic”, where pleasure can be derived from both the physical features of a landscape and an understanding of its ecological function. It appears, therefore, that although biodiversity is often positively associated with aspects of amenity, an understanding or cognitive perception of biodiversity is essential for people to benefit directly from their experiences.

5. Promoting Biodiversity and Amenity at the Local Scale

5.1 Amenity as a vehicle for achieving biodiversity and sustainability outcomes.

It is clear from international literature that there are many positive relationships between facets of amenity and biodiversity outcomes. Could amenity therefore be a useful vehicle for realising the goals of new urban sustainability planning paradigms such as biophilic or

eco-cities? Can amenity be activated in local planning to enhance the conservation of urban biodiversity? We believe there is immense potential here. Millard (2010, p. 69) states that “[t]he continued existence of such space [i.e. green space] is dependent much more on its perceived value to people for cultural, amenity, recreational and health reasons, rather than biodiversity alone”. In a planning context, the term ‘amenity’ “still has currency in practice” notwithstanding its “encroachment of other synonyms or competing labels such as ‘liveability’ and ‘sense of place’” (Parker & Doak, 2012). For this reason, amenity is an ideal vehicle to capitalise on in planning, designing and managing sustainable urban landscapes. However, this will not be without challenge as many potential conflicts arise between the goals of biodiversity conservation and amenity enhancement. These practical opportunities and challenges are explored below.

5.2 The importance of context in determining biodiversity and amenity goals.

Social and cultural context is very important in defining what both amenity and biodiversity goals are appropriate. This can result in differing degrees of conflict and compatibility in practice. In the case of amenity, there are clear universal principles that apply to landscape visual quality regardless of context. These are based on evolutionary theories of landscape perception and preference, such as humans’ affinity for savannah-like environments (Tveit, Ode, & Fry, 2006). However, cultural preference is also critical with its influence on city design being evident elsewhere. Perhaps one of the most obvious is the export of the European aesthetic to the New World, with English landscape and gardenesque styles common in cities in the United States, Canada, Australia and New Zealand (Ignatieva et al., 2009). Clearly, this aesthetic does not bode well for biodiversity conservation in geographic contexts far removed from Europe. However, Gobster’s (1999) work on the ‘ecological

aesthetic' suggests that cultural preferences can be shifted in favour of ecologically healthy environments, even if it means accepting untidy landscapes. The degree to which this may be necessary will of course depend on the social and cultural context of a particular city.

Appropriate biodiversity goals are also influenced by geographic context and history. In many New World colonial cities, indigenous biodiversity has been decimated by land clearing together with the introduction of exotic species coinciding with European occupation. In these cases, protecting threatened species habitat while promoting the retention of native plants represents the principal biodiversity goals. In contrast, Europe has experienced intense human occupation for thousands of years, and the ecology has adapted accordingly. Initiatives to enhance urban biodiversity in this context may include leaving small green patches to regenerate naturally, operating as 'wild' spaces with scant human intervention (Jorgensen & Tylecote, 2007). However, this is unlikely to achieve positive ecological outcomes in many new world cities, as the seed bank can be full of exotic propagules leading to local biotic homogenisation (Ignatieva, 2010).

5.3 Practical applications for landscape managers.

Given substantial variability in the types of amenity and biodiversity goals that may be pursued in different urban contexts, how can planners and landscape practitioners bring these two concepts together? We argue that it can be achieved through a two-stage process. First, it is important to assess and define the context in which one is working, and second, to identify appropriate synergies between amenity enhancement and biodiversity conservation. Below we explore how amenity can be brought together with biodiversity to achieve mutually-beneficial outcomes in practice, drawing examples from Australian and British cities. However, there

are many instances where the goals of amenity provision and biodiversity conservation do not easily coincide. Thus, in section 5.3.2 we highlight these practical challenges before recommending some ways in which they can be overcome in section 5.3.3.

5.3.1 Examples of promoting biodiversity and amenity

Typically, urban landscapes are divided into zones or parcels with corresponding objectives and functions. Broadly, all land can be classed as either existing for human use or for environmental functions. We show here how both biodiversity and amenity can be enhanced in both. In the case of urban parks designated for amenity functions, choosing local indigenous tree species and including some ecological complexity through planting understory species may help increase its value for native wildlife while not detracting from their social appeal (see Figure 1.) Even on private land, municipal officials can encourage areas of remnant vegetation to remain or promote gardens with indigenous species. Such small scale actions have potential to enhance biodiversity at the local and regional scale while maintaining amenity and increasing human/nature interactions (Goddard, Dougill, & Benton, 2010). In densely populated areas, promoting green rather than grey spaces and screening buildings with plant species local to the area can promote biodiversity while increasing the psychological wellbeing of people who live and work there.

< Figure 1 >

Just as human-dominated spaces can be enhanced for biodiversity, so too can urban parks or forested areas that are set aside primarily for conservation be made more attractive and accessible to the public, often with minor modifications. Providing walking tracks,

educational signage and picnic areas within parks and reserves can assist in raising the amenity value and the level of public support for their protection. Urban greenways (i.e. linear strips of vegetation often containing walking tracks) are examples of features that provide significant biodiversity benefits while contributing greatly to urban amenity (Bryant, 2006). Even in uncharismatic yet ecologically valuable ecosystems (such as Melbourne's western grasslands; Williams & Cary, 2001), visible 'cues to care' such as fences and well maintained edges may help to increase the public's affinity for such areas (Nassauer, 1995). This can be further augmented by well designed signage or carefully placed physical infrastructure (e.g. benches or tables), as demonstrated in seen in Figure 2).

< Figure 2 >

While urbanisation is increasing globally, some cities are in decline. The growth trajectory of a city can present unique opportunities for considering biodiversity alongside amenity. For cities expanding at their fringes (often in response to resident preference for access to rural or natural landscapes), green spaces and reserves within newly created suburbs can be managed according to their ecological significance. Conversely, for cities with declining populations (such as Detroit or many Eastern European cities), vacant blocks and disused spaces can be enhanced through planting gardens or mini forests resulting in both biodiversity and amenity benefits.

5.3.2 Challenges in bringing together amenity and biodiversity in landscape practice.

While there are clearly many instances where targeted amenity enhancement can help enhance both social well-being and ecological integrity in urban landscapes, there are also

situations where the dual goals of amenity provision and biodiversity conservation conflict. One of the more common examples is the design and selection of trees for public green spaces and streetscapes. Commonly, clean and manicured lawns framed by vegetation are preferred aesthetically over cluttered natural habitats or overgrown vegetation (Powers, 2000). Landscape architects often select species of plants based upon design, aesthetics or functional criteria rather than their biodiversity value, and are influenced by globalised landscape preferences (Ignateiva and Stewart, 2009). For example, while deciduous trees are likely to offer the best thermal advantages through providing shade in the summer and allowing sunlight to pass through in winter, planting these species may not be ecologically beneficial in countries such as Australia where few deciduous trees are indigenous.

In some cases, local laws and planning policies can favour amenity at the expense of biodiversity. For example, tree protection legislation is common in many countries (Schmied and Pillmann, 2003). Tree Preservation Orders (TPOs) – a particular legal mechanism derived from England – was introduced in the UK in 1943 by the *Town and Country Interim Development Act* (Booth, 2003). It granted local authorities the power to require approval for “the cutting down, topping, lopping or wilful destruction of trees” (see section 8(1)(a)). While the protection of trees is generally positive for biodiversity, the emphasis of TPOs has been on amenity, with little consideration of ecological function, connectivity or the role of understorey species (Kelly 2006; 2014). The typical revenue structure that supports local government can also work against biodiversity protection. As it is often based on property taxation, it can lead to the “rate payer ideology” that undermines progressive functions that serve the wider community (Mowbray, 1984). When the rate is based on a site’s unimproved

capital value, it encourages land to be developed to its fullest potential. This is often at odds with vegetation management controls or restrictions to limit suburban sprawl.

There are also instances where amenity can be neglected while prioritising biodiversity conservation. Local nature reserves and protected areas can become spaces where human visitation is discouraged. They can even be regarded as menacing because of unfavourable vegetation, dangerous wildlife or threats such as wildfire. Yet encouragingly, even in densely vegetated areas designated for conservation, research has shown that people can still strongly value these areas and engage in activities sympathetic to biodiversity objectives, even with little knowledge of the ecological significance of the site (Gill, Waite, & Head, 2009).

5.3.3 Overcoming challenges in managing for biodiversity and amenity.

These incompatibilities and challenges can be overcome through addressing several key areas. First, urban planners have become increasingly specialised despite the traditional focus of the discipline on integrating multiple objectives of infrastructure provision, housing supply, economic development and environmental protection. A more integrative approach to landscape planning is needed in order for both amenity and biodiversity to be adequately accommodated in the future. We also highlight the need for a high level of public participation in the decision-making process since amenity benefits of landscapes are perceived principally by local people.

Much has been written on the benefits of public participation in planning, and this literature is especially pertinent in the context of reconciling amenity and biodiversity outcomes. Arnstein (1969) developed a typology of eight levels of participation according to varying degrees to

which citizens are empowered to determine the end product in planning. She stressed that much public participation is tokenistic (e.g. decision-makers informing or consulting stakeholders) rather than allowing the public to be genuinely involved in the decision process. Reed (2008) outline both normative and pragmatic motivations for high levels of public participation. Normative arguments are those that highlight the ethical and moral imperative of including people in decision-making, while pragmatic arguments stress the importance of participation for the quality and durability of decisions. Both of these are important when enhancing amenity and biodiversity in urban landscapes; urban residents ought to be engaged in the planning of their local environment, and doing so will help improve realised outcomes. Perhaps the most compelling argument for public participation in this context is its ability to help bridge the gap between scientific evidence and the values and preferences of diverse stakeholders (Bulkeley and Mol, 2003).

We suggest that planners address the following three elements when developing landscape plans for an urban areas (i) the setting of clear objectives, (ii) establishing a robust understanding of empirical links between biodiversity and amenity relevant to the area, and (iii) effective public engagement. We note that these three elements are not necessarily linear steps, but will interact throughout the course of a plan's development. Practical guidance on these three topics is outlined below.

First, as biodiversity and amenity contain multiple attributes, implementation of the two in practice must be based on clearly defined terms and measurable objectives. Frameworks like those presented by Ives et al. (2010) and Savard, Clergeau, & Mennechez (2000) might aid in understanding the compositional, structural and functional attributes of biodiversity at

different spatial scales. These frameworks are useful when seeking to identify biodiversity indicators that are meaningful in different urban contexts. For example, maximising the species richness of vascular plants might be an apt objective for a local community park, while ensuring genetic flows among frog populations within a stream network might be an appropriate biodiversity objective at a landscape scale. Setting clear goals for amenity is more challenging, particularly if a subjective approach to landscape aesthetics is adopted. However, frameworks put forward by Tveit et al. (2006) and Daniel (2001) can assist in identifying the features of landscapes that are likely to generate positive amenity benefits in a general sense. Tveit et al. (2006) provide guidance for moving between concepts, dimensions, attributes and indicators of visual character, which can be included in landscape plans. For example, the coherence of an urban park can (in part) be indicated by measuring percentage land use in correspondence with natural conditions (Tveit et al., 2006). Furthermore, if resources permit, empirical studies of local residents can be employed to generate data on amenity features that can guide planning and design. Methods such as photo elicitation (de Vries, de Groot, & Boers, 2012) or public participation mapping (Tyrvaäinen, Mäkinen, & Schipperijn, 2007) might offer assistance here.

Second, bringing together amenity and biodiversity will require a thorough understanding of the empirical links between the two concepts. Fry, Tveit, Ode, & Velarde (2009) outline a useful framework for how indicators of ecological and visual quality may interact. Urban planners, policy formulators, landscape architects, engineers and decision makers alike must work from a solid knowledge of how people use and appreciate their environment and the role that biodiversity plays in these interactions. This will require insight from a range of disciplines including ecology, psychology, sociology and urban design. Accordingly, there is

a need for researchers to work closely with practitioners to enable generated knowledge to be translated into practice. This can be done relatively easily, but it requires both foresight on the part of the practitioner to include researchers in the design phase of projects, as well as a willingness on the part of the researcher to adapt to how practitioners and governance organisations operate.

Third, engagement of the public in the planning process is key to generating effective outcomes for amenity and biodiversity. This is especially the case given the many conflicts that can arise between the two objectives. The first point to note is that public participation does not necessarily generate consensus among individuals but can enable solutions to emerge from recognition that trade-offs are inherent to decision-making (Reed, 2008). We stress that when planning for biodiversity and amenity, public consultation should occur throughout the process. This includes the early stage of setting objectives, envisioning options for future landscapes, and developing strategies for landscape enhancement. There is a vast literature on methods for public engagement, which has been reviewed by numerous authors (see for example Rowe and Frewer, 2000; Tippett, Handley & Ravetz, 2007). Specific techniques that would be useful for engaging different stakeholder groups in urban landscapes include public opinion surveys, public forums or town hall meetings, or smaller focus groups. Feedback could be sought on issues such as the prioritisation of biodiversity and amenity objectives, the generation of ideas for desirable future landscapes and preferences for landscape planning options.

It should be recognised that policy and organisational reform may be required to ensure that biodiversity conservation and amenity provision are integrated in practice and that the public

is included in the planning process. The separation of conservation policies from those related to urban and suburban design has frequently resulted in the division of land for either human or conservation purposes (Beatley, 2000). Addressing stipulations to consider or even require amenity and biodiversity within statutory documents could help promote both objectives without detracting from the primary purpose of the land. However, it is crucial that a level of flexibility be inserted in local plans so that carefully articulated aims on how amenity and biodiversity can be met together within each city's unique social-ecological context.

6. Conclusion

Amenity can be a useful concept for translating the objectives of new paradigms such as biophilic cities, Ecopolis and green infrastructure into the language of planners. Although amenity and biodiversity conservation provisions do not always sit together easily, careful consideration of the urban context and application of robust assessment methods can help landscape planners achieve both liveable and biodiverse cities of the 21st Century. To enhance amenity and biodiversity together will require clear objective setting and a good understanding of the empirical connections between elements of the two goals. To meet these challenges there is a need for strong public engagement to ensure local communities support actions. The bringing together of amenity and biodiversity also presents opportunities for collaboration between practitioners and researchers. These partnerships could facilitate theoretical and applied research on both the empirical relationships between amenity and biodiversity and the elements of planning practice that enable them to be enhanced. This might even lead to the emergence of a new concept, 'bio-amenity', that can guide landscape planning practice in urban environments.

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References

- Appleton, J. (1975) *The experience of landscape*. London: Bellhaven Press.
- Aruninta, A. (2012) Green design and planning resolutions for an eco-industrial town: a case study of polluted industrial estate in Rayong Province, Thailand, *Journal of Environmental Protection*, 3, pp. 1551-1558.
- Armytage, W.H.G. (1961) *Heavens below: Utopian experiments in England 1560–1960*. Toronto: University of Toronto Press.
- Arnstein, S. R. (1969). A ladder of citizen participation. *Journal of the American Institute of Planners*, 35(4), pp. 216–224.
- Aronson, M.F.J., La Sorte, F.A., Nilon, C.H., Katti, M., Goddard, M.A., Lepczyk, C.A., Warren, P.S., Williams, N.S.G., Cilliers, S., Clarkson, B., Dobbs, C., Dolan, R., Hedblom, M., Klotz, S., Kooijmans, J.L., Macgregor-fors, I., Mcdonnell, M., Mörtberg, U., Pysek, P., Siebert, S., Werner, P., Winter, M., Williams, S.G., Sushinsky, J. & Pys, P. (2014). A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Society B*, 281(20133330).
- Bates, G. (Ed.) (1997) *Butterworths Management and Law Dictionary*. Sydney: Butterworths.
- Beatley, T. (2000) Preserving biodiversity, challenges for planners. *American Planners Association Journal*, 66(1), pp. 5–20.
- Beatley, T. (2011) *Biophilic Cities*. Washington, DC: Island Press.
- Benedict, M. A. & McMahon, E. T. (2006) *Green Infrastructure: Linking Landscapes and Communities*. Washington, DC: Island Press.
- Bonyhady, T. (2000) *The colonial earth*. Melbourne: Melbourne University Press.
- Booth, P. (2003) *Planning by Consent: the Origins and Nature of British Development Control*. London: Routledge.

- Booth, P. & Huxley, M. (2012) 1909 and all that: reflections on the Housing, Town Planning, Etc. Act 1909, *Planning Perspectives*, 2(2), pp. 267–283.
- Botkin, D. B. & Beveridge, C. E. (1997) Cities as environments, *Urban Ecosystems*, 1, pp. 3–19.
- Bulkeley, H., & Mol, A. (2003). Participation and Environmental Governance: Consensus, Ambivalence and Debate. *Environmental Values*, 12, pp. 143–154.
- Bryant, M. M. (2006) Urban landscape conservation and the role of ecological greenways at local and metropolitan scales, *Landscape and Urban Planning*, 76(1-4), pp. 23–44.
- Brown, A. J. (1952). Some notes on Canberra, federal capital of Australia. *The Town Planning Review*, 23(2), pp. 163-165.
- Colesca, S. & Alpopi, C. (2011) The quality of Bucharest's green spaces, *Theoretical and Empirical Researches in Urban Management*, 6(4), pp. 45-59.
- Commonwealth of Australia (2011) *Nationally Threatened Ecological Communities of the Victorian Volcanic Plain: Natural Temperate Grassland and Grassy Eucalypt Woodland*.
<http://www.environment.gov.au/resource/nationally-threatened-ecological-communities-victorian-volcanic-plain-natural-temperate> [Accessed 21 May 2014].
- Crompton, J. (2005) The impact of parks on property values: empirical evidence from the past two decades in the United States, *Leisure Management*, 10, pp. 203–218.
- Dallimer, M., Irvine, K. N., Skinner, A. M. J., Davies, Z. G., Rouquette, J. R., Maltby, L. L., Warren, P. H., Armsworth, P. R. & Gaston, K. J., (2012) Biodiversity and the feel-good factor: understanding associations between self-reported human well-being and species richness, *BioScience*, 62(1), pp. 47–55.

Daniel, T. C. (2001) Whither scenic beauty? Visual landscape quality assessment in the 21st century, *Landscape and Urban Planning*, 54(1-4), pp. 267–281.

Department for Communities and Local Government (2012) *National Planning Policy Framework*. UK Government.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf [Accessed 26 February]

de Vries, S., de Groot, M., & Boers, J. (2012) Eyesores in sight: Quantifying the impact of man-made elements on the scenic beauty of Dutch landscapes, *Landscape and Urban Planning*, 105(1-2), pp. 118–127.

de Vries, S., Verheij, R., Groeneweggen, P. & Spreeuwenburg, P. (2003) Natural environments—healthy environments? An exploratory analysis of the relationship between greenspace and health, *Environment and Planning*, 35, pp. 1717–1731.

Downton, P. F. (2009) *Ecopolis: Architecture and Cities for a Changing Climate*. Dordrecht: Springer, and Collingwood, Australia: CSIRO Publishing.

Elmqvist, T., Fragkias, M., Goodness, J., Güneralp, B., Marcotullio, P.J., McDonald, R.I., Parnell, S., Schewenius, M., Sendstad, M., Seto, K.C. & Wilkinson, C. (Eds.) (2013) *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities*. (Netherlands: Springer). Available online: www.cbobook.org [Accessed 26 February 2015].

Fang, C. & Ling, D. 2003. Investigation of the noise reduction provided by tree belts. *Landscape and Urban Planning*, 63, 187–195.

Fogg, A. (1985). Patterns in the use of development control in Australia, *Western Australia Law Review*, 16, pp. 258–275.

- Freestone, R. (1989) *Model Communities: The Garden City in Australia*. Melbourne, Australia: Thomas Nelson.
- Freestone, R. (2007) The internationalization of the city beautiful. *International Planning Studies*, 12(1), pp. 21-34.
- Freestone, R. (2010) *Urban nation Australia's Planning Heritage*. Canberra: CSIRO Publishing.
- Freestone, R. (2013). Canberra's gardens, parks, and landscape: a bibliographical essay. *Australian Garden History*, 24(4), pp.5-11.
- Fry, G., Tveit, M. S., Ode, Å., & Velarde, M. D. (2009) The ecology of visual landscapes: Exploring the conceptual common ground of visual and ecological landscape indicators, *Ecological Indicators*, 9(5), pp. 933–947.
- Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J., (2007) Psychological benefits of greenspace increase with biodiversity, *Biology Letters*, 3(4), pp. 390–394.
- Ghilarov, A. (1996). What does “biodiversity” mean - scientific problem or convenient myth? *Trends in Ecology & Evolution*, 11(7), pp. 304–6.
- Giles-Corti, B., Broomhall, M. H., Knuiaman, M., Collins, C., Douglas, K., Ng, K., Lange, A. & Donovan, R. J. (2005) Increasing walking: how important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine*, 28, pp. 169–176.
- Gobster, P. H. (1999). An ecological aesthetic for forest landscape management, *Landscape Journal*, 18(1), pp. 54–64.
- Gobster, P. H., Nassauer, J. I., Daniel, T. C., & Fry, G. (2007). The shared landscape: what does aesthetics have to do with ecology? *Landscape Ecology*, 22(7), pp. 959–972.

- Goddard, M. A, Dougill, A. J. & Benton, T. G. (2010). Scaling up from gardens: biodiversity conservation in urban environments, *Trends in Ecology and Evolution*, 25(2), pp. 90–98.
- Grimm, N. B., Faeth, S. H., Golubiewski, N. E., Redman, C. L., Wu, J., Bai, X., & Briggs, J. M. (2008). Global change and the ecology of cities. *Science* 756–60.
- Hartig, T. (1993) Nature experience in transactional perspective, *Landscape and Urban Planning*, 25, pp. 17–36.
- Hartig, T., Evans, G. W., Jamner, L. D., Davis, D. S., Garling, T. (2003). Tracking restoration in natural and urban field settings, *Journal of Environmental Psychology*, 23, pp. 109–123.
- Hornsby Shire Council (2012). Tree Preservation Order.
http://www.hornsby.nsw.gov.au/___data/assets/pdf_file/0007/34972/Tree-Preservation-Order-2011.pdf [Accessed 21 May 2014].
- Hu, Z., Liebens, J., & Ranga, K. R. (2008) Linking stroke mortality with air pollution, income, and greenness in northwest Florida: An ecological geographical study, *International Journal of Health Geographics*, 7, pp. 1202–1211.
- Ignatieva, M. (2010). Design and future of urban biodiversity, In Muller, N., Werner, P., & Kelcey, J. G. (Eds.) *Urban Biodiversity and Design*. (Chichester, West Sussex: Wiley-Blackwell), pp 118-144.
- Ignatieva, M. and Stewart, G. (2009). Homogeneity of urban biotopes and similarity of landscape design language in former colonial cities. In McDonnell, M. J., Hahs, A. K. and Breuste, J. H. (Eds.) *Ecology of Cities and Towns*. Cambridge, UK: Cambridge University Press.
- Ignatieva, M., Stewart, G. H. & Meurk, C. (2011). Planning and design of ecological networks in urban areas. *Landscape and Ecological Engineering*, 7, 17-25.

- Irvine, K. N., Fuller, R. A., Devine-Wright, P., Tratalos, J., Payne, S. R., Warren, P. H., Lomas K. J. & Gaston, K. J. (2010) Ecological and psychological values of urban green space, in: M. Jenks and C. Jones (Eds) *Dimensions of the Sustainable City*. Dordrecht, the Netherlands: Springer.
- Itami, R. M. (1994) Characteristics of landscape aesthetic value and implications for assessment methodology, in: J. Ramsay & J. Paraskevopoulos (Eds) *More than meets the eye: Identifying and assessing aesthetic value (1993 Technical Workshop Series No 7)*. Canberra and Melbourne: Australian Heritage Commission.
- Ives, C. D., Taylor, M. P., Nipperess, D. A. & Davies, P. (2010) New directions in urban biodiversity conservation: The role of science and its interaction with local environmental policy, *Environmental and Planning Law Journal*, 27, pp. 249–271.
- Jeffries, M. J. (1997) *Biodiversity and conservation* (London: Routledge).
- Jan, F. C., Hsieh, C. M., Ishikawa, M. & Sun, Y. H. (2012) Influence of street tree density on transpiration in a subtropical climate, *Environment and Natural Resources Research*, 2(3), pp. 84-95.
- Jorgensen, A., & Tylecote, M. (2007). Ambivalent landscapes—wilderness in the urban interstices. *Landscape Research*, 32(4), 443–462. doi:10.1080/01426390701449802
- Kaplan, R. & Kaplan, S. (1989) *Experience of nature: a psychological perspective*. New York: Cambridge University Press.
- Kelly, A. H. (2006) Securing urban amenity: does it coincide with biodiversity conservation at the local government level? *Australasian Journal of Environmental Management*, 13(4), pp. 243–253.

- Kelly, A. H. (2014) Amenity enhancement and biodiversity conservation in Australian suburbia: Moving towards maintaining indigenous plants on private residential land, *International Journal of Law in the Built Environment*, 6(1/2), pp. 91–105.
- Keniger, L. E., Gaston, K. J., Irvine, K. N. & Fuller, R. A. (2013) What are the Benefits of Interacting with Nature? *International Journal of Environmental Research and Public Health*, 10, pp. 913–35.
- Korpela, K., Hartig, T., Kaiser, F. & Fuhrer, U. (2001) Restorative experience and self-regulation in favorite places, *Environment and Behaviour*, 33(4), pp. 572–589.
- Kuo, F. E. (2001). Coping with poverty: Impacts of environment and attention in the inner city. *Environment and Behaviour*, 33, pp. 5–34
- Lindemann-Matthies, P., Junge, X., & Matthies, D. (2010). The influence of plant diversity on people's perception and aesthetic appreciation of grassland vegetation. *Biological Conservation*, 143, pp. 195–202.
- Luck, G. W., Davidson, P., Boxall, D. & Smallbone, L. (2011). Relations between urban bird and plant communities and human well-being and connection to nature. *Conservation Biology*, 25(4), pp. 816–826.
- Maas, J., Verheij, R. A., Groenewegen, P. P., de Vries, S., & Spreeuwenberg, P. (2006) Green space, urbanity, and health: how strong is the relation? *Journal of Epidemiology and Community Health*, 60(7), pp. 587–592.
- McKinney, M. L. (2006). Urbanization as a major cause of biotic homogenization. *Biological Conservation*, 127(3), 247–260.
- Memon, R. A., Leung, D. Y. C., & Chunho, L. (2008) A review on the generation, determination and mitigation of urban heat island, *Journal of Environmental Sciences* 20, pp. 120–128.

- Millard, A. (2010) Cultural aspects of urban biodiversity, In Muller, N., Werner, P., & Kelcey, J. G. (Eds.) *Urban Biodiversity and Design*. Chichester, West Sussex: Wiley-Blackwell, pp 56-90.
- Minister of Local Government and Planning to Parliament by Command of His Majesty (1951). *Town and Country Planning 1943-1951: Progress Report by the Minister of Local Government and Planning on the Work of Ministry of Town and County Planning*. London: His Majesty's Stationery Office.
- Mowbray, M. (1984). Fiscal welfare and local government, in: J. Halligan and C. Paris (Eds) *Australian Urban Politics: Critical Perspectives*. Melbourne: Longman Cheshire.
- Muller, N., Werner, P., & Kelcey, J. G. (Eds.) (2010) *Urban Biodiversity and Design*. Chichester, West Sussex: Wiley-Blackwell.
- Nassauer, J. I. (1995). Messy ecosystems, orderly frames, *Landscape Journal*, 14(2), pp. 161–170.
- Nielsen, T. S. & Hansen, K. B. (2007) Do green areas affect health? Results from a Danish survey on the use of green areas and health indicators, *Health and Place*, 13(4), pp. 839–850.
- Paquet, C., Orschulok, T., Coffee, N., Howard, N. J., Hugo, G., Taylor, A. W., Adams, R. J. & Daniel, M. (2013) Are accessibility and characteristics of public open spaces associated with a better cardiometabolic health? *Landscape and Urban Planning*, 118, pp. 70-78.
- Parker, G. & Doak, J. (2012) *Key Concepts in Planning*. London: SAGE Publications Ltd.
- Peterson, J. A. (2003) *The Birth of City Planning in the United States, 1840-1917*. Baltimore: John Hopkins University Press.

- Pimm, S. & Raven, P. (2000). Biodiversity: Extinction by numbers, *Nature*, 403, pp. 843–845.
- Powers, J. (2000). How effective are local government planning schemes in protecting ecosystems? *Local Government Law Journal*, 5, pp. 172–184.
- Purcell, A. T. & Lamb, R. J. (1984) Landscape perception: an examination and empirical investigation of two central issues in the area, *Journal of Environmental Management*, 19, pp. 31–63.
- Qiu, L., Lindberg, S., & Neilsen, A. B. (2013). Is biodiversity attractive? – On-site perception of recreational and biodiversity values in urban green space. *Landscape and Urban Planning*, 119, pp. 136-146.
- Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. *Biological Conservation*, 141(10), pp. 2417–2431.
- Rowe, G., & Frewer, L. J. (2000). Public Participation Methods: A Framework for Evaluation. *Science, Technology & Human Values*, 25(1), pp. 3–29.
- Sandercock, L. (1975) *Cities for Sale: Property, Politics and Urban Planning in Australia*. Melbourne: Melbourne University Press.
- Sandström, U. G., Angelstam, P., & Khakee, A. (2006). Urban comprehensive planning - Identifying barriers for the maintenance of functional habitat networks. *Landscape and Urban Planning*, 75, pp. 43–57.
- Savard, J., Clergeau, P. & Mennechez, G. (2000) Biodiversity concepts and urban ecosystems, *Landscape and Urban Planning*, 48(3-4), pp. 131–142.
- Schipperijn, J., Ekholm, O., Stigsdotter, U. K., Toftager, M., Bentsen, P., Kamper-Jørgensen, F. & Randrup, T. B. (2010) Factors influencing the use of green space: Results from a Danish national representative survey, *Landscape and Urban Planning*, 95, pp. 130–137.

- Schmied, A., and Pillmann, W. (2003) Tree protection legislation in European cities, *Urban Forestry and Urban Greening*, 2, pp. 115–124.
- Schwartz, M. W., Jurjavic, N. L., & Brien, J. M. O. (2002). Conservation's Disenfranchised Urban Poor. *BioScience*, 52(7), pp. 601–606.
- Secretariat of the Convention on Biological Diversity (SCBD) (2012) *City Biodiversity Index*. <http://www.cbd.int/authorities/gettinginvolved/cbi.shtml> [accessed 21 May 2014].
- Seto, K. C., Güneralp, B., & Hutyrá, L. R. (2012). Global forecasts of urban expansion to 2030 and direct impacts on biodiversity and carbon pools. *Proceedings of the National Academy of Sciences*, 109(40), pp. 16083–8.
- Smardon, R. C. (1988) Perception and aesthetics of the urban environment: review of the role of vegetation, *Landscape and Urban Planning*, 15, pp. 85–106.
- Stein, L. A. (2008) *Principles of Planning Law*. Melbourne: Oxford University Press.
- Sushinsky, J. R., Rhodes, J. R., Possingham, H. P., Gill, T. K. & Fuller, R. A. (2012). How should we grow cities to minimise their biodiversity impacts? *Global Change Biology*, 19(2), pp. 401–410.
- Sutcliffe, A. (1988). Britain's first town planning: a review of the 1909 achievement, *The Town Planning Review*, 59(3), pp. 289–303.
- Szczygiel, B. (2003) "City Beautiful" revisited: an analysis of nineteenth-century civic improvement efforts, *Journal of Urban History*, 29, pp. 107-132.
- Tippett, J., Handley, J.F., Ravetz, J. (2007). Meeting the challenges of sustainable development – A conceptual appraisal of a new methodology for participatory ecological planning. *Progress in Planning*, 67, pp. 9–98.
- Tuan, Y. (1974). *Topophilia: A Study of Environmental Perception*. Englewood Cliffs, New Jersey: Prentice Hall.

- Tveit, M., Ode, Å. & Fry, G. (2006) Key concepts in a framework for analysing visual landscape character, *Landscape Research*, 31(3), pp. 229–255.
- Tyrväinen, L., Mäkinen, K. & Schipperijn, J. (2007). Tools for mapping social values of urban woodlands and other green areas. *Landscape and Urban Planning*, 79(1), pp. 5–19.
- Tyrväinen, L., Silvennoinen, H., and Kolehmainen, O. (2003). Ecological and aesthetic values in urban forest management. *Urban Forestry and Urban Greening*, 1(3), pp. 135–149.
- Tzoulas, K., Korpela, K., & Venn, S. (2007). Promoting ecosystem and human health in urban areas using Green Infrastructure: A literature review. *Landscape and Urban Planning*, 81, pp. 167–178.
- Ulrich, R. S. (1979). Visual landscapes and psychological well-being. *Landscape Research*, 4, pp. 17–23.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991) Stress recovery during exposure to natural and urban environments, *Journal of Environmental Psychology*, 11, pp. 201–230.
- United Nations (1992) Convention on Biological Diversity, concluded at Rio de Janeiro on 5 June 1992 (United Nations Environment Programme, 1992), <http://www.cbd.int/convention/text> [Accessed 21 May 2014].
- Vernon, C. (2006). Canberra: where landscape is pre-eminent. In D. L. A. Gordon (Ed.), *Planning Twentieth Century Capital Cities* (pp. 130-149). New York: Routledge.
- Vlahov, D. & Galea, S. (2002) Urbanization, urbanicity, and health, *Journal of Urban Health*. 79, pp. S1–S12.
- Wells, N. M. (2000) At Home with Nature: Effects of “greenness” on children’s cognitive functioning, *Environment and Behaviour*, 32(6), pp. 775–795.

Williams, K., & Cary, J. (2001) Perception of native grassland in southeastern Australia.

Ecological Management and Restoration, 2(2), pp. 139–144.

Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.

Wilson, W. H. (1989) *The City Beautiful Movement*. Baltimore: John Hopkins University Press.



Figure 1. An example of a high-amenity landscape utilising native vegetation with a complex structure and clearly marked edges as ‘cues to care’. Photograph by C. Ives.



Figure 2. The use of physical infrastructure like seats and tables can help enhance amenity in high conservation value areas. This image depicts a native grassland reserve in Epping, Melbourne (Photograph © James Newman, courtesy of MDG Landscape Architects).

