

Environmental Infrastructure: *Achieving regional liveability outcomes through a broader regional planning perspective*

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Abstract: Investments in the provision of physical and social infrastructure have traditionally been used by governments in developing regions in attempts to offset the impacts of development and to maintain the regional community's Quality of Life (QoL) expectations. This paper explores this approach in terms of a holistic response that can embrace all of the acknowledged components that constitute the community's QoL expectations in a growing region. It introduces the notion of environmental infrastructure and explores its role in sustaining the region's landscape, its natural resource systems as well as its open space framework, which can make a crucial contribution to the QoL experienced by a region's population.

However, the question arises as to how the necessary elements of environmental infrastructure can be identified and addressed through traditional forms of regional and infrastructure planning processes, especially those associated with growth management paradigm.

The paper explores the emergent landscape planning paradigm and contrasts it against more traditional forms of planning. It outlines the potential role of landscape planning in facilitating the identification of the required environmental infrastructure necessary to maintain the quality of a region's open space that contributes to its sustainability and liveability. The paper argues a case for a balanced and holistic approach to infrastructure planning that acknowledges the need for environmental infrastructure alongside the conventional forms of physical and social infrastructure.

Introduction

A major ongoing challenge for regional planners and policy makers responsible for the management of rapidly growing areas is to ensure that the growth is managed through appropriate policies and initiatives whilst at the same time securing the community's vision for their region. Increasingly, there is a growing acknowledgement that more comprehensive approaches are required to deliver these outcomes. This has extended to commitments and initiatives that take a more holistic approach in the planning process to set in train a complementary balance of policy initiatives.

The case of the Regional Plan Association's plan for their New York-New Jersey-Connecticut metropolitan area is a good example. The Association has argued that "to recapture the promise of the region ...(their plan proposes) to reconnect the region to its basic foundations ... (*the*) interlocking foundations (*of*) the "Three E's" – economy, environment and equity, the components of our quality of life" (Yaro and Hiss, 1996, p. 6).

Clearly, many contemporary regional planning initiatives now articulate definite intentions to address the undoubted strong community expectations for liveable and sustainable communities and regions as determined by quality of life (QoL) issues. These expectations can only increase as a regional landscape and its ecological systems come under increasing pressure from continued population growth and urban development.

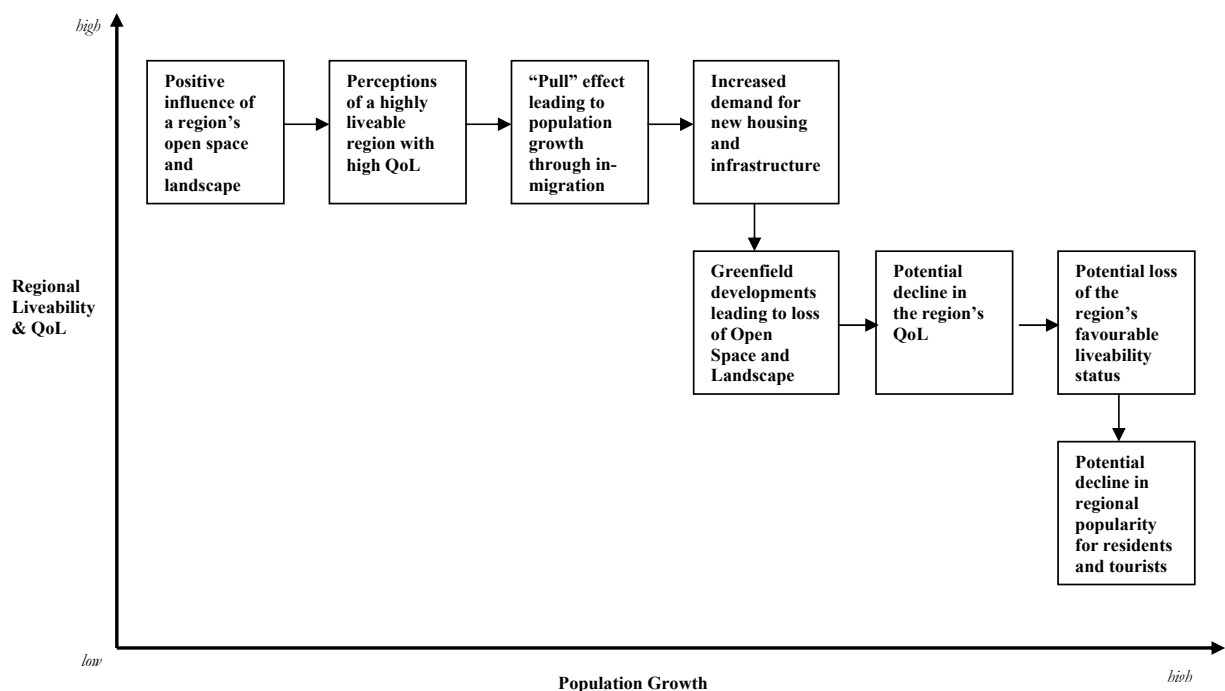
Traditional planning responses usually involve the proposal of a suite of infrastructure investments aimed at safeguarding the community's desired QoL expectations. These approaches are also seen as offsetting the loss of QoL through impacts to the regional landscape and loss of open space as a consequence of urban expansion.

This paper explores this approach in terms of a comprehensive response that can address the components that contribute to the QoL and liveability of a region. It introduces the notion of environmental infrastructure and considers whether it can play a role in sustaining the region's landscape, its natural resource systems as well as its open space framework, which in turn, contribute to the QoL experienced by a region's population. These notions are set against the contemporary regional planning initiatives and the State and Local government's growth management responses for Australia's fastest growing metropolitan region – South East Queensland (SEQ).

Challenges & Prospects for Rapidly Growing Regions

The inseparable relationship between the regional landscape and notions of QoL and liveability has been summed up as the value that a community places “on landscape attributes such as scenery (or nature conservation or outdoor recreation opportunities) that are derived from the open space that constitutes the regional landscape. These values determine the QoL that residents enjoy which in turn contributes to the achievement of liveability objectives that the community seeks for its region” (Low Choy, 2004, p. 13).

However, what happens when these relationships are placed under threat from rapid landscape change and modification as a consequence of urbanisation processes? Low Choy (2004) has identified a “regional open space paradox” which establishes a potentially negative relationship between a region’s landscape and open space and its rapidly growing urban areas. This paradoxical situation involves a downward spiral of a region’s popularity that started with substantial in-migration responding to the positive open space influence on liveability and QoL. This action creates an “urban tidal wave” effect which leads to a loss of regional open space and landscape quality which in turn has the potential to result in a decline in the region’s QoL and the eventual loss of the region’s favourable liveability status – a ‘lose-lose’ result all round. This situation is illustrated in Figure 1.



Source: Low Choy, 2004

Figure 1: The Regional Open Space Paradox: *The downwards spiral of a region’s popularity resulting from the positive open space influence on liveability*

Increasingly, contemporary examples of overseas planning for rapidly growing regions are incorporating overarching intentions to safeguard the region’s environmental assets. These initiatives involve the establishment of a regional landscape (open space) framework that can support the urban areas whilst not being violated through inappropriate developments (Yaro and Hiss, 1996; Simonds, 1998; Leccese and McCormick, 2000; Heid, 2004).

These proposals are underpinned by a unifying theme for maintaining the ecological integrity of the region through the concept of ‘interconnectedness’ which embraces a number of fundamental ecological principles (McHarg, 1992; Calthorpe and Fulton, 2001). This approach is consistent with two Regional Principles of the Charter of the New Urbanism. The first states: “The metropolis has a necessary and fragile relationship to its agrarian hinterland and natural landscapes. The relationship is environmental, economic, and cultural. Farmland and nature are as important to the metropolis as the garden is to the home”. This second supporting principle acknowledges that “Metropolitan regions

are finite places with geographic boundaries derived from topography, watersheds, coastlines, farmlands, regional parks, and river basins. The metropolis is made of multiple centres that are cities, towns, and villages, each with its own identifiable centre and edges" (Leccese and McCormick, 2000, p. 29/23).

Picking up the notion of the landscape, Selman (2000, p. 108/109) argues that "landscape ... (*is*) an important integrating framework for sustainable development ... (*and that it*) must be integrated into the drivers of regional and national change rather than treated as a sectoral activity". This requires that the essential policy framework in which landscapes are managed should comprise liveability, biodiversity and prosperity policies and initiatives.

Overseas experience demonstrates that continued and unmanaged urban growth will play "havoc with the green infrastructure of watersheds, farmlands, estuaries, woodlands and other resources that make life in these places possible and desirable" (Yaro and Hiss, 1996, p. 12). The inadequacy of conventional infrastructure and pollution control measures to protect the environment, their high costs, their reliance on "end of the pipe" treatment and their focus on remedial as opposed to preventive approaches has also been noted (Yaro and Hiss, 1996; Williamson, 2003; Heid, 2004).

Emerging from the contemporary US literature is the reference to traditional open space systems and regional landscapes as "green infrastructure" (Yaro and Hiss, 1996; Eugster, 2000; Benedict and McMahon 2002 & 2006; Williamson, 2003; Heid, 2004; Randolph, 2004). Benedict and McMahon (2002, p. 8) put the concept into context when they state "green infrastructure is a new term, but it is not a new idea". They explain that the concept has its origins in planning and conservations efforts of 150 years ago which involved "(1) linking parks and other green spaces for the benefit of people and (2) preserving and linking natural areas to benefit biodiversity and counter habitat fragmentation" (Benedict and McMahon 2002, p. 8). The concept of considering these natural environmental and open space elements of a regional landscape as infrastructure to support a region, its settlements and its communities, in the same manner as conventional infrastructure such as roads, water, schools and hospitals, provides an essential key to the composite pathway towards achieving the visions of sustainability and liveability.

A Role for Environmental Infrastructure

Traditionally however, the urban land development process has rarely recognised the regional landscape and its components as essential ingredients in their delivery of liveable developments. However, this view may be changing. Randolph (2004, p. 82) notes that increasingly, open space is seen less "as an afterthought of development, and more as an integral part of the land use and development process". It is argued that "green infrastructure implies that protecting and restoring our natural life support system is a necessity, not merely an amenity" (Heid, 2004, p. 7). In this sense it is seen in terms of its potential to contribute to achieving the community's desired standard of living and QoL in the same manner as traditional forms of infrastructure. Heid, (2004) goes so far as to propose that future sprawl-free greenfield developments in the USA can be achieved through attention to three critical elements, namely: green infrastructure; mobility and access; and liveability and lifestyle choices. In this context, green infrastructure "preserves watersheds and other natural and cultural resources in a connected open-space system ... (*it*) can also make 'hard' infrastructure such as rights-of-way, utilities, and recreation more land-friendly and cost effective" (Heid, 2004, p. 6).

The basic components of a green infrastructure network are hubs (reserves, habitats, working lands, regional parks) and links (conservation corridors, greenbelts, greenways, floodplains) (Benedict and McMahon 2002 & 2006; Williamson, 2003; Randolph, 2004). In essence this concept equates to the regional scale landscape frameworks or open space systems that are already recognised in most contemporary regional planning initiatives.

Whilst 'green infrastructure' has been used to refer to the whole regional landscape inclusive of open space, 'environmental infrastructure' refers to those nature-based elements that should and could be planned for in the same manner that traditional hard (physical) and soft (social and community) infrastructure are planned and provided in order to support a community. Once secured, these elements of environmental infrastructure would contribute to the green infrastructure of the region. In this manner the achievement of the regional community's vision of sustainability and liveability becomes closer as all of the essential elements of infrastructural support have now been proactively addressed. In reality, it represents a holistic approach to infrastructure provision for a growing regional community.

The focus of environmental infrastructure then is to satisfy our need for conservation (protection of biodiversity and nature conservation), outdoor recreation, landscape appreciation (scenic amenity), natural life support systems (clean air and water), and food production. In meeting these needs and as part of a region's landscape system (green infrastructure), environmental infrastructure comprises elements such as: public open space; national and conservation parks; regional parks providing outdoor recreation opportunities; regional corridors (bioregional and scenic); and rural production lands.

Environmental infrastructure (particularly for greenfield sites) can also comprise innovative alternatives to traditional 'hard' engineering infrastructure. Examples include: best practice stormwater management centred around non-pipe solutions; artificially constructed wetlands and phased, self contained decentralised wastewater treatment systems. These innovations are designed to be fully integrated into natural systems in cost effective and cost saving ways compared to the conventional engineering approaches of hard infrastructure.

Applying a Green Infrastructure Approach

Heid (2004, p. 10) notes that "the green infrastructure concept reminds us that open space must be planned as rigorously and managed as effectively as any 'hard' infrastructure elements like water, sewer, roads ... (*commenting*) rather than a luxury to add when public coffers are full, this essential element deserves to be budgeted for and managed as prudently as any other civic asset".

In the same manner that 'blueprints' are developed to achieve built infrastructure, green infrastructure is achieved through the employment of 'greenprints' (Heid, 2004; Randolph, 2004). Heid (2004) reports a 'greenprinting for Growth program' process that involves three key steps of visioning (reflecting community growth and land protection goals), funding (including a combination of public and private sources), and acquisition and stewardship.

It is argued that the 'greenprints' should display a number of essential attributes involving an approach that is: more proactive and less reactive; more systematic and less haphazard; holistic not piecemeal; multijurisdictional not single jurisdictional; multifunctional, not single purpose; large scale, not small scale; and better integrated with other efforts to manage growth and development (Benedict and McMahon 2002 & 2006; Heid, 2004).

Guidance in achieving desired green infrastructure (GI) outcomes was originally advanced by Benedict and McMahon (2002) and quoted by Randolph (2004, p. 100) in the form of several principles. More recently, Benedict and McMahon (2006, p. 37) have articulated a revised set of Green Infrastructure principles, including:

1. Connectivity is key;
2. Context matters;
3. Green infrastructure should be grounded in sound science and land-use planning theory and practice;
4. Green infrastructure can and should function as the framework for conservation and development;
5. Green infrastructure should be planned and protected *before* development;
6. Green infrastructure is a critical public investment that should be funded up front;
7. Green infrastructure affords benefits to nature and people;
8. Green infrastructure respects the need and desires of landowners and other stakeholders;
9. Green infrastructure requires making connections to activities within and beyond the community; and
10. Green infrastructure requires long-term commitments.

These principles demonstrate the need to adopt a proactive approach towards achieving the region's vision that requires a crucial public investment program complimented by the application of a range of positive stewardship tools as opposed to the sole reliance on negative regulatory tools.

The potential scenario that could result from a greenprint approach that secures important environmental infrastructure and consequently maintains a growing region's QoL and liveability status is illustrated in Figure 2 (bold boxes - top right). Importantly, this figure also illustrates the critical point of intervention in the regional development scenario and growth management process.

However, the question arises as to how the necessary elements of environmental infrastructure can be identified and addressed in traditional forms of regional planning and infrastructure processes, especially those associated with rapidly urbanising regions. Importantly, how do these notions of

environmental infrastructure fit with current and evolving paradigms in planning such as the environmental and landscape fields? Does the emergent landscape planning paradigm have a potential to facilitate the identification of the required environmental infrastructure necessary to maintain the quality of a region's open space that contributes to its sustainability and liveability.

A Landscape Planning Approach

Regional scale planning has been given renewed emphasis through developments in allied professions. This has included the advancement of strong arguments for the employment of the ecological paradigm as the basis for study, analysis, planning, policy development and overall management. These advancements have emerged from the Landscape Architecture profession and have given rise to the emergent field of landscape planning.

Proponents of modern forms of landscape planning at the end of World War 2 saw it as embracing management and the creative designs for broad landscapes (Crowe 1969; Hackett, 1970; McHarg, 1969; Laurie, 1986). They considered the prime objective was to ensure that "landscape changes continue to provide habitat conditions that will accommodate the various forms of life, either in the existing pattern or, if the habitat conditions are changing, in a new pattern" (Hackett, 1970, p. 1).

Importantly, contemporary views of landscape planning are consistent with the previous discussion and emergent views in the environmental planning field. Landscape planning acknowledges its distinguishing dimensions to include: an ecological dimension; social and cultural dimensions; and an overall scientific approach.

The ecological dimension

A significant and pragmatic contribution to the ecological underpinning of the landscape architecture profession came from McHarg with his seminal 1969 publication: *Design with Nature* which he describes as "a book on ecology and planning" (McHarg, 1996, p. 199-200). McHarg defines ecological planning as "that approach whereby a region is understood as a biophysical and social process comprehensible through the operation of laws and time. This can be reinterpreted as having explicit opportunities and constraints for any particular human use. A survey will reveal the most fit location and processes" (McHarg and Steiner, 1998, p. 195).

McHarg was among the first planners to draw on ecological theory to stress the interconnectedness of natural systems and the value to urban areas of often ignored resources such as wetlands, marshes, airsheds, and aquifers". McHarg's ecological planning approach also incorporated another contemporary dimension – that of "an ongoing (planning) process, one where information about a place is used to chart paths for its futures" (McHarg and Steiner, 1998, p. 278).

Landscape ecology has added a further dimension to landscape planning, specifically in the areas of: rural and agricultural land; natural resource areas for forestry, wildlife and biodiversity; and corridors and greenways. Forman (1995, p. 522) considers that our most pressing challenge is to "discover an optimal spatial arrangement of ecosystems and land use that makes ecological sense in any landscape or region (that seeks) to maximise ecological integrity for achieving human needs (and) for creating a sustainable environment".

The social and cultural dimensions

Contemporary views hold that landscape planning has both social and cultural dimensions. Linehan and Gross (1998) consider landscapes to be more than a scale and set of interacting ecosystems. They claim that landscapes are not only a container of resources but are themselves resources - they are simultaneously ecological, cultural, economic, political, poetic, ideological, and symbolic sociospatial phenomena.

Linehan and Gross correctly conclude that it will be society that will ultimately determine whether and what degree our landscape becomes sustainable. This is a view shared by Luz, who, quoting Hirsh (1992), notes that "as a rule, landscape planning aims can only be accomplished with collaboration of the local actors and stakeholders (as) the implementation of ecological concepts stems from social rather than ecological systems" (Luz, 2000, p. 157). In calling for socially relevant practice, Linehan and Gross (1998) argue for the engagement of open and participatory planning processes so that landscape planning can receive adequate attention in larger planning circles.

An Overall Scientific Approach

Underpinning current landscape planning and design approaches is their reliance and application of sound science. Advocating this connection between science and planning, Laurie (1986, p. 106)

argues “a scientific aspect concerned with research and a shaping aspect based on the research; the two parts result in the production of a policy statement. The landscape plan sets out the framework and the lines of action by which the landscape is to be adjusted in accordance with ecological principles to meet the needs of changed circumstances”.

Contemporary advocates argue that landscape planning should be based on well informed scientific analysis, linked with pragmatic policies in an effective planning process that displays certain scientific qualities including a well researched and understood plan and a process that is cyclical through monitoring and review (Selman and Doar, 1991; Rookwood, 1995; Wilkin, 1996; Linehan and Gross, 1998).

A Future Role for Landscape Planning

Wilkin (1996) placed the role of landscape planning into the contemporary sustainability debate. He argued that we should be monitoring local progress towards sustainability by critically applying landscape planning expertise to the comprehensive monitoring of what he calls ‘human ecosystem productivity’. However, as he himself has pointed out, these types of quality of life issues, the commonly sought-after objectives of most contemporary planning endeavours are not well understood and are imprecisely measured at present.

These contemporary planning aspirations of regional communities however can be addressed through planning approaches that can perform a linking function between the scientific and the design approaches to landscape management. As the preceding discussion has argued, the field of landscape planning can provide a discipline base and the professional expertise in core areas to include regional scale landscape design, landscape ecology, and social and cultural considerations related to landscape design. Summing up this evolving situation, Low Choy (2002) has concluded that landscape planning has the potential to offer:

- a philosophical planning foundation based solidly on ecological principles;
- an emerging philosophical planning foundation incorporating social and cultural principles;
- a philosophical and evolving methodological base to address ‘nebulous’ landscape issues such as scenic quality, landscape aesthetics, human perception and cultural affinity to landscapes;
- a broad scale approach for planning large landscapes, regions and natural entities such as catchments;
- a planning approach that can address strategic and long-term issues;
- a scientific approach facilitating the incorporation of scientific information and methods into the planning process;
- a design approach providing the best spatial fit consistent with ecological principles, aesthetic considerations and social analysis of user needs;
- a planning approach that can lead to the design and management of landscapes (natural, constructed and rehabilitated); and
- a planning process that can facilitate open and participatory planning in the context of a participatory action research approach.

The emergent landscape planning approach can provide a range of potential solutions to the challenges of identifying and developing appropriate management policies for protecting regional landscape values as well as identifying associated environmental infrastructure to sustain rapidly growing regions.

McHarg (1992, p. vi) summed up these opportunities when he commented “.... in 1969, while many people accepted the proposition - **Design with Nature** - there was no legislation empowering or requiring ecological planning now the situation is vastly different and it is the new legislation which provides this book with an enlarged purpose the power to employ ecological planning from national to local scales has accumulated slowly. Serious omissions remain, notably the fragmentation of environmental sciences and the plethora of responsible institutions, but there are now innumerable opportunities to employ the (his) method”. This statement sums up the current regional planning situation on the State of Queensland, Australia where the South East Queensland (SEQ) region which contains the state capital of Brisbane City has experienced phenomenal population growth by Australian standards over the last decade and is expected to remain the fastest growing metropolitan region in the country for at least the next decade.

Adopting an Environmental Infrastructure Approach (A Way Ahead for SEQ)

As the fastest growing metropolitan region in Australia, SEQ has experienced unprecedented population growth during the past two decades. Its population grew by 25%, largely through interstate

migration, during the ten year period from 1991 to 2000 (Queensland Government and SEQROC, 2003). The region's preliminary 2006 population estimate was 2,802,523 with an average annual growth rate of 2.5%. From this current population base, the median population projection for the region for the current regional planning horizon of 2026 is 3.7 people – an additional one million residents (Queensland Government and SEQROC, 2005). Favourable perceptions of a high QoL and liveability based largely on the region's open space and landscape attributes have played an important role as "pull" migration factors in this process.

The additional housing demands created by this population growth has largely been accommodated in greenfield developments in the form of a low density "urban tidal wave" moving outwards into the region's peri-urban areas from its' major metropolitan and urban centres. This form of urban development has resulted in a significant loss of open space with reported land clearances resulting in the loss of approximately 7,500 ha of bushland and agricultural land each year. This situation is further compounded by the projected population increases where it has been estimated that some 575,000 new dwellings will be required by 2026 (Queensland Government and SEQROC, 2005).

Continued low density greenfield developments are unsustainable and place at risk the very essence of the region's quality of life that continues as one of the principal magnets to draw people to the region. It has become blatantly clear in recent times that the region's residents, both old and new, expect government intervention to guarantee the maintenances of the region's QoL and the protection of its landscape values that contribute to their desired standard of living.

This brings firmly into sharper focus the need for adequate planning processes with conceptual frameworks that are capable of working through the often conflicting demands on the regional landscape while addressing the emerging community concerns for loss of regional open space, declining QoL and threats to liveability.

It is clear that an environmental infrastructure approach is appropriate to the SEQ circumstance particularly in view of the region's continued rapid growth projections, the reliance on greenfield developments to accommodate a large proportion of the incoming population, the potential loss of open space of regional and local significance, the deficiency in outdoor recreation opportunities, the region's unsecured water catchments and the lack of a secured regional landscape framework.

The associated SEQ Infrastructure Plan does acknowledge that the future SEQ region "will be expected to exhibit a series of essential characteristics ... (*including*) ... a high-quality natural environment, including protected natural areas, waterways and beaches and environmental infrastructure including public open space, national, state and regional parks and opportunities for nature-based recreation" (Queensland Government, 2005). However the details of how this expectation and the Regional Plan's sustainability and liveability vision are to be achieved are less clear in terms of the environmental infrastructure required to sustain a permanent regional landscape framework. Without the commitment to an advanced provision of essential environmental infrastructure, the potential scenario that results in the maintenance of the growing region's QoL and liveability status (illustrated in Figure 2) will not be realised. Under these circumstances, the region's popularity for residents and tourist will decline.

All the components of SEQs regional landscape framework (the hubs and the links of the green infrastructure) are known in outline. However, they lack precision due to a paucity of adequate scientifically derived and stakeholder-accepted data. The current regional plan has provision for such an approach to be accommodated in ongoing regional planning endeavours. Implementation considerations should however consider a proactive public investment program and the application of a range of positive stewardship tools to complement the existing regulatory tools.

Conclusions

Selman (2000, p. 109) concludes "landscape is thus a natural candidate as a framework for the integrative and transdisciplinary tasks of sustainable development ... (*but it*) must be understood not only as localised, particular expressions of people and places, but also as the regional and national frames for the analysis and maintenance of fundamental patterns and processes". As we have seen, it is the regional open space frame through its preservation of the best landscape features that gives a region its unique landscape character. In this regard, Simonds (1998, p. 371) sets out a clear and unambiguous challenge when he states "perhaps the most important task of regional planners is to define and help bring into being a spacious, interconnecting, and permanent open-space preserve as a framework for ongoing development". This can only be achieved if a proactive environmental infrastructure program is introduced and integrated with the existing physical and social/community

infrastructural programs. It would have to address existing deficiencies as well as protect threatened elements of the region's landscape, its natural resource systems as well as its open space framework.

Clearly the identification and securing of essential environmental infrastructure that can contribute to a permanent regional landscape (open space or green) framework will be a crucial outcome that must be pursued through the regional planning process and its associated infrastructure program. Overseas and interstate experience is demonstrating that we must move towards an imperative that results in an integrated regional landscape framework that can contribute to the achievement of the key QoL and liveability aspirations of the region's population. This same experience is also demonstrating that we must develop new ways of thinking based on past experience and in this regard, an environmental infrastructural approach fully integrated with existing and traditional infrastructural approaches offers real opportunities to move closer to our regional community's vision of sustainability and liveability.

References

- Benedict, M.A. and McMahon, E.T. (2002) *Green Infrastructure: Smart Conservation for the 21st Century* The Conservation Fund, Washington DC.
- Benedict, M.A. and McMahon, E.T. (2006) *Green Infrastructure: Linking Landscapes and Communities* The Conservation Fund, Island Press, Washington DC.
- Calthorpe, P. and Fulton, W. (2001) *The Regional City: Planning for the end of sprawl* Island Press, Washington DC.
- Crowe, S. (1969) *Landscape Planning: A policy for an overcrowded world* IUCN Publications, Switzerland.
- Eugster, G. (2000) "Seven Principles of Green Infrastructure", Abstract for 2000 APA National Planning Conference, <http://www.asu.edu/caed/proceedings00/EUGSTER/eugster.htm> (site visited 20 May 2005).
- Forman, R.T.T. (1995) *Land Mosaics - The Ecology of Landscapes and Regions* Cambridge University Press, Cambridge.
- Hackett, B. (1970) *Landscape Planning - An Introduction to Theory and Practice* Oriel Press, UK.
- Heid, J. (2004) *Greenfield Development Without Sprawl: The Role of Planned Communities* ULI Working Paper on Land Use Policy and Practice, Urban Land Institute, Washington DC.
- Laurie, M. (1986) *An Introduction to Landscape Architecture* 2nd ed, Elsevier, New York.
- Leccese, M. & McCormick, K. (eds) (2000) *Charter of the New Urbanism* McGraw Hill, New York.
- Linehan, J.R. & Gross, M. (1998) "Back to the future, back to basics: the social ecology of landscapes and the future of landscape planning" *Landscape and Urban Planning* 42(2-4), pp 207-223.
- Low Choy, D.C. (2005) "Achieving the Vision: *The role of environmental infrastructure in the achievement of a sustainable and liveable region*" *Queensland Planner* 45(2), June, 2005, pp14-17.
- Low Choy, D.C. (2004) "The Regional Open Space Paradox" *Queensland Planner* 44(3), September, 2004, pp12-15.
- Luz, F. (2000) "Participatory landscape ecology - A basis for acceptance and implementation" *Landscape and Urban Planning* 50(1-3), pp 157-166.
- McHarg, I.L. (1969 & 1992) *Design with Nature*, John Wiley, New York.
- McHarg, I.L. & Steiner, F.R. (1998) *To Heal the Earth: Selected Writings of Ian L. McHarg* Island Press, Washington DC.
- Queensland Government in association with South East Regional Organisation of Councils (SEQROC) (2005) *South East Queensland Regional Plan 2005-2026* Office of Urban Management, Brisbane.
- Queensland Government (2005) *South East Queensland Infrastructure Plan and Program 2005-2026*, Office of Urban Management (OUM) Queensland Department of Local Government, Planning, Sports and Recreation (Q.DLGPS&R).
- Queensland Government in association with South East Regional Organisation of Councils (SEQROC) (2003) *SEQ2021 A Sustainable Future – South East Queensland's Regional Planning Challenges: Options for the Future* Department of Local Government and Planning, Brisbane
- Randolph, J. (2004) *Environmental Land Use Planning and Management* Island Press, Washington DC.
- Regional Coordination Committee (RCC) (2000) *South East Queensland Regional Framework for Growth Management 2000* SEQ 2001 Regional Resource Unit.
- Rookwood, P. (1995) "Landscape Planning for Biodiversity" *Landscape and Urban Planning* 31, pp 379-385.
- Selman, P. (2000) "Landscape Sustainability at the National and Regional Scales" Ch 6 in Benson, J.F. and Roe, M.H., (eds) 2000: *Landscape and Sustainability* Spoon Press, London.

- Selman, P.H. & Doar, N.R. (1991) "A Landscape Ecological Approach to Countryside Planning" *Planning Outlook* 34(2), pp 83-88.
- Simonds, J.O. (1998) *Landscape Architecture: A Manual of Site Planning and Design* 3rd ed, McGraw-Hill, New York.
- Wilkin, D.C. (1996) "Accounting for sustainability: challenges to landscape professionals in an increasingly unsustainable world" *Landscape and Urban Planning* 36, pp 217-227.
- Williamson, K.S. (2003) *Growing with Green Infrastructure* Heritage Conservancy, Doylestown.
- Yaro, R.D. and Hiss, T. (1996) *A Region at Risk: The Third Regional Plan for the New York-New Jersey-Connecticut Metropolitan Area* Regional Plan Association, Island Press, Washington DC.

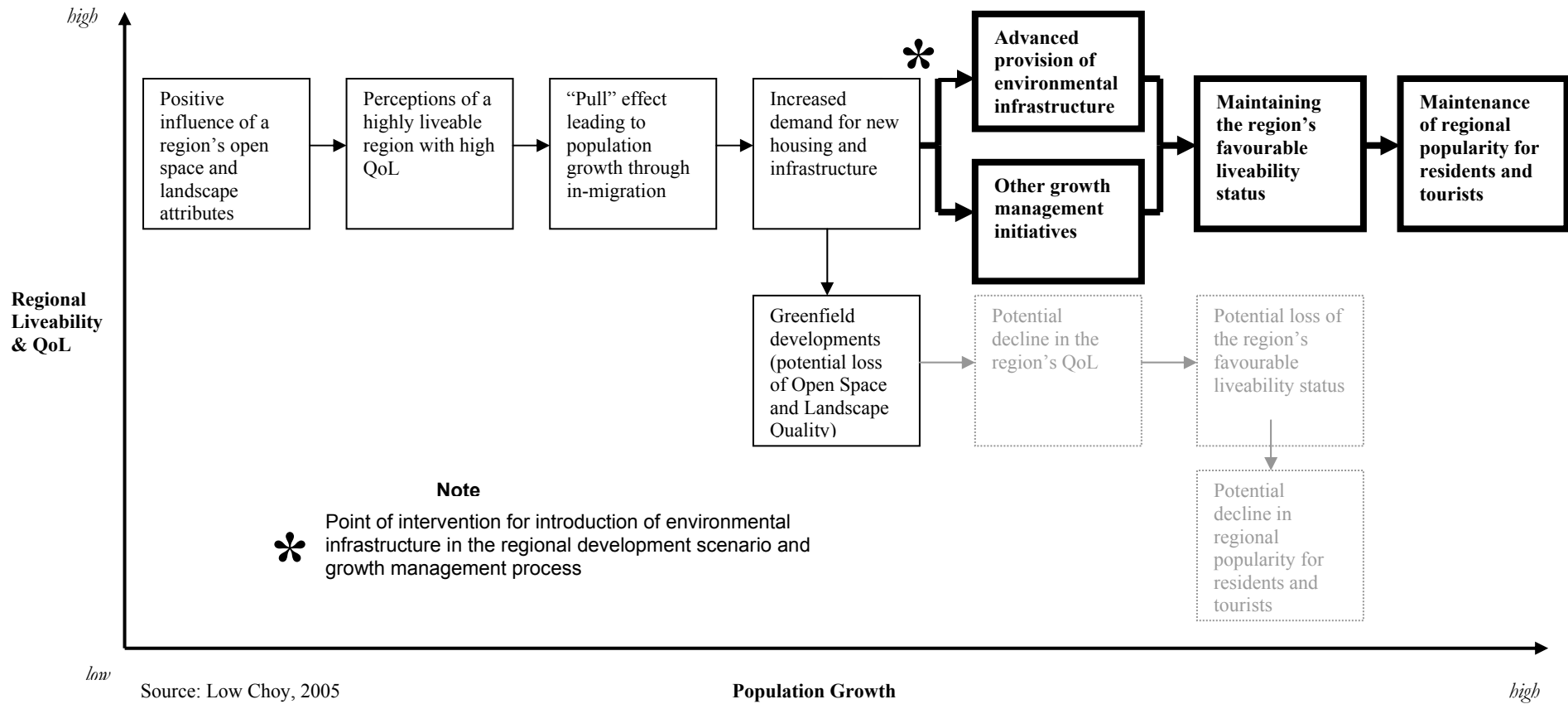


Figure 2: Environmental Infrastructure: Addressing the Regional Open Space Paradox