Developing Effective Urban Open Space Policies; Using Excludability, Rivalry and Devolved Governance

Andrew MacKenzie, University of Canberra
Leonie J. Pearson, University of Canberra
Craig J Pearson, Australian National University

Abstract: Urban open space provides both social and environmental services that range from 'private' to 'public' goods. This paper investigates the relationship between urban open space public and private goods and human wellbeing, to identify effective planning and management strategies based on theory and case studies of Ottawa and Canberra. The paper constructs a framework for effective management based on the economic principles of excludability, rivalry and devolved governance. This framework is the basis of an analysis of literature and exploration of unpublished surveys and reports on the gazetting and operation of open space networks in Ottawa and Canberra. Historically, gazetting urban open space provides 'public' ecosystem services (i.e. non-excludable and non-rival) however, in operation; these open spaces offer a variety of services ranging from public to private goods. The findings indicate that urban open spaces are most effectively established by government. However in operation, they are more effectively managed collaboratively. By adopting the framework of excludability, rivalry and devolved governance, policy makers can better allocate resources for effective management of urban open space for human wellbeing.

Key words: excludable, rival, devolved governance, open space, Canberra, Ottawa.

Introduction

Urban open spaces range from large continuous 'natural' environments adjacent to urban areas to parks, reserves and other open areas containing urban infrastructure separated and isolated by other urban land uses. Many investigations into urban open space have focused on the values attributed to the physical environment and their spatial relationship to users and their management (Williams, Gottfried et al. 2004, Amati and Yokohari 2006, Bryant 2006, Homans and Mashall 2008). More recent research emphasizes the multiple functions provided to society and the costs associated with managing these spaces (Vandermeulen, Verspecht et al. 2006, Fung and Conway 2007, Tzoulas, Korpela et al. 2007, MacKenzie and Sumartojo 2012).

From a planning and land management perspective, urban open spaces have regained attention at a strategic and metropolitan scale. As planners attempt to translate resilience theory to practice (Gallent and Shaw 2007), the role of landscapes in achieving the appropriate mix of built and unbuilt spaces in cities has shifted (MacKenzie 2012). This shifting role of open space in cities has also attracted interest from professional organisations seeking to insert a green legitimacy into the metropolitan planning and policy approaches required to meet the environmental challenges of urbanization and climate change see AILA Green infrastructure statement (AILA 2012). While the positive social benefits of green space in urban areas are known, but difficult to quantify, the effects of fragmenting and diminishing the urban landscape have measureable negative environmental impacts (Tzoulas, Korpela et al. 2007). Empirical evidence also shows that current changes to development densities and patterns in existing urban areas more often lead to a cumulative loss of urban forest (Banks and Brack 2003) and increased urban heat island effects (Whitford, Ennos et al. 2001). Such social and environmental effects resulting from urban development practices highlight the need for strategic assessment of landscape values in cities. Consequently, research into urban landscape values has enjoyed a resurgence of interest in the last decade (Wylie 2007).

This paper proposes a novel approach to managing and incorporating landscape values into planning practice. It does so by developing a framework for prioritizing different governance structures to support land management approaches based on the economic principles of excludability and rivalry. Evidence for this approach is discussed by reviewing case studies of research undertaken in Ottawa and Canberra. The development of this approach occurs in two stages. Stage one constructs a conceptual framework based on the ecosystem services provided by urban open space and classified by their excludability and rivalry and how this links to management effectiveness. Stage two examines

primary data sources on public perceptions of the ecosystem services and management objectives of urban open space in the case studies.

The conceptual framework developed in the paper will be used to organize the results from the literature review and primary data to help formulate new insights and debate on effectively planning urban open space in an increasingly unpredictable future.

Framework development for urban open space planning and management.

This paper draws on the literature to establish a relationship between the provision of ecological services (ecosystem services) and social benefits in the form of human wellbeing[1]. It applies theories from ecological economics to provide insights on how the characteristics of the services provided by the open space can influence the allocation of resources and support new approaches to the planning policy for the effective management of urban open spaces.

Ecosystem services are the benefits people obtain from ecosystems through the transformation of natural assets such as soil, biota, air and water into things that are valued such as clean air and water, as well as psychological and physical wellbeing (Millennium Ecosystem Assessment 2005). There is a growing body of literature on how ecosystem services are consumed and provided in urban areas (Bolund and Hunhammar 1999, Grimm, Grove et al. 2000, Pickett and al. 2001). Although the general consensus remains that the net flow of ecosystem services is invariably into, rather than out of, urban systems (Millennium Ecosystem Assessment 2005, Birkeland 2008). Consequently urban areas are sites of consumption of the ecosystem services provided by urban open spaces and yet increasingly the cost of management and changes to landscape structure resulting from climate variability and increased population density place increasing constraints on agencies and communities to effectively manage urban open space (SGS. Economics and Planning 2009, Cary, Bradstock et al. 2012).

The diversity of benefits provided by urban open space is well documented. Ecosystem services produced in cities contribute to human wellbeing through a variety of functions, including; human health (Tzoulas, Korpela et al. 2007), quality-of-life of urban citizens (Bolund and Hunhammar 1999, Chiesura 2004), conservation of species and maintenance of biodiversity (Bryant 2006), social place (Quayle 1995), wind protection (Kongjian Yu, Dihua Li et al. 2006), spaces for working and living (Rottle 2006), creation of “new standards” for aesthetics and landscape management (Cranz and Boland 2004) microclimate regulation (Gomez, Tamarit et al. 2001),and recreational activities like walking, nature viewing and education (Hamilton and Quayle 1999). The challenge is how this informs planning and management in an increasingly constrained environment both in terms of funding and in relation to the effects of climate change on landscape structure (Cary, Bradstock et al. 2012).

There is a growing fear that new forms of governance for green infrastructure are providing undue private sector influence, loss of public accountability, and a merely symbolic role for community participation in managing green infrastructure (Sandercock 2005, Young and McPherson 2013). This is often presented as a dualism i.e. governance is either purely private or government (Falkner 2003) with management having a ‘symbolic’ role of public participation. However, this dualism fails to recognize the growing acknowledgement that cities are actually part of multilevel governance schemes. The implication on metropolitan planning from cities operating in multi-level governance structures, as opposed to the traditional hierarchical policy systems has not been explored within the literature ensuring that this paper adds to the fledgling work around the thick analysis of governance in urban environmental governance.

We propose adopting a novel approach that derives from ecological economics based on the principles of excludability[2] and rivalry[3]. This in turn supports the development of a continuum of

[1] Human wellbeing or welfare is the net livability or quality of life of each person in society. Ecosystem services contribute directly to the health, wellbeing, and quality-of-life of urban citizens (Bolund and Hunhammar 1999, Chiesura 2004, Kane 2004).

[2] Excludability is the extent to which an individual can prevent another person from consuming a good or service (Schotter, 1997).

[3] Rivalry is the extent to which consumption of a good or service by an individual impacts the utility (or benefits) other individuals can derive from it (Grafton, et al., 2001).

centralized to devolved governance approaches that can be used to allocate ecosystem services effectively into urban open space planning and management.

We posit that, management of ecosystem services depends on three characteristics; excludability, rivalry and devolution of governance. The 'excludability' of the service produced, in principle expresses the ability of the open space as the service producer to distinguish and avoid uncompensated consumption of the services provided by that space. In practice, ecosystem services generated by urban open space fit along a continuum from excludable services such as recreation or changes in property values attributed to proximity or views, to non-excludable services such as clean air and water, carbon capture and biodiversity conservation.

The 'rivalry' of services in use, is the degree to which multiple users can consume the service without affecting its function or benefit to other users. Like, excludability, ecosystem services generated by urban open space can also be fitted along a continuum from rival such as production of goods and services to non-rival such as clean air and water, carbon capture and biodiversity conservation. The extent to which a service is both excludable and rival influences the mixture of effective management approaches, the most effective governance level and what sector of the community should contribute to managing and deciding upon the appropriate actions for effective management.

	Excludable	Non-Excludable
Rivalrous	Market	Common[4]
Non-Rivalrous	Club[5]	Government

Table 1- Spectrum of management approaches for urban open space

There are four broad types of management classifications based on these two characteristics from economic theory (Perman, Mas et al. 2003), which we apply to ecosystem services: markets, government, common and club (Table 1). At one extreme, excludable and rival services are most effectively managed through markets that directly link production of the service to its consumption. For example horse riding as a recreational service is most effectively provided by a market which can clearly limit the number of horses and riders to the demand. At the other extreme a non-excludable and non-rival service such as biodiversity conservation requires government intervention as it is undersupplied in a free market as there is no direct link between the production and consumption of the service. As a result, there is no price for biodiversity conservation because no market system exists to force consumers to reveal their demand for such a service (Whitten and Bennett 2005).

However most of the ecosystem services generated by urban open spaces are not at these extremes but may be managed along a spectrum of excludability and rivalry. Therefore, these ecosystem services can be further divided into common; rival in use but non-excludable in production such recreation users in protected wetlands and club services; non-rival in use and excludable in production such as outdoor education programs in public parks. These services require different management approaches involving input from both the private sector, the local community and the responsible governing authority to effectively define property rights and manage the service (Burger, E et al. 2001). For example the provision of a symbolically important or aesthetically pleasing open space requires community demand for the protection and enhancement of the landscape characteristics contained in that space and for government to regulate or provide incentives to encourage landowners to adopt practices that protect those aesthetic values. This is the case in Canberra's National Capital Open Space System (NCOSS).

[4] Common goods or common pool resources are goods that non-excludable resources such as firewood collection, however the resource is rival as once used the wood cannot be used by someone else.

[5] It is possible to exclude people from using a club good by restricting access such as imposing an entry fee. However a club good is not rival since one person's use of a space does not reduce its usefulness to others.

The third characteristics to deliver effective management of urban open space are determined by the level of governance6 desired. There is growing recognition of the need for devolving governance of natural resources away from a centralised approach enacted by a government agency to adopting a more collaborative set of arrangements with government, non-government and private actors. Table 1 shows the continuum from centralized Government, through Club and Common to market structures and totally devolved. Indeed decision making as well as management responsibility should devolve to private individuals or collectives (Lane and McDonald 2005). This has been achieved in many cases by adopting a principle of subsidiarity. With clear distinctions in responsibilities between each level of governance, subsidiarity determines the level of intervention that is most relevant in the area of competency shared between stakeholders. There are examples supporting the notion that subsidiarity combined with good collaboration can offer beneficial outcomes because of the particular cultural, ecological and geographical dynamics of the 'local knowledge' that can inform and improve open space decision-making (Wondolleck and Yaffee 2000). The purpose of the framework in this paper is to support a shift toward this approach.

Therefore, not only is effective management a function of the excludable and rival nature of ecosystem services but also the degree of devolved governance of the service in the urban open space. In this paper, we investigate the extent and excludability of ecosystem services and the desire for devolved governance, by way of participation by the community in open space management in the two case studies.

Case studies and Methods

Case studies of two open space networks of Ottawa and Canberra

The two case studies are defined urban open spaces that are gazetted as part of the metropolitan plans for Ottawa and Canberra. The Ottawa open space amounts to 218 km2 of public land and provides a southern boundary to the city. This open space, known as the Ottawa greenbelt (Figure 2) was proposed as part of the 1950 master plan by Jacques Gréber for the city of Ottawa. The greenbelt was gazetted as part of the plan to prevent urban sprawl and provide open space for the future development of farms, natural areas and government campuses(National Capital Commission 2002). At the time, the greenbelt was "intended to circumscribe an area large enough for the accommodation of some 500,000 persons. The inner limit was chosen by considering what area could be economically provided with municipal services" (Eggleston 1961).

The present City of Ottawa comprises an extensive urban area surrounded by an even more extensive rural zone, a situation brought about by the 2001 amalgamation of Ottawa with several surrounding urban and rural municipalities. As a result, the greenbelt no longer surrounds Ottawa, but rather it forms an arc separating the older inner urban area from the outer satellite settlements. Today, land cover within the current greenbelt comprises mainly forest, wetland, and fields - all with mixed uses including recreation, nature conservation, farming, research, and forestry. It also includes limited urban development, including government buildings and the Ottawa/Macdonald-Cartier International Airport. To date, the Ottawa greenbelt remains one of the largest urban parks in the world (NCC 2012).

In Canberra, the National Capital Open Space System (NCOSS) (Figure 3) gazetted in 1984, covers over 70 percent of the Australian Capital Territory (ACT). Its importance in defining the natural setting of Canberra is recognised by the formal adoption of the NCOSS into the National Capital Plan in 1990. The NCOSS was formally incorporated into planning regulation through a series of planning and policy reviews undertaken by the National Capital Development Commission (NCDC) during the 1970s and 1980s. These reports identified the NCOSS for its amenity and recreation value for residents and visiting tourists. The NCOSS consists of publically owned and privately leased land. While the Federal Government is responsible for gazetting the NCOSS in the Metropolitan Policy Plan. The ACT government along with other stakeholders is responsible for managing all of the urban open space

[6] Devolved governance arrangements are the extent to which locally relevant (government, non-government and private) actors become involved) in strategy and activities to manage an environmental good or service. At the extreme is centralized government control and management through to collaboration and the privatization or de centralization (Anderson et al 2004)

except for a few areas around the parliamentary precinct and Lake Burley Griffin in the centre of the city which are managed by the Australian Government.

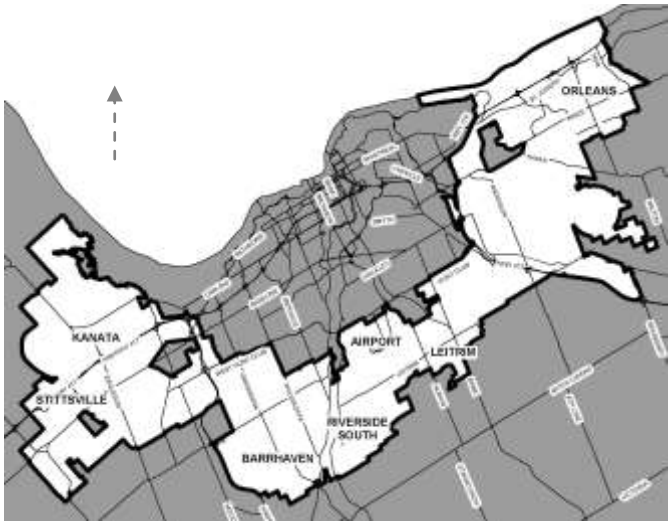

Figure 1- Ottawa Greenbelt (Grey is the urban areas and white is the open space)

Figure 2- Canberra's National Capital Open Space System (Light grey is the urban area and dark grey is the NCOSS).

Methods

The methods described in this paper examine public perceptions of the Canberra and Ottawa case studies. These include content analysis of government reports and notes taken at a public forum attended by 300 people in 2003 on the future use of the NCOSS in Canberra (TAMS 2003). Analysis of results of annual (from 1997 to 2006) Canberra telephone surveys of 1200-1500 people per year and in-park interviews with approximately 250 users, reported by Market Attitude Research Services (2006). Finally, analysis of survey data collected for the review of the NCOSS discussion paper (2011) and consultation report (2012).

The Data from the Ottawa case study include an analysis of 50-140 targeted surveys carried out by the National Capital Commission for Ottawa in 1992, 1999-2000 and 2005; in the Ottawa greenbelt, visitors to Stony Swamp were surveyed in 1999 and 2000 and visitors to the Mer Bleue Conservation Area were surveyed twice in 2000-1. In both cases, interpretation requires recognition that the samples were taken from users of the areas, not the general public.

Results

A critical dimension to understanding the link between urban open space, public participation and effective management is to understand the degree to which land management can be devolved to a level below a central management authority such as a municipal services agency. This paper argues that this approach can be supported by a framework based on excludability and rivalry.

Excludable and rival ecosystem services provided

As previously mentioned, urban open spaces produce the full continuum of excludable and rival ecosystem services in operation. A city wide survey of public perception of the NCOSS in Canberra indicated that there was a strong support for the ecological and recreational services provided by the NCOSS (National Capital Authority 2012). More broadly, the preference for environmental services recorded the highest percentage of votes 46 percent followed by the social services 42 percent and economic services at 12 percent (Figure 3).

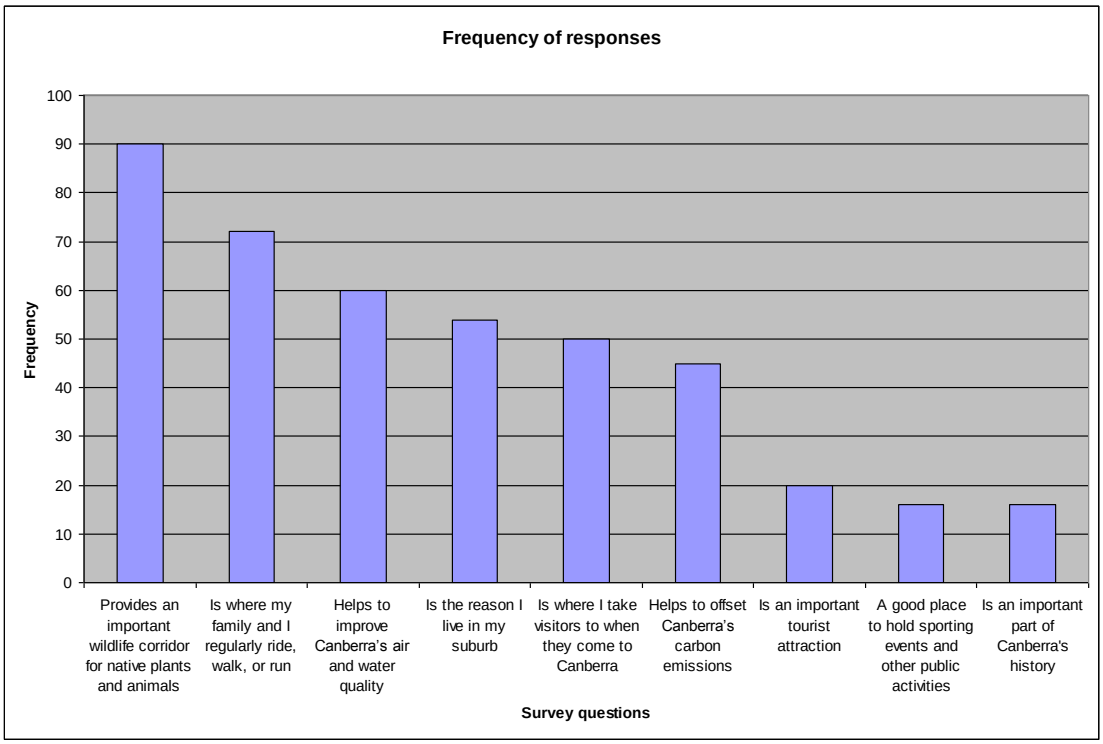

Figure 3- Frequency of responses to an online survey of user perceptions of the NCOSS (NCA 2011)

In addition, 43 short answer responses were provided. The dominant themes emerging from the survey short answer responses included; the visual importance of the NCOSS to the overall look and

feel of Canberra and the bush land close to the city centre makes Canberra much more livable than many other cities. The NCOSS was also seen as providing a range of public ecosystem services. Respondents understood that it is rich in biodiversity and helps provide resilient spaces for plants and animals and it has rare and endangered ecological communities. These various public (non-excludable and non-rival) ecosystem services are expected by the community from urban open spaces. In another study, clean water and biodiversity were identified as two key ecosystem services by 300 attendees at a community workshop to provide input into the Canberra Plan (ACT 2003).

Demand for devolved governance of ecosystem services provided

The diversity in demand for ecosystem services is also found in studies on the Ottawa National Capital Greenbelt (National Capital Commission 1992). Survey results indicated that there is strong support for agricultural land to be protected for future use. This corresponded with less support for directly intervening into the management of these agricultural lands through increased public access for recreation or direction as to where and how farms supply local markets. However, government management in the form of legal protection was seen as an appropriate management tool when non-excludable and non-rival (public) services- such as the protection of soils-were valued (Table 2). Additionally even where management has traditionally been fully devolved to the farmers, there was public interest for broader participation in management of ecosystem service provided by agriculture.

Principle	% support	Comment
High-quality soils should be protected for future farm use regardless of current demand for farmland	81	Protection, supporting excludability
An effort should be made to orient greenbelt agriculture to the production of food for local markets	66	Public participation
Greenbelt farms should be more accessible for public viewing, education and participation (e.g. pick-your own)	61	Public participation

Table 2- Support for "principles" of farming in the Ottawa Greenbelt (NCC 1992, 1995)

A survey of 140 National Capital greenbelt users in 1992 (National Capital Commission 1992) also showed strong support for recreation and environmental protection, as well as continuing support for the greenbelt's role in defining a distinctive national capital (table 3). The strong support for both public participation and protection illustrates the duality and potential for conflict in management options for urban open space. Particularly as centralized government provides 'protection' however public participation requires a more collaborative (devolved) form of management.

Role	% support	Comment
Provide places for outdoor recreation	86	Public participation
Integrate wetlands, wildlife and natural forests into the urban region	76	Protection
Provide a distinctive and symbolic rural setting for the Capital	76	Protection
A living laboratory where Canadians can explore new ways to exist in harmony with the	67	Public participation

environment		
Demonstrate how cities benefit from working farms and forests	67	Participation & protection
Reinforce strong, individual community identities	59	Protection
Accommodate national organizations	28	Public participation

Table 3-Survey of n.140 in which roles are ranked according to the percentage of respondents who "strongly supported" or "supported" each role for the Ottawa Greenbelt (NCC 1992).

Discussion

We posit that effective management of urban open space is a function of three characteristics; excludability, rivalry and devolved governance. The data illustrate the variety of ecosystem services ranging in excludability and rivalry provided and desired from urban open space. It also shows a desire by the public to be collaboratively involved in the management of some ecosystem services. This suggests that the types of services most demanded by the community (i.e. common or club services) are more aligned to more collaborative management types and there is a corresponding desire for public participation, supporting more devolved governance. Figure 4 provides a framework for decision makers to develop strategies for community engagement and at the same time devolution of governance to those communities that perceive the values of the ecosystems services provided by urban open space to be worthy of protection. Broadly, ecosystem services that are either purely public (non-excludable and non-rival) or private (excludable and rival) in nature should be easy to determine. However there is a confounding factor of devolved governance to consider. Additionally, most urban open spaces provide a multitude of ecosystem services and many of these are not at the extremes of the continuums, therefore determination of the most effective management model is more challenging. Figure 4(a) suggests how a single park, reserve, or greenbelt would benefit from different management types as related to different service provision. At the time of gazetting of a park, the benefits provided by the ecosystem services are largely non-excludable, however once the open space is in use and being managed, these services can be both rival and excludible and therefore changing the most effective level of management responsibility. Alternatively, figure 4(b) presents a framework for management of agricultural land in an urban open space. This different scenario reinforces the complexity and multi-functionality of urban open spaces and from a management perspective, how different ecosystem services demand different types of management.

This approach proposes an alternative framework for the effective planning and management of urban open spaces in five ways:

1. Urban open spaces provide multiple ecosystem services for wellbeing. These results indicate that different ecosystem services are enacted in the gazetting of urban open spaces such as the NCOSS (Canberra) and the National Capital Greenbelt (Ottawa). These services change in nature as these urban open spaces transition through creation to operational phases; therefore requiring ongoing changes to the mix of governance arrangements over time. This extends research that identifies the multitude of services offered at different stages in urban open spaces (Bolund and Hunhammar 1999, Chiesura 2004) by drawing attention to the different types of services and how they change between creation and operation open space networks.

2. A consequence of the diversity of ecosystem services is that there is a spectrum of excludability and rivalry in the nature of the services provided. This categorization of the multitude of services extends the work by Rodenburg and Nijkamp (2004) who simply describe the complexity of possible conflicting services, and land uses.

3. A consequence of the range of excludability and rivalry of services is that there is no single optimum model for management of urban open spaces and the services they provide. There is therefore a need to map and classify these services into manageable units, such as recreation, conservation or land management (Figure 4a). Alternatively, specific management

models for each major ecosystem service can be developed (Figure 4b). This is consistent with Ostrom, (1990) and Ostrom et. al. (1994) theory, and Bills and Gross (2005) who posited that management of natural resources should be based on the characteristics of the services and the community in which it is situated.

4. Most approaches to management of urban open space appear to range from centralised governance during gazettal of urban open space to collaborative management for common services, such as recreation to devolved or private management such as agricultural production. This desire for differing levels of devolved governance is consistent with calls for management to be more participatory (Gallent and Shaw 2007) and in keeping with literature on hierarchies of public engagement in decision making (Ross 2002). Engagement can generally be viewed on a continuum from tokenistic engagement to full citizen control and may be described in terms of either being instrumental (achieving a particular end) or transformational (resulting in problem ownership) (Buchy and Race 2001). For urban open spaces to deliver on their various ecosystem services, requires matching the type of service being provided with a desired level of devolved governance.

5. Certain management types can be considered most effective depending on the relationship i.e. Governments for public services and markets for private services. However, results indicate that there are cases where a private service (excludable and rival), such as agricultural production, is seen as worthy of public participation (as in Ottawa), which is contrary to the private property, market based management type suggested in the literature (Burger, E et al. 2001). The desire for public participation in management of the Ottawa farmland is consistent with it being publicly owned. This again, highlights the need to include all three dimensions of Figure 4 to determine the most effective management approach.

Any proposal for a framework for urban open space management needs to be flexible to accommodate both predictable futures, such as urban population growth, and anticipated but unknowable futures such as climate change. The threat of global climate change is one of the most significant scientific and political challenges of our time. It has been identified as a leading threat to future planning schemes and city futures – principally due to the far reaching impact on built and green infrastructure. To deal with this challenge along with others Canberra and Ottawa have embarked on two community led planning initiatives (covering physical infrastructure, green infrastructure, culture, economy and society) Horizon 2067 for Ottawa (National Capital Commission, 2011) and The Sustainable Future project and Time to Talk: Canberra 2030 in Canberra.

In its draft form the Horizon 2067 review contains three objectives that specifically relate to the management of landscapes in the greenbelt. These include; better integration of natural areas into the urban fabric, pilot projects focused on ecological and sustainable agriculture and new tools for the protection of valued ecosystems and green infrastructure in the greenbelt. Horizon 2067 has repositioned the landscape values to incorporate metrics to measure the performance of the landscape as part of its sustainable development agenda. In effect the City of Ottawa has begun to explore options for management that fit the conceptual approach of the framework identified in this paper through investigating new tools for ecosystem services and green infrastructure. The challenge from a policy perspective will be to link the management objectives to the most appropriate level of devolved governance.

Canberra has not achieved the same level of cooperation between state and federal administration as Ottawa and for this reason the landscape objectives are not as clearly defined. Despite this the new ACT Planning Strategy directly links land use and infrastructure planning through the conscious incorporation of green infrastructure in metropolitan planning. As a result the landscape has been sustained, as a land use classification, largely unchanged since the inception of the NCOSS. Like Ottawa, Canberra has established to policy goals to improve land use management but is yet to establish this link between management objectives and governance arrangements. Resulting in a continuation of the centralized governance approach currently in operation with little devolution and distribution to other actors (locals, community groups, non-government organizations).

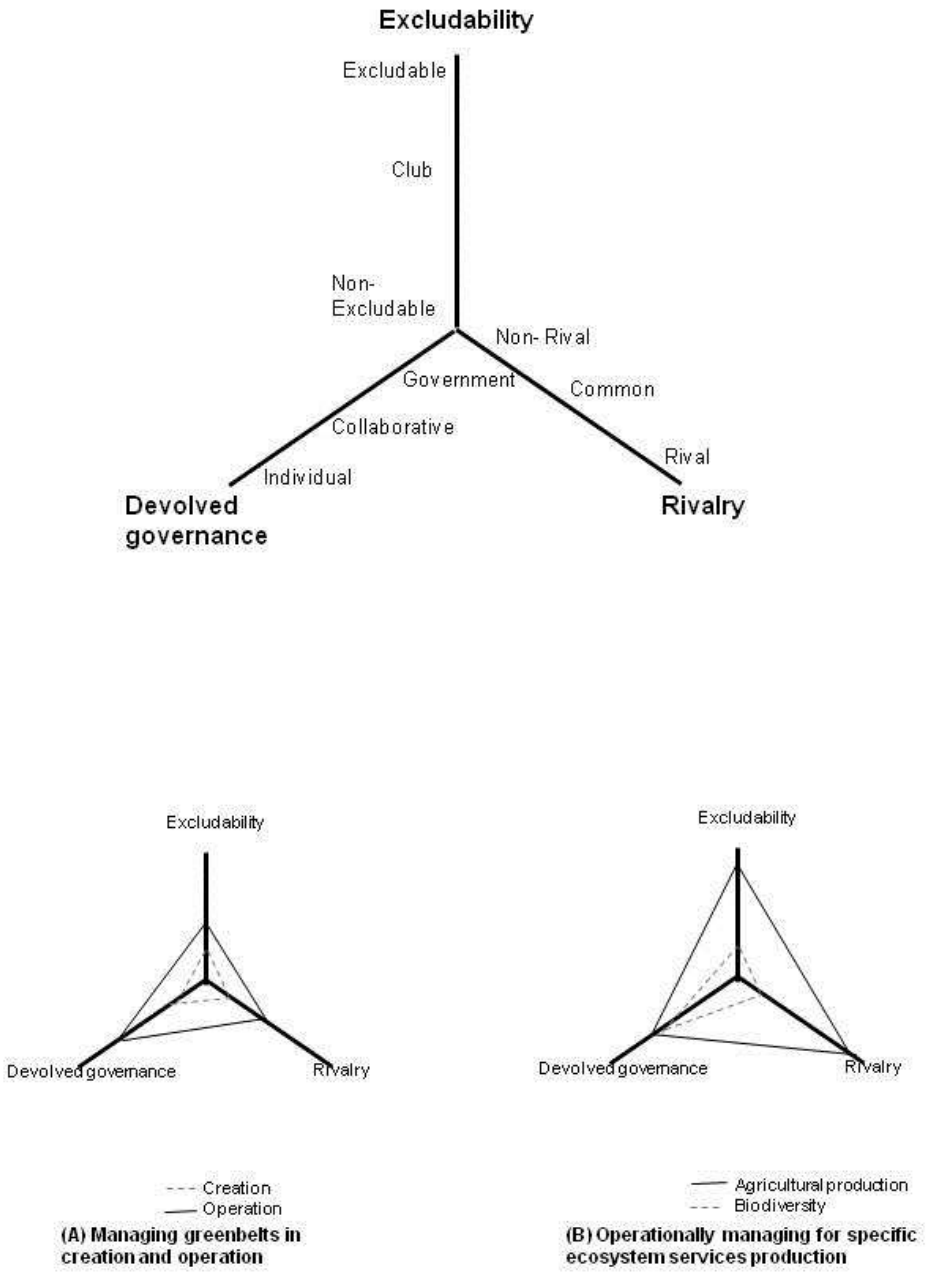

Figure 4. Framework for managing greenbelts for human wellbeing; accounting for ecosystem excludability, rivalry and devolved governance.

Conclusions

This paper has investigated the relationship between urban open space management and the ecosystem service provided for human benefits. It provides a model for identifying effective planning and management strategies, based on theory and surveys of open spaces in Ottawa and Canberra. This paper has added to the work on effective urban open space management by: (i) providing case study examples of excludable and rival ecosystem services of urban open space, (ii) analyzing primary data to show that higher order devolved governance through greater public participation are called for when managing services that are common (non-excludable and non-rival) in nature and (iii)

designing a framework based on: excludability; rivalry; and devolved governance of services to inform the management of urban open spaces. The research findings from this paper argues that the goal is to not focus on the perceived outputs of urban open space but rather to develop a framework for managing urban landscapes to capture the benefits of ecosystem services for community wellbeing. The paper has also shown a need to engage the public in the specific task of comprehending the competing services and the implication for urban open space management.

References

ACT (2003). Your Canberra Future Directions Summit Outcomes. Canberra, ACT Government.

AILA. (2012). "Green infrastrucutre policy statement." Retrieved 12/02/13, from http://www.aila.org.au/greeninfrastructure/.

Amati, M. and M. Yokohari (2006). "Temporal changes and local variations in the functions of London's green belt." Landscape and Urban Planning **75**: 125-142.

Banks, J. and C. Brack (2003). "Canberra's Urban Forest: Evolution and planning for future landscapes." Urban Forestry & Urban Greening **1**(3): 151-160.

Bills, N. and D. Gross (2005). "Sustaining multifunctional agricultural landscapes: comparing stakeholder perspectives in New York (US) and England (UK)." Land use policy **22**: 313-321.

Birkeland, J. (2008). Poisitve Development- from viscous circles to virtuous circles through built environment design. London, Earthscan.

Bolund, P. and S. Hunhammar (1999). "Ecosystem services in urban areas." Ecological Economics **29**: 293-301.

Bryant, M. (2006). "Urban landscape conservation and the role of ecological greenways at local and metropolitan scales." Landscape and Urban Planning **76**: 1-4.

Buchy, M. and D. J. Race (2001). "The twists and turns of community participation in natural resource management in Australia: What is missing?" Environmental Palnning and Management **44**: 293-308.

Burger, J., O. E, R. B. Norgaard, D. Policansky and B. S. Goldstein (2001). Protecting the Commons: A framework for Resource Management in the Americas. Montreal, Island Press.

Cary, G., R. Bradstock, M. Gill and R. Williams (2012). Global change and fire regimes in Australia. Flammable Australia: Fire regimes, biodiversity and ecosystems in a changing world. R. Bradstock, M. Gill and R. Williams. Melbourne, CSIRO**:** 149-169.

Chiesura, A. (2004). "The role of urban parks for the sustainable city." Landscape and Urban Planning **68**: 129-138.

Cranz, G. and M. Boland (2004). "Defining the sustainable park: a fifth model for urban parks." landscape Journal(23): 102-120.

Eggleston, W. (1961). The Queen's Choice. Ottawa, The National Capital Commission.

Falkner, R. (2003). "Private environmental governance and international relations: Exploring the links." Global Environmental Politics **3**(2): 72-87.

Fung, F. and T. Conway (2007). "Greenbelts as an Environmental Planning Tool: A Case Study of Southern Ontario, Canada." Journal of Environmental Policy and Planning **9**: 101-117.

Gallent, N. and D. Shaw (2007). "Spatial planning, area action plans and the rural-urban fringe." Journal of Environmental Planning and Management **50**: 617-638.

Gomez, F., N. Tamarit and J. Jabaloyes (2001). "Green zones, bioclimatic studies and human comfort in the future development of urban planning." Landscape and Urban Planning(55): 151-161.

Grimm, N., M. Grove, S. A. Pickett and C. Redman (2000). "Integrated Approaches to Long-term Studies of Urban Ecological Systems." Bioscience **50**(7): 571-584.

Hamilton, S. and M. Quayle (1999). Corridors of green and gold: impact of riparian suburban greenways on property values. Fraser River Action Plan. B. C. Dept Fisheries & Oceans. Britsh Columbia.

Homans, F. R. and E. P. Mashall (2008). "Modeling Recreation Amenities in an Urban Setting: Location, Congestion and Substitution Effects " Agricultural Research and Economic Review **37**: 257-272.

Kongjian Yu, Dihua Li and Nuyu Li (2006). "The evolution of greenways in china." Landscape and Urban Planning(76): 223-239.

Lane, M. B. and G. McDonald (2005). "Community-based environmental planning: Operational dilemmas, planning principles and possible remedies." Journal of Environmental Planning and Management(48): 709-731.

MacKenzie, A. (2012). Re-covering suburbia: An investigation into the reconfiguration of the suburban landscape PhD, Australian National University.

MacKenzie, A. and S. Sumartojo (2012). Narratives of sustainability in the urban landscape: Canberra's National Capital Open Space System (NCOSS). World in Denmark. Copenhagen Denmark.

Millennium Ecosystem Assessment (2005). Millennium Ecosystem Assessment: Ecosystems and Human Well-being; A framework for Assessment. World Resources Institute. Washington, D.C.

National Capital Authority (2012). Consultation report into the review of the National Capital Open Space System. Canberra, National Capital Authority.

National Capital Commission (1992). The future greenbelt. Recreation trends and the greenbelt. Ottawa, National Capital Commision.

National Capital Commission (2002). Capitalizing on research. A compilation of findings on Canada's capital region. Ottawa, National Capital Commision.

Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge, Cambridge University Press.

Ostrom, E., R. Gardner and J. Walker (1994). Rules, Games and Common Pool Resources. Chicago, University of Michigan Press.

Perman, R. J., Y. Mas, M. Common, D. Maddison and J. Mcgilvary (2003). Natural resource and environmental economics. Essex, Pearson Education Limited.

Pickett, S. T. A. and e. al. (2001). "Urban Ecological Systems: Linking Terrestrial Ecological, Physical, and Socioeconomic Components of Metropolitan Areas." Annual Review Ecological Systems **32**: 127-157.

Quayle, M. (1995). "Urban greenways and public ways: realizing public ideas in a fragmented world." Landscape and Urban Planning **33**: 461-475.

Rodenburg, C. A. and P. Nijkamp (2004). "Multifunctional land use in the city: a typological overview." Built Environment **30**(4): 274-288.

Ross, H. e. a. (2002). "Laying down the ladder: A typology of public participation in Australian natural resource management. ." Australian Journal of Environmental Management **9**: 205-217.

Rottle, N. (2006). "Factors in the landscape-based greenway: a mountains to Sound case study." Landscape and Urban Planning(76): 134-171.

Sandercock, L. (2005). "Democratisation of Planning: Ellusive or Illusory?" Planning Theory and Practice **6**(4): 437-441.

SGS. Economics and Planning (2009). The Territory Plan Urban Principles Review. ACTPLA. Canberra.

TAMS, A. (2003). A Survey for all those interested in Stromlo. Canberra, ACT Government.

Tzoulas, K., K. Korpela, S. Venn, V. Yli-Pelkonen, A. Kazmierczak, J. Niemela and J. James (2007). "Promoting Ecosystem and human health in urban areas using Green Infrastrucutre: A literature review." Landscape and Urban Planning **81**: 167-178.

Vandermeulen, V., A. Verspecht, G. Van Huylenbroeck, H. Meert, A. Boulanger and E. Van Hecke (2006). "The importance of the institutional environment on multifunctional farming systems in the peri-urban area of Brussels." Land use policy **23**: 486-501.

Whitford, V., A. Ennos and J. Handley (2001). "City form and natural processes: indicators for the performance of ecological areas and their application to Merseyside, UK." Landscape and Urban Planning **20**(2): 91-103.

Whitten, S. M. and J. Bennett (2005). The private and social values of wetlands. Cheltenham, Edward Elgar.

Williams, E. D., R. R. Gottfried, C. D. Brockett and J. P. Evans (2004). "An integrated analysis of the effectiveness of Tennessee's Forest Greenbelt Program." landscape and urban planning **69**: 287-297.

Wondolleck, J. and S. Yaffee (2000). Making Collaboration Work: Lessons from Innovation in Natural Resource Management. Washington D.C, Island Press.

Wylie, J. (2007). Landscape. New York, Routledge.

Young, R. and E. McPherson (2013). "Governing metropolitan green infrastructure in the United States." Landscape and urban planning **109**: 67-75.