Infrastructure as Landscape:
Integrating Human and Natural Realms in Urban Highways Planning and Design

Mahdi Khansefid
Landscape Engineering Department, College of Agriculture and Natural Resources, University of Tehran, Iran.

mkhansefid@ut.ac.ir

Abstract| In the context of rapid global changes in the urban environments and sustainability and resilience approaches, many aspects of cities including infrastructure, i.e. urban highways, is experiencing a paradigm shift where programming for multiple-use and the integration of both human and natural needs is a primary consideration. In the ecological urbanism approach to infrastructure planning and design, urban infrastructure, including transportation routes, no longer belongs in the exclusive field of engineers, transportation planners and managers and role of landscape architecture and landscape ecology is incremental in this process. The potential of infrastructure systems for performing the additional function of shaping architectural, ecological, and urban form has been largely unrealized. Urban transportation corridors as an important part of built urban ecosystems can be enhanced by integration with ecological features in terms of their contribution to both human experiences of the urban environments and green infrastructure in the city. The significant roles of landscape architecture, landscape ecology and landscape urbanism in the urban transportation corridors planning and design is the core of this paper to find out how urban infrastructural projects can be built more sustainably and become multifunctional and bring ecological services to the city.

This research uses a case study for investigation; EastLink, a large scale infrastructural transportation project in Melbourne, Australia. This project is the largest road ever constructed in state of Victoria and Australia's largest urban road project. It incorporates an extensive shared use path network for cyclists and pedestrians and has established constructed wetlands, water retention basins and bioretention strips along its route. The environmental experience of drivers, cyclist, pedestrians and the people living in the nearby environments has been considered during the planning and design and landscape architects and designers were actively involved in the process. The research has established accessibility, connectivity, multiple use, multi scale functions, and maintainability as main criteria for integrating human and natural realms in contemporary infrastructure design for the cities and reshaping future urban landscapes.

Keywords |Urban landscape, Ecological urbanism, Landscape ecology, Infrastructure, Urban highway, Urban ecosystem services.

Introduction| "Infrastructure, no longer belongs in the exclusive realm of engineers and transportation planners. In the context of our rapidly changing cities and towns, infrastructure is experiencing a paradigm shift where multiple-use programming and the integration of latent ecologies is a primary consideration. Defining contemporary infrastructure requires a multi-disciplinary team of landscape architects, engineers, architects and planners to fully realize the benefits to our cultural and natural systems." (Aquino et al., 2011).

As an intrinsic characteristic of urban infrastructural plans, many disciplines and factors influence the planning and design of urban infrastructure and numerous criteria should be taken into consideration during their design and a team of experts should utilize and integrate their expertise in the a project design and delivery process. The significant roles of landscape architecture, landscape ecology and landscape urbanism in the urban infrastructure design process are the core of this research to find out how urban infrastructural projects can be built more sustainably and multifunctional and bring ecological services to the city as well as functional engineering benefits.

The potential of infrastructure systems for performing the additional function of shaping architectural, ecological, and urban form is largely unrealized. The planners and designers have most often been charged with hiding, screening and mitigating infrastructure. They are rarely asked to consider infrastructure as an opportunity. Infrastructure has the capacity to serve as the raw material of design or establish a local identity with tangible synergic relationship to the region and can be designed with a formal clarity that expresses its importance to society, at the same time creating new layers of urban landmarks, spaces and connections (Strang, 1996). The transportation infrastructure, an urban highway for example, is an inseparable component of urban landscape where many interactions of natural and built features meet. The integration of human and natural realms in contemporary infrastructure planning and design of cities are discussed in this paper and a conceptual and practical framework is presented for this process.

Landscape/Ecological Urbanism and Infrastructure Planning and Design

Landscape urbanism as a school of thought in design and planning (Weller, 2008) and urban landscape ecology that investigates the structural and functional interrelationships between the abiotic, biotic and human aspects of the environment (Forman, 1995a; 1995b; Niemela, 2011) can provide the theoretical background for the study of urban infrastructural projects due to the numerous factors and elements that influence these large scale plans where landscape, ecology and urbanism (Mostafavi and Doherty, 2010; Mostafavi and Najle, 2003) meet to increase the ecosystem services at the landscape scale (Müller et al., 2010). As well as achieving its transport objectives in moving people and goods, road networks and infrastructure projects should contribute to the form of human settlements and their accessibility. Approaches such as urban design approach to road infrastructure development indicate a shift in values from a traditional engineering approach, and instead adopting an urban design approach to the development of road and other related transport infrastructure, emphasizing that such projects should regard the natural ecology as well as the built, natural and cultural heritage (Raeburn, 2005).

Similarly, landscape ecological thinking can potentially play important roles in planning and designing urban infrastructure. Landscape architecture can act as a driving force for physical application of the ecological principles in urban projects. Ideas such as green infrastructure (Benedict and McMahon, 2006; Davies et al., 2006, Ignatieva et al., 2011) and urban landscape and infrastructural design (Bélanger, 2009; Meyboom, 2009; Tatom, 2006) increasingly confirm the crucial role of landscape and landscape architecture in urban transportation infrastructure.

The urban built infrastructure can provide other opportunities for landscape architects similar to that of the natural infrastructure in the city. In other words, the transportation systems across landscapes including urban landscapes can provide ecological flows and biological diversity in addition to safe and efficient human mobility (Forman, 1998; Forman and Deblinger, 2000; Harvard GSD Zofnass Program, 2010; Pollalis et al., 2012).

The interaction of ecological sciences and methods such as landscape ecology with architecture, landscape architecture and urban design seem as a logical solution for solving many of the today's environmental concerns. In the utilitarian approach to urban infrastructure design process, mostly the blue (water), grey (urban built) and green (natural or built) infrastructure for the cities are designed separately at different periods of time or are planned and utilized incompatibly. Sometimes the green infrastructure is built after a long time of the initial grey and blue infrastructure or very often the grey infrastructure destroys environmental potentials during construction. Due to the vital and inevitable roles of both natural and built infrastructure in the liveability of cities, an integrated approach towards designing and building the infrastructure is necessary and landscape urbanism and ecological approaches can be of great help to solve this problem by their comprehensiveness to bring the potential services and roles of the ecologically designed infrastructure into urban environments (Khansefid, 2013; 2014).

The current paper tries to find out how urban infrastructure can be designed more ecologically sound, sustainable, and responsive to the living urban environment based on a landscape ecological/urbanist approach. In ecological urbanism studies, there is a gap between the concepts and

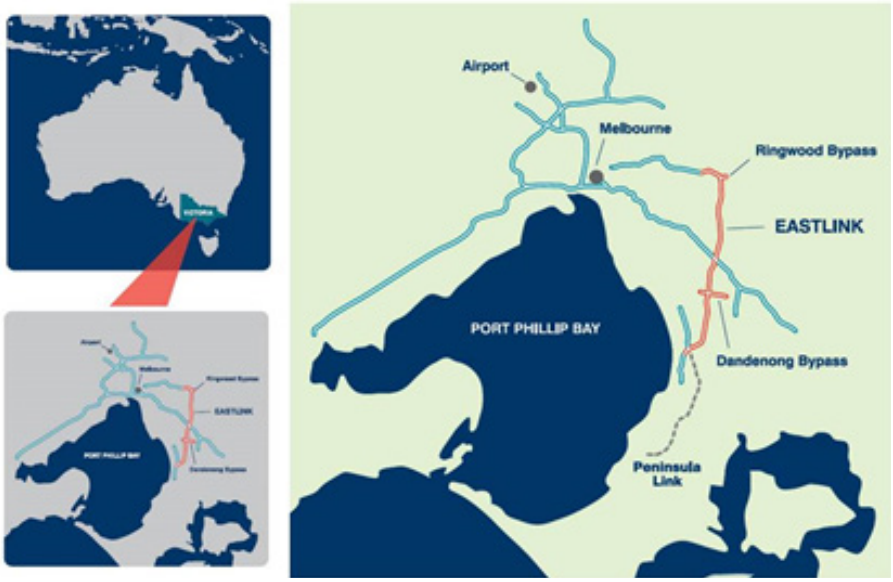
methods presented in the urban ecological sciences and the current the planning and design process. This paper tries to fill out the gap and more specifically focuses on built urban movement corridors, i.e. highways within urban settings, seeking to answer one basic question; "How can urban infrastructure, specifically movement corridors, be designed to improve urban landscape and ecology of the city?" Within the proposed landscape ecological approach in urban infrastructural projects, the environmental features and processes play important roles and should be considered in the design process of built infrastructure along with engineering factors.

The main focus of this paper is on the built corridor and the natural aspects are studied according to their relationships and impacts on and the form and function of highway corridors. The paper explores the theoretical and practical knowledge in that field of activity from a built environment professional point of view and looks at infrastructure as an important part of urban landscape.

Case Study– EastLink, Melbourne, Australia

In order to evaluate the effectiveness of the design and delivery of a built infrastructural project in a landscape/ecological sense, a case study is conducted and several aspects including design and delivery process, ecologically important landscape elements and features and their functions in the urban environment are investigated during the study.

EastLink, a large scale infrastructural transportation project in Melbourne, is regarded unique and extreme and can be considered as a critical case in theorization of the ecological design and delivery framework. The project is the largest road ever constructed in Victoria and Australia's largest urban road project. It is an integration of both built and natural features and it is also a fundamentally important connecting element to the eastern part of the city region and acts as crucial urban transportation corridor, a vital connection for 1.5 million people living in Melbourne's eastern and south-eastern suburbs, completed and opened to traffic in 2008 (Pic1).



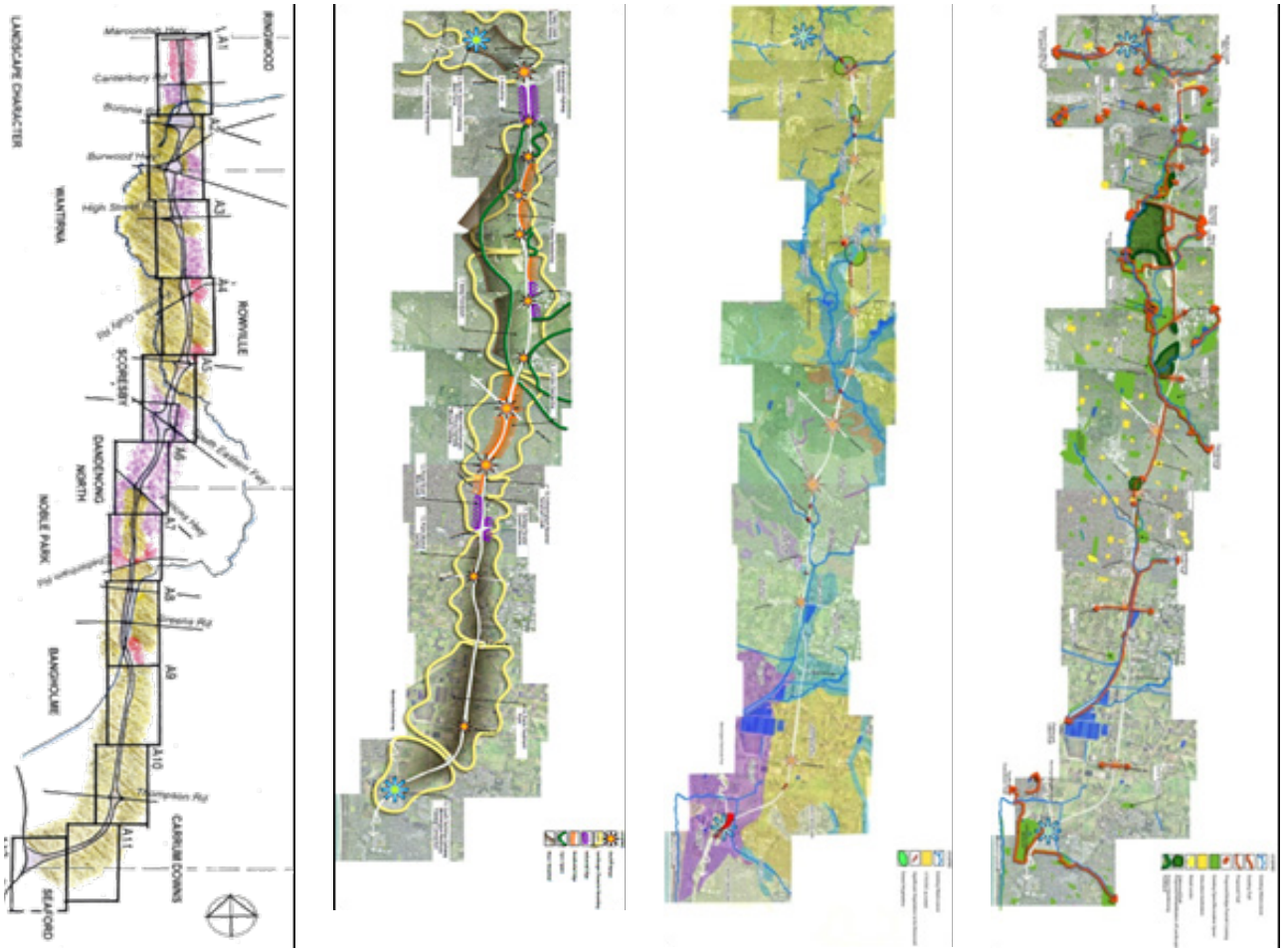
Pic1: The location of EastLink in Melbourne, Australia
Source: Linking Melbourne Authority

A better understanding of the EastLink planning and design process is achieved by exploring related documents and plans, from 1960s transportation networks plans of Melbourne to the 1990s Environmental Effects Statements (EES) and project construction legislation along spatial and temporal scales, followed by investigation of pre-construction and post-construction conditions of the project corridor post construction evaluations that were conducted as a part this research (Pic2).

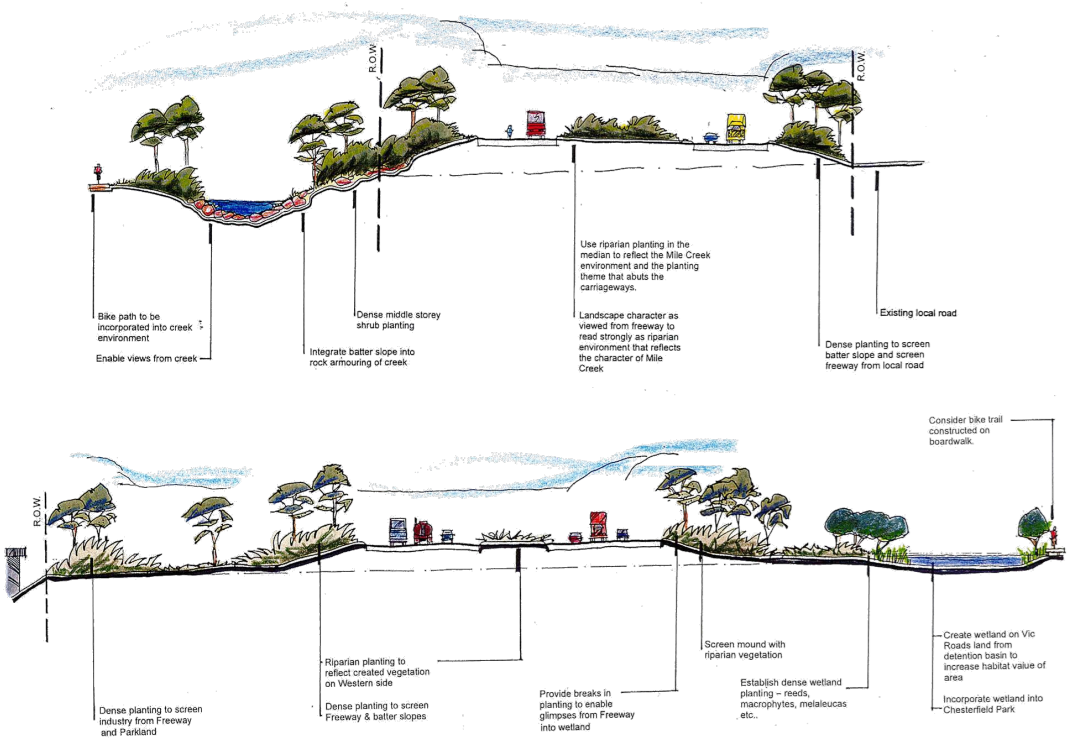
Many recent environmental considerations are applied in EastLink's design and construction process regarding the contextual natural and built features including wetlands and water quality treatment systems and tunnels to preserve parklands and significant forest species. The 39km motorway is connected to the surrounding urban fabric by a network of bridges, cycling and walking pathways.

The project involved construction of 45km of new roadway including 6km of bypass roads and 35km EastLink Trail for walking and cycling. More than 3.6 million plants are being used along the corridor in an area of 480 hectares which is larger than the parks and gardens in the City of Melbourne combined. More than 60 wetlands and water quality treatment systems are located along the way to treat water runoff from the motorway. The 1.6km Melba and Mullum Mullum Tunnels preserve the parkland above, including significant Valley Heath Forest species (ConnectEast). It has been awarded by the Australian Institute of Landscape Architects (AILA) for the landscape architecture and urban design section of the project (Australian Institute of Landscape Architects). Pic3 and 4 show some of initial landscape analysis and typologies of landscape character in the project documents.

Pic2: EastLink planning and design process from 1960s to 2008 and the conducted evaluations
Source: Author



Pic3: Landscape analysis along the project corridor in the EES for Scoresby Transport Corridor, later named EastLink, by EDAW 1990s (Department of Infrastructure, 1998) and Tract Landscape Architects, Urban Designers and Town Planners in 2000s: a) Landscape character, b) Site analysis and views, c) Watercourse and vegetation, d) Connections to wider infrastructure



Pic4: Some of the typologies of EastLink cross-sections at the landscape plan, the EES for Scoresby Transport Corridor, later named EastLink, by EDAW
Source: Department of Infrastructure, 1998

EastLink incorporates an extensive shared use path network for cyclists and pedestrians, which will connect with Melbourne's existing paths. The pathway route was refined after an extensive review process involving discussions with the Department of Sustainability and Environment (DSE), VicRoads, Bicycle Victoria and representatives from city councils and local environmental groups. Several walks through the Mullum Mullum area were conducted with these groups to identify further small areas of sensitive plant life. As a result of these inspections, a final pathway design was determined which protects areas of greatest ecological significance. The shared use path route through the valley will stretch 2.75 kilometers (Pic5,6,7).

Pic5: The shared use paths of EastLink in Mullum Mullum area
Source: Linking Melbourne Authority

ConnectEast, the owner and operator of EastLink, established around 70 constructed wetlands, water retention basins and bioretention strips along EastLink's route, representing a degree of wetland provision unparalleled for a roadway project of this magnitude in Australia. These wetlands function as a north-south string of new aquatic habitats within the road corridor, connecting to existing waterways, drainages and creek channels. The wetland ponds will create a safe ecosystem for frogs, water birds, insects and small mammals in these areas. They have been designed for the capture and treatment of all road surface water run-off throughout the freeway standard motorway. The series of wetlands has been designed to accept all of this water before it is safely released into the waterways nearby (Linking Melbourne Authority). In many cases along the corridor, the creeks were realigned and reconstructed along EastLink to represent a naturalistic views, with ecosystem benefits as constructed ecologies (Pic8,9,10).

Pic6: Preservation of parklands above the tunnels, including significant Valley Heath Forest species and natural flows of the creeks
Source: Author

Pic8: More than sixty constructed wetlands along EastLink for water retention, infiltration, wildlife habitat, and recreation
Source: Author

Pic7: Shared use path network for cyclists and pedestrians above the tunnels and along the corridor of the highway
Source: Author

Pic9: Creeks rehabilitation to remove weeds and protect native vegetation, Melbourne's Water Corridors of Green, a project to re-vegetate urban waterways
Source: Author

Pic10: Creeks realignments and reconstruction with naturalistic views along EastLink
Source: Author

In many places along the north-south EastLink corridor, where there is a chance of recreation and park spaces, natural elements and constructed ecologies are utilized as a tool for environmental awareness among the public in addition to ecological services near urban areas and residential lands (Pic11,12).

Pic11: Using remnant natural elements and constructed ecologies for environmental awareness education and ecological services near urban areas and residential lands
Source: Author

Pic12: The naturalistic planting of the landscape design along the project corridor considering the natural vegetation of the sites
Source: Author

Ecological Urban Landscape – A Framework for Integration

When a transportation corridor is studied from a landscape ecological perspective within urban environments in terms of sustainable planning and design issues, a wide range of natural and built features should be investigated in relationship to a wider scale beyond the local vicinity of the road. Parks and reserves, local remnant or planted patches of green spaces, natural or constructed wetlands, and built up urban areas are among these ecologically important patches. The hydrological flows of major and minor creeks and streams, major and minor access of streets and their patterns, alternative ways of transport such as walking and cycling paths, and public transportation line rails make the significant corridors in the overall ecological structure of these types of urban contexts.

In other words, these features influence urban form, transport modes, and public open spaces and landscape types in any infrastructure project, including urban transportation corridors of highway projects. The urban form and landscape in addition to integration with existing infrastructure and development brings the ideas of integrating of land use and transportation planning in close relationship with the surrounding environment. It is of great importance especially when it is looked at the scale of large urban transportation corridors, such as highways. Therefore, the scale and level of analysis is very important in studying the ecological characteristics of urban transportation corridors.

Each transportation infrastructure project can be evaluated at least at three regional, corridor and site scale and multi-scale analysis is of crucial importance for assessment of urban transportation projects to integrate ecological and cultural values. The five main evaluation criteria for contemporary infrastructure projects as investigated in this paper and proposed in the integrated approach are; 1) Accessibility, 2) Connectivity, 3) Multi-functionality, 4) Multi-scale functions, and 5) Maintainability.

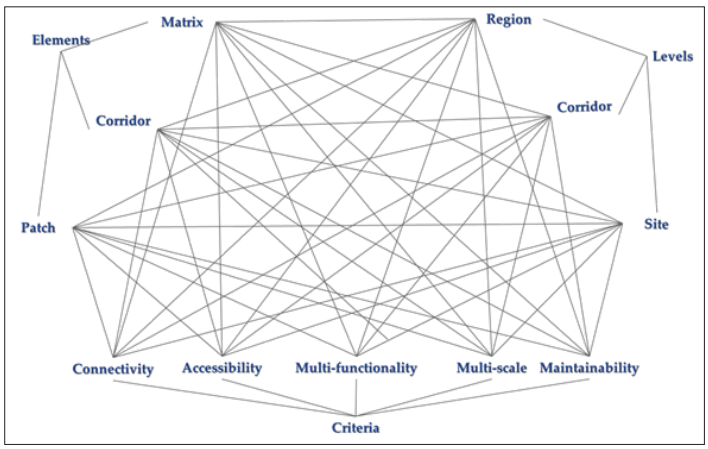
As illustrated in Pic13 and then categorized in Table 1, the issues considered in transportation infrastructure projects at different places and phases, regarding ecological features and landscape characteristics, are multiple and complex and there are multi-level interactions between landscape features including ecological components (patch-corridor-matrix). Type, number, size, location and proximity, shape, hard or soft edges of ecological patches and their interaction with surrounding environments are very important in evaluation and assessment of the infrastructure plans. In evaluation of corridors, type, width, number, proximity, patterns, edges and interaction with surrounding context should be studied in detail. Matrix intersections, nodes, connectedness, fragmentation and mosaic patterns are among the most important criteria for investigating the infrastructure projects from a landscape ecological point of view (Table 2).

Accessibility of and to both natural and human features like relation to green spaces, relationship to parks, wildlife crossings, natural corridors and built linear landscape elements, relation to streets, relation to urban context and existence of shared paths, under and over passes, bridges and availability of public transport are key to success of any infrastructure project.

Connectivity of parks and green spaces, creeks and water ways, highways and streets, railways, alleyways, and minor roads in addition to multi-functionality of the project design to conserve wildlife habitat, establish constructed ecologies, make a balance between motorized transport, cycling and walking, meeting needs for recreation, as well as engineering functions are fundamental fields that should be considered by planners, designers and managers.

Multi-scale functions both in the natural context; 1) regional ecosystem, 2) ecological corridors, 3) ecological elements, and human context; 1) broader transportation network, 2) relation to urban areas, 3) immediate vicinity houses and verges, is another criteria for evaluation of infrastructure corridors projects (Pic14).

Maintainability is an often unseen aspect in planning and design, especially when an integrated approach to projects does not exist. Operation, maintenance, monitoring of the project in long term is the ultimate key of success and a source of durability and sustainability of any project that can potentially make a significant part of contemporary and future urban landscape.

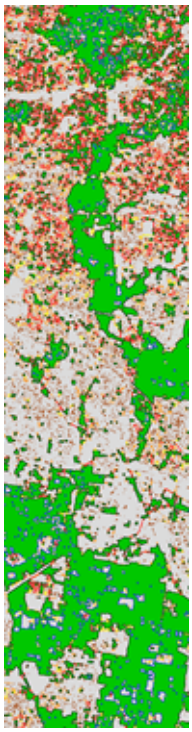
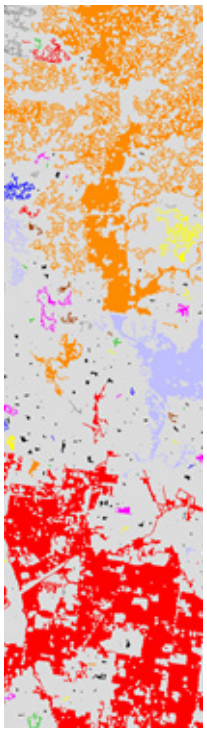
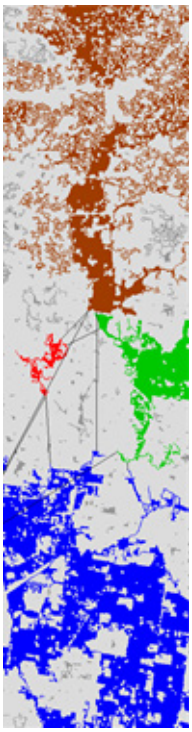
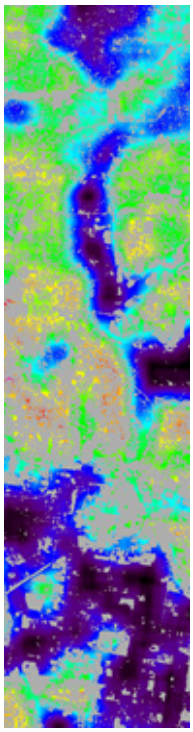
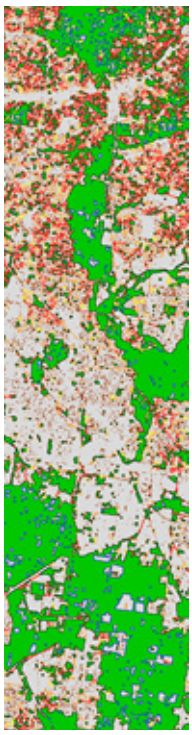
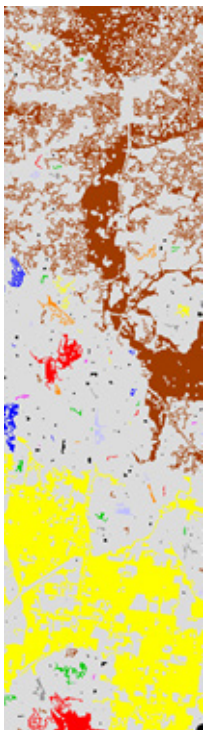
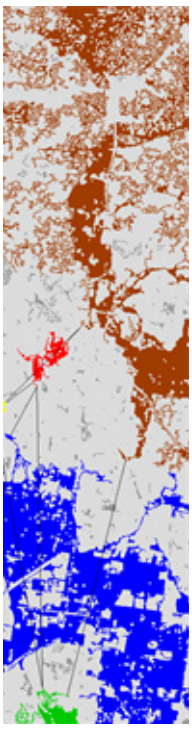
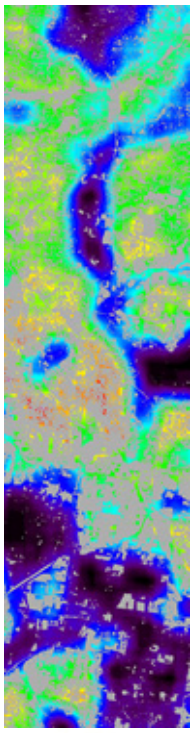


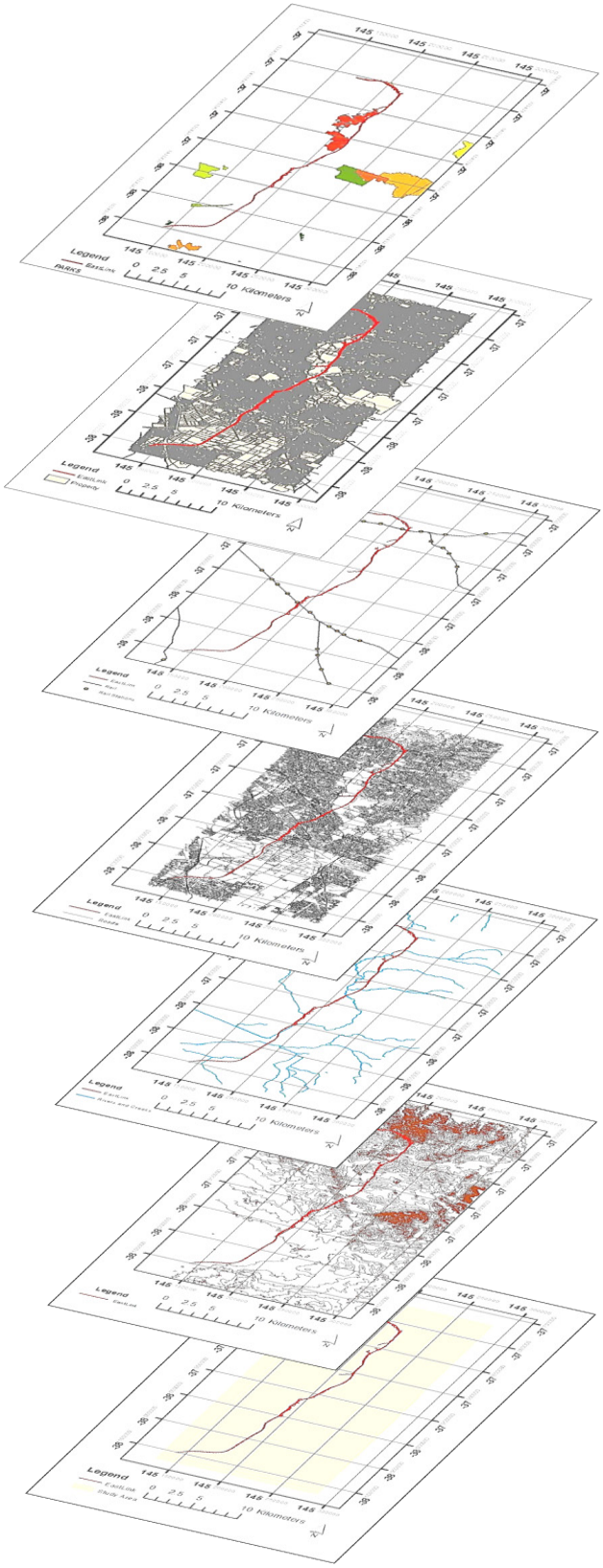
Pic13: Multiple, complex, and multi-level interactions of landscape ecological elements (patch-corridor-matrix) of urban environments (at site, corridor and region levels) influencing transportation corridors of highway projects planning and design criteria
Source: Author

Table 1. Human and natural dimensions and evaluation criteria of urban transportation infrastructure projects in an integrated approach to planning, design and delivery
Source: Author

Criteria	Elements and features	
Accessibility	**Natural**	Relation to green spaces
		Relationship to parks
		Wildlife crossings
		Natural corridors
	Human	Relation to streets
		Relation to urban context
		Shared paths
		Under and over passes, bridges
		Public transport
Connectivity	**Natural**	Parks and green spaces
		Creeks and waterways
	Human	Highways and streets
		Railways
		Alleyways, minor roads
Multi-functionality	**Natural**	Conserve wildlife habitat
		Constructed ecologies
	Human	Motorized transport
		Cycling and walking
		Recreation
		Engineering functions
Multi-scale	**Natural**	Regional ecosystem
		Ecological corridors
		Ecological elements
	Human	Broader transportation network
		Relation to urban areas
		Immediate vicinity houses and verges
Maintainability	**Operation**	
	Maintenance	
	Monitoring	

Table 2. Landscape morphological, connectivity, and fragmentation analysis for EastLink corridor region before and after construction of the project
Source: Author based on remote sensing spatial data from satellite imagery

Year	Landscape Morphology	Landscape Connectivity Components	Landscape Connectivity Node/ Link	Landscape Component Connectors	Landscape Fragmentation
Before Construction of EastLink Project – 2004					
After Construction of EastLink Project – 2010					



Pic14. EastLink relationship with other major natural and built corridors and patches within urban environment
Source: Author based on spatial data provided by University of Melbourne spatial data library

The spectrum of changes of both human and natural features at different places along linear transportation corridors, especially at the large scale of mega-projects, such as EastLink, may need varied but harmonious planning and design strategies for different areas along the way. It is the source of different types of designed landscape along the corridor which greatly influences accessibility, connectivity, multi-functionality, multi-scale functions, and maintainability of the project in planning, design and consequently construction and post-construction phases. Integrating different human and natural realms in contemporary infrastructure planning and design of cities and moving beyond single-use projects can greatly help to bring ecological services to the city.
Considering the interaction of natural and built environment and landscape in motorway design
(Qian et al., 2014) and creating green roadways by integrating cultural, natural, and visual resources (Sipes and Sipes, 2012), is the key to success in transportation infrastructure projects. In doing so, in terms of natural ecology, quantifying the road-effect zone and threshold effects of motorways (Eigenbrod et al., 2009) using landscape ecological methods, metrics and tools will be useful. In terms of visual resources, assessing viewer appreciation and preferences of highway landscapes Froment and Domon, 2006) leads to new approaches in urban highways landscape planning and design.

Acknowledgments

This paper is based on a section of the author's PhD research in Landscape Architecture at Melbourne School of Design, Faculty of Architecture Building and Planning, University of Melbourne, Victoria, Australia. The author wishes to acknowledge the University of Melbourne, Melbourne Sustainable Society Institute (MSSI), Infrastructure Sustainability Council of Australia (ISCA) formerly named Australian Green Infrastructure Council (AGIC), ConnectEast, VicRoads, Linking Melbourne Authority (LMA), Australian Research Centre for Urban Ecology (ARCUE), and Tract Landscape Architects, Urban Designers and Town Planners for their help and support during the research.

Conclusion | This paper investigated a landscape/ecological planning and design approach to provide a framework for assisting designers and planners of built urban infrastructural corridors, i.e. urban highways to enhance these projects and plans from an ecological perspective for interaction with other urban land uses especially green and open spaces to add to their multi-functionality. In order to do so, utilizing a case study is helpful to have a better understanding of the important criteria and features in different scales of project studies. In doing so, the following three categories of considerations should be carefully taken into consideration; 1) Natural and constructed landscape and water features and natural infrastructure, as the foundation based on which the project is constructed, 2) Land use, spaces and urban patterns in relationship to the alterations made by the projects, and 3) Transportation modes and alternative types of transport, i.e. walking and cycling integrated in the project with a wider context and the surrounding urban settings.

The landscape ecological components (patch-corridor-matrix), levels of analysis (region, corridor, site) and evaluation criteria for projects need further studies and research to establish precise evaluation sub-criteria and metrics for each of them at different scales. Integrating ecological and social benefits into the design and delivery process of linear transportation infrastructure projects is very much context-sensitive and greatly influenced by topological and morphological aspects of the places and local settings.

The proposed approach is applicable both in planning, design and construction of new projects and evaluation of similar existing constructed projects and plans to retrofit them. The outcome of applying landscape/ecology approaches to the urban infrastructure corridors design and delivery, specifically transportation corridors of urban highways, is realization of more sustainable and multifunctional transportation corridors and road projects which add values and services to urban landscapes of contemporary and future cities.

Reference List

- Aquino, G., Hung, Y., Sasaki Walker Associates. (2011). *Landscape infrastructure: case studies by SWA*. Basel: Birkhauser.
- Australian Institute of Landscape Architects (AILA). Retrieved from http://www.aila.org.au 30/03/2014.
- Bélanger, P. (2009). Landscape As Infrastructure. *Landscape Journal*, 28(1), 79-95.
- Benedict, M. A., McMahon, E. (2006). *Green infrastructure: linking landscapes and communities*. Washington, DC: Island Press.
- ConnectEast Pty. Limited the owner and operator of EastLink. Retrieved from http://www.eastlink.com.au 30/03/2014.
- Davies, C., McGloin, C., MacFarlane, R., Roe, M. (2006). Green Infrastructure Planning Guide Project: Final Report. NECF, Annfield Plain.
- Department of Infrastructure DoI. (1998). Scoresby Transport Corridor Environment Effects Statement. Melbourne: Sinclair, Knight, Merz and the Department of Infrastructure.
- Eigenbrod, F., Hecnar, J., Fahrig, L. (2009). Quantifying the Road-Effect Zone: Threshold Effects of a Motorway on Anuran Populations in Ontario, Canada. *Ecology and Society*, 14(1), 1-18.
- Forman, R. T. T. (1995a). *Land mosaics: the ecology of landscapes and regions*. Cambridge; New York: Cambridge University Press.
- Forman, R. T. T. (1995b). Some general principles of landscape and regional ecology. *Landscape Ecology*, 10(3), 133-142.
- Forman, R. T. T. (1998). Road ecology: A solution for the giant embracing us. *Landscape Ecology,* 13(4), III-V.
- Forman, R. T. T., Deblinger, R. (2000). The ecological road-effect zone of a Massachusetts (USA) suburban highway. (Article). *Conservation Biology*, 14(1), 36-46.
- Froment, J., Domon, G. (2006). Viewer appreciation of highway landscapes: The contribution of ecologically managed embankments in Quebec, Canada. *Landscape and Urban Planning,* 78(1–2), 14-32.
- Harvard University Graduate School of Design. (2010). Zofnass Program for Sustainable Infrastructure. http://www.gsd.harvard.edu/research/research_centers/zofnass/index.html
- Ignatieva, M., Stewart, G. H., Meurk, C. (2011). Planning and design of ecological networks in urban areas. (Review). *Landscape and Ecological Engineering*, 7(1), 17-25.
- Khansefid, M. (2013). Applying Landscape Ecological/Urbanist Approaches to Urban Infrastructure Design and Delivery A Case of EastLink in Melbourne, Australia. International Federation of Landscape Architects (IFLA) 50th World Congress, Auckland, New Zealand, 302-310.
- Khansefid, M. (2014). Integrating Landscape Ecology and Urbanism in Transportation Corridors Design and Delivery: An Australian Case Study. *Landscape Research Record*, No. 02, Council of Educators in Landscape Architecture (CELA), Maryland, USA, 213-221.
- Linking Melbourne Authority. Retrieved from http://www.linkingmelbourne.vic.gov.au 15/12/2013.
- Meyboom, A. (2009). Infrastructure as Practice. *Journal of Architectural Education,* 62(4), 72-81.
- Mostafavi, M., & Najle, C. (2003). *Landscape urbanism: a manual for the machinic landscape*. London: Architectural Association.
- Mostafavi, M., Doherty, G., Harvard University. Graduate School of Design. (2010). *Ecological urbanism*. Baden, Switzerland: Lars Muller.
- Müller, F., de Groot, R., Willemen, L. (2010). Ecosystem Services at the Landscape Scale: the Need for Integrative Approaches. *Landscape Online,* (23), 1-11.
- Niemela, J. (2011). *Urban ecology: patterns, processes, and applications*. Oxford, U.K.: Oxford University Press.
- Pollalis, S. N., Schodek, D., Georgoulias, A., Ramos, S. J. (2012). *Infrastructure Sustainability and Design:* Taylor & Francis Group.
- Qian, G., Tang, S., Zhang, M., Jing, C. (2014). *The Environment and Landscape in Motorway Design*. John Wiley & Sons.
- Raeburn, R. C. C. (2005). An urban design approach to road infrastructure development in Sydney. *Urban Design International*, 10(3-4), 165.
- Sipes, J., Sipes, M. (2012). *Creating green roadways*: *integrating cultural, natural, and visual resources into transportation.* Washington DC: Island Press.
- Strang, G. L. (1996). Infrastructure as Landscape, Landscape as Infrastructure. *Places*, 10(3), 8-15.
- Tatom, J. (2006). *Urban Highways and the Reluctant Public Realm*. The Landscape Urbanism Reader, 179–195.
- Weller, R. (2008). Landscape (Sub)Urbanism in Theory and Practice. *Landscape Journal*, 27(2), 247-267.