

Proceedings of the Fábos Conference on Landscape and Greenway Planning

Volume 3

Issue 1 *Proceedings of the Fabos Conference on Landscape and Greenway Planning 2010*

Article 11

2010

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Recommended Citation

Sharma, Archana (2010) "Rethinking greenways design in context of sustainable development: towards landscape synergism," *Proceedings of the Fábos Conference on Landscape and Greenway Planning*: Vol. 3 : Iss. 1 , Article 11.
Available at: <https://scholarworks.umass.edu/fabos/vol3/iss1/11>

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Rethinking greenways design in context of sustainable development: towards landscape synergism

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Abstract

Greenways design and planning has been largely framed as a multi-functional, multi-objective approach to address socio-cultural and ecological concerns (Fabos, 2004; Hough 2004, Steiner, 2002; Fabos, 1995, Ahern, 1995; Ndubisi, 1995; Forman, 1995). Social well-being, identity and memory have been predominant socio-cultural concerns while biodiversity preservation and natural resources conservation have been key ecological concerns. These concerns have now been superseded by the more urgent concerns of sustainable development such as availability of energy resources, both food and fuel. Whether and how the design and practice of greenways meets these sustainable development challenges is the primary question raised through this paper.

The greenway design and planning practice is reviewed through academic papers, government proposals and greenway reports generated by relevant agencies. Physical design typology in reference to the given physical, socio-cultural, political and ecological contextual is studied, and a hypothetical compound network design typology explored through academic projects. The inquiry overarches the realms of landscape design, planning, sustainability and urbanism.

The paper, (a) outlines three predominant design typologies of greenways: connector design, containment design and composite network design, (b) advocates for composite network design typology of greenways for its scalar versatility enabling neighbourhood to city level applications, (c) illustrates the sustainable development outcomes related to socio-cultural, ecological and economic wellbeing as generated through green network design at neighbourhood scale, and, (d) articulates greenways as synergistic landscapes that create harmony amongst the urban system with broader biophysical system. Essentially, the paper calls for a renewed approach to greenways design and planning practice in order to start meeting sustainable development challenges more effectively and advocates for landscape synergism approach to design for sustainability and harmony.

Introduction: Greenways as a landscape systems approach

The author approaches greenways as a landscape system, which subsequently is an integral component of the broader bio-physical system. Olmsted through arguments for appropriation of land parcels for park system in 1886 (1978), McHarg (1967, 1992) with his studies on nature in metropolis, river basin and articulation of suitability mapping, Forman with his reading of landscape as patches, corridors and matrix (1995) and emphasis on road ecology (2003) set ground for landscape systems approach. Little (1990) with his seminal book on greenways and subsequent

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publications on the topic (Flink and Searns, 1993, Fabos, 1995, Fabos and Ahern, 1996, Jongman and Pungetti, 2004, Hellmund and Smith 2006) explored the form and function of this emerging linear landscape systems. The greenways movement in America did have an overreaching impact on other parts of the world which is not very well documented, particularly in American literary context.

This papers reviews selected international greenways movement, with specific attention to the design typology and contextual influences that act as design generators.

Literature review

Singapore: Park Connector Network

Singapore is an island country with a thriving, industrialization, seaport, tourism and knowledge based economy, land footprint of 710.2 square kilometer and population density of 6814 per square kilometer for the year 2008 (Singapore statistics, 2008). Open space planners faced the challenge of enhancing the garden image of the country that attracts high number of tourists and expat skilled workers while maintaining clean environment. The park connector was created thus to enhance aesthetics, provide a biodiversity corridor, to serve as a noise and pollution buffer between residential and industrial zones, create pedestrian as well as automobile friendly connections, and link open water system.

The park connector network, popularly communicated as greenways in urban setting are asphalt laden, lined with a mix of native and exotic plantings (Tan, 2004, 5). The working group recommends a minimum width of 1.5m for footpaths, 2.0m for cycling paths while retaining the 2.0m wide planting strips (Tan, 2004, 8). A singular-programming of land as greenways thus results in a multipurpose, multifunctional, socially and environmentally responsible landscape system in Singapore. Primary critique of his plan has been from the biodiversity conservation perspective and emphasizes upon the design and planning of landscape in the adjacencies of the park connectors since the adjacent landscapes directly impacts the biodiversity value of connectors (Briffett, Sodhi et al, 2004, 61).

Melbourne: Green wedges

Melbourne city in Victoria state with a land area of 8806 square kilometer population density of 1566 per square kilometer in 2006 (Australian Bureau of Statistics, 2007) is one of the progressive economies of Australia, based on arts, education, tourism, seaport and automotive industries. Green wedges are the open landscapes that were set aside, more than 30 years ago, to conserve rural activities and significant natural features and resources between the growth areas of metropolitan Melbourne as they spread out along major road and rail links (Department Sustainability and Environment, 2003).

Urban sprawl was one of the key challenges identified by the Victorian Government in sustainable management of Melbourne's growing population. Melbourne 2030, a long term strategic plan for sustainable growth of Melbourne thus aimed at maintaining the livability of the established areas through majorly revisiting the strategic redevelopment sites such as activity centers and underdeveloped land. The idea was to maintain a good supply of land for development in heavily urbanized and metropolitan growth areas thus preventing urban expansion into surrounding rural land (Department Sustainability and Environment, 2002). The policy on green wedge was outlined as a seemingly feasible solution to address sprawl and to regulate the urban growth boundary. Selected land areas or green wedges surrounding the Melbourne metropolitan region were set aside for non-urban uses, which included (Department Sustainability and Environment, 2005):

- land for agricultural uses, such as market gardening, viticulture, aquaculture, farm forestry and broad acre farming
- rural and scenic landscapes
- renewable and non-renewable resources and natural areas such as water catchments
- sites for infrastructure that supports urban areas such as airports and sewage treatment plants
- sand and stone extraction industries close to major markets
- networks of open space
- opportunities for tourism and recreation

Melbourne @5 million a planning update on Melbourne 2030 (Department of Planning and Community Development, 2008) articulated several amendments to Melbourne 2030, including the one on urban growth boundary thus directly impacting the green wedge planning: “The expansion of the outer Melbourne Urban Growth Boundary to accommodate some of the 284,000 new dwellings expected to be built in the growth areas and to maintain housing affordability. Areas to be considered for inclusion within the growth areas are designated as ‘investigation areas’. Detailed planning in these areas will identify the final location of the Urban Growth Boundary within the investigation areas. Councils, residents and developers had an opportunity to make submissions on proposed changes to the Urban Growth Boundary in 2009”. The proposal is being strongly opposed by the Green Wedge Coalition and Australian Printed Press. The key opposition concerns are: green wedge land sales to property developers, further loss of native grasslands thus leading to loss of biodiversity (West, 2010, 2009; Davidson, 2004).

Local greenways

Knoxville is one of the four prominent cities in the Tennessee state of USA with a land area of 240.09 square kilometers and population of 184,802. Formerly, an agricultural and mining dominated economy, Knoxville is a thriving education, research, sports and industrial center. Knoxville, Knox County has a land of 1,854 acres or 7.50 square kilometer of land currently allocated to parks and recreation areas (City of Knoxville, 2010).

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The current greenways plan is a further development of the Knoxville Greenways and Community Trails Commission Report, 1992, the Knox County Greenways Plan, 1994, Knox County Park and Recreation Facility Plan, 1998, and Knoxville Parks, Greenways and Open Space Resource Inventory, 1999. The intent is to provide a connected and cohesive system of parks and recreation facilities throughout the city and the county while also facilitating the preservation of important natural resources (Knoxville Metropolitan Planning Commission, 2009, 7,10).

The design and development guiding policies of Knox county's greenways plan could be outlined as: connecting parks, recreational areas and water bodies so as to protecting open space systems, reinforcing the pedestrian transportation network and promoting sustainable design practices, facilitate avenues of economic vitality (Knoxville Metropolitan Planning Commission, 2009, 19,20). All policies are actually hinged to the idea primordial intent of "Develop(ing) the park and open space system as a foundation in community development"(2009, 20). The key principle of Knox county's greenways plan, however, could be condensed as promotion of social, ecological and economic sustainability. It is not clear whether the goal of connectivity was rooted in landscape preservation tenet, or, aimed at physical social connectivity as well in the vision plan by Skelton, Ideker and Rogers (Knoxville Greenways Coalition, 2010). Given the current state, the greenways could be primarily critiqued in terms of walkable connections and disrupted ecologies along the corridor.

Greenways in Nashville, middle Tennessee with a land area of **1,225.84** square kilometers with a population of 596,462, were primarily designed with an intention of creating connections between the places of natural beauty with the neighborhoods. "Greenways are linear parks and trails which connect neighborhoods to schools, shopping areas, downtown, offices, recreation areas, open spaces and other points of activity. Often located along natural landscape features like streams, rivers and ridges, or along built features, such as railroad corridors and scenic highways, greenways provide valuable green space for conservation, recreation and alternative transportation. Greenways provide all citizens with barrier-free access to natural resources and recreational opportunities" (Nashville Greenways Commission, 2010).


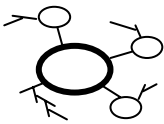
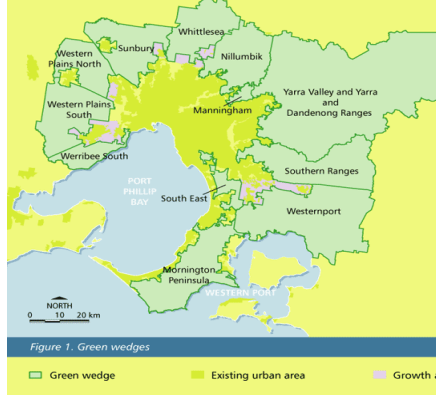
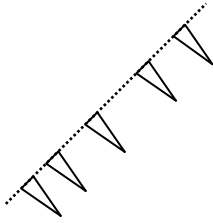
Mecklenburg county in North Carolina state has a land area of 1,362.33 square kilometers and population of 687,456. Mecklenburg County's Greenway System, initially proposed in 1980 as a "green necklace" along the creeks and streams of the County was updates in 1998 which forms the backbone of current Mecklenburg greenways plan. Plan Update recommends that the Greenway System be expanded to include floodplain management and water quality buffer objectives. Thus redefining greenways as linear landscapes used to protecting stream corridors and their floodplains from degradation due to land use development and poor land management practices, and to improve water quality. The primary objective however was identified as providing connectivity between close-to-home and close-to-work recreation opportunities, and thus walking and biking as an alternative transportation mode (Haden and Stanziale, 1999, 2010).

Results and Discussion

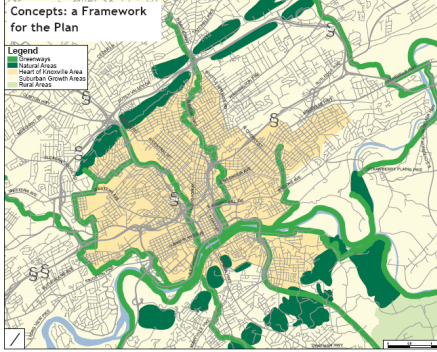
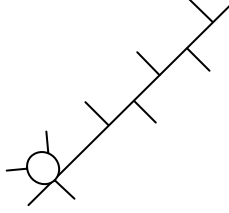
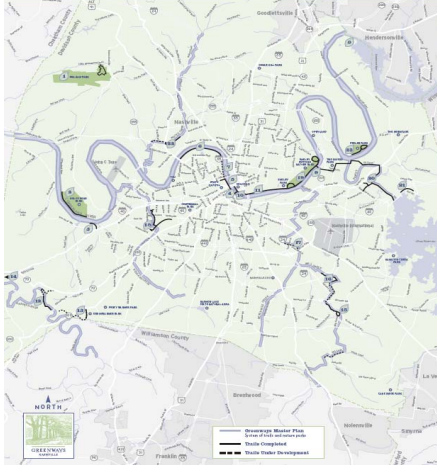
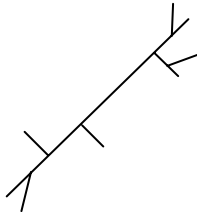

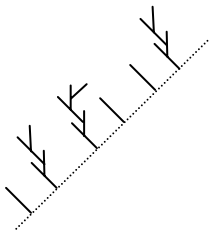
Design typology

The assessment of constructed greenways and published proposals indicated that the broad design typology employed for greenways design has primarily remained that of connector design, containment design and compound network design. The typology is also illustrative of the attitude to greenways design and planning that stays empathetic to recreational, aesthetic needs as well as to the conservation of biodiversity and naturalistic resources within urbanized contexts. In the face of these concerns, greenways design has not evolved sufficiently to address the shifting concerns regarding availability of food and fuel for sustenance of human society.

Table 1. Greenways: objectives, formal diagrammatic abstractions and design typology

Greenways plans	Primary design objectives	Formal diagrams as abstracted from greenways plans and design typology
 <p>Singapore: Park connector network plan, 2002</p>	<ul style="list-style-type: none"> — provision of pedestrian and biking connections — visual screening — pollution buffer 	<p>Connectivity + Containment</p> 
 <p>Melbourne: Green wedges plan, 2005</p>	<ul style="list-style-type: none"> — protection of agricultural and fragile landscapes from development — prevention of development expansion on urban fringes 	<p>Containment</p> 

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<p>Concepts: a Framework for the Plan</p>  <p>Legend Greenways Park of Knoxville Area Natural Open Space Rural Area</p>	<ul style="list-style-type: none"> — to connect parks, recreational areas and water bodies — to protect open space systems 	<p>Connectivity + Containment</p> 
<p>Knoxville: Greenways Plan, 2009</p>  <p>Legend Greenways Major Road Interstate State Road Local Road Rail Airport Waterway Park Open Space Floodplain Wetland Urban Area Rural Area</p>	<ul style="list-style-type: none"> — connecting people to natural resources — provision of alternative transportation mode 	<p>Connectivity</p> 
<p>Nashville: Greenways Plan, 2009</p>  <p>LEGEND Greenways Major Road Interstate State Road Local Road Rail Airport Waterway Park Open Space Floodplain Wetland Urban Area Rural Area</p>	<ul style="list-style-type: none"> — protection of floodplains — connecting people to nature 	<p>Connectivity</p> 

Localized green networks as synergistic landscapes

Also, it should be noted that the reason green areas and greenway connections were lost during urbanization in the first place was the under-valuation of the natural resources and open spaces. Continuing with the traditional greenways design practice would be based on a presumption that human society now sees value in land and resource conservation; the assumption is questionable. A fresh approach to greenways is thus warranted both for meeting sustainable design challenges and for popularizing the acceptance of the greenways.

Human society is self-centered and responds to environmental conservation efforts best when these are articulated as advantageously impacting. Responding to this facet of human psyche, greenways design was articulated as a combination of localized green-switches or networks actively supporting the socio-cultural, economic, or ecological needs of the neighborhood community.

The greenways plan for northwest sector of Knoxville city shows that the proposed greenways actually bypass the Lonsdale neighborhood, see figure 1 below.





**Figure 1. Greenways plan for Northwest sector of Knoxville:
bypassing Lonsdale neighborhood**

An academic design studio thus experimented with design of localized green networks to directly and immediately benefit the local community simultaneously continuing to test the landscape synergism hypothesis of the author.

Synergy literally means working together and in applied sciences as the working together of two or more components to produce an effect greater than the sum of their individual effects. Based on these definitions, the hypothesis of landscape synergism advocates for design and operation of the landscape and urban systems as mutually beneficial constructs at scales of residence, neighborhood and city towards the aims of sustainable and harmonious biophysical environment.

Table 2. Academic explorations: green networks as synergistic landscapes

Design studio agenda: Green networks as synergistic landscapes	
<ul style="list-style-type: none"> — Multifunctional, multi-objective design; — Landscape architecture to be approached from systems perspective; — The green network could have time, climate, topography, program based subsystems for year round functionality; — Green networks to perform the eco-analogous functions of producing, storing and recycling natural resources based energy; — Connectivity between biophysical and residential environment; 	
	<p>Primary design typology: connection</p> <p>Preservation and protection of native species; Natural storage bank for seeds of native species; Creation of biodiversity corridor</p> <p>Dalton, David, Studio LandWeave, Fall 2009</p>
	<p>Producing biomass for energy production; Connecting and planting vacant lots as a productive system for quantity advantage; Creation of biodiversity corridor</p> <p>Tharp, Erin, Studio LandWeave, Fall 2009</p>
	<p>Storing and recycling water Connecting people to natural resources; Protecting water bodies and floodplain;</p> <p>Allen, Justin, Studio LandWeave, Fall 2009</p>

Academic explorations in an underprivileged neighborhood of Lonsdale in Knoxville, TN, USA, indicated a significant impact on the community in terms of (a) food support, (b) educational awareness regarding alternative energy resource, and lastly (c) enhanced visual aesthetics and improved ambience.

Conclusion

In summary, the paper emphasizes the need of revisiting the attitude to greenways design in order to better meet the complex sustainable development challenges. Suggestion on employing a compound network design typology by integrating localized green-switches or networks within greenways, towards the aim of sustainable neighborhoods is promising and should be further explored. The underlying idea should be to explore greenways design as a physical design based harmonizing strategy for neighborhoods and cities. There is an urgent need to depart from the approach of landscape urbanism towards that of landscape synergism, towards the aim of sustainable development and in designing for harmony.

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