

Smart Integrated Ecological Approach for Geelong, Australia

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1 ABSTRACT

Regeneration of many cities is essential to enable their sustainable re-development but importantly to maintain their viability and creativity in this global and rapidly changing world. Most cities face major ecological challenges that require immediate intervention for their future survival. The predominant focus of current sustainable cities projects is concentrated upon the challenges of natural adaptation and mitigation practices these burgeoning metropolises present.

Smart Cities is one of those terms, like sustainable, resilient, carbon free, post carbon cities that mean different things to different people. Smart could mean fashionable, stylish, and chic as much as intelligent clever and shrewd. This article argues that Intelligence is the ability of a city to vary its state or actions in response to varying situations and past experience, in other term, develops a self-organising characteristics; one of the principles of ecological systems.

Regeneration initiatives provide opportunities for new approaches to urban development in regional Australian cities. There is a need for innovative re-think beyond terms, like sustainable, resilient, carbon free, post carbon cities that mean different things to different people. The paper discusses the development of Vision II, a regeneration project for the City of Geelong. The paper highlights the need for new ways to theorize, contextualize, and practice the design of future smart interventions in Australian cities.

The realities of climate changes on the other hand, led to the urgency to channel our thinking into a new direction, one that is capable to engage our people, one that is capable of extracting hope from the structures of fear that underpins an obsolete mitigation agenda and outdated governance structures. Impacts of climate change is also one of the causes of the shift in city agenda that also include the general decline of infrastructure, conspicuous resource depletion, and the emergence of ecology as a new paradigm in urban studies. This paper challenges the capacity of a number of cities to deal with ecological stress adversities and the ability to bounce back and maintain well-being for their inhabitants. The presentation provides a broad critical analysis of the contemporary ecological challenges. The paper, through a study of an applied project directed by the author in Geelong, considers various strategies and guidelines that have formed regenerating existing urban forms and relationships.

Keywords: regeneration, sustainability, post carbon, smart interventions, climate change

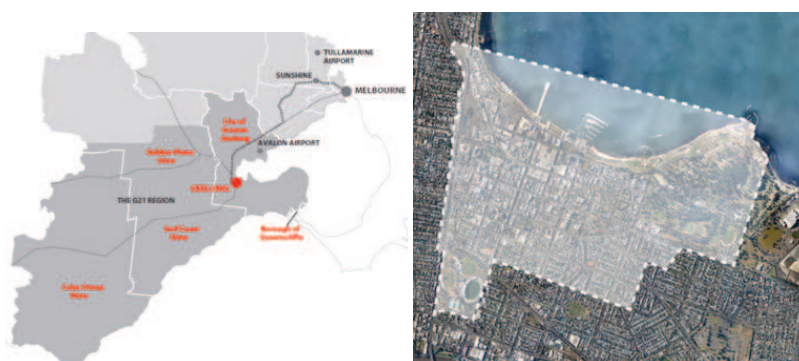


Fig. 1 (left): The location of Geelong city, Fig. 1 (right): Vision II study area, Geelong

2 THE CITY OF GEELONG

Greater Geelong is the second largest city in the state of Victoria with a population of approximately 230,000 inhabitants. The coastal city is situated around 75 km South West of Melbourne City (Figure 1). Central Geelong is located on a north-facing slope flanked by Corio Bay from the north and the Barwon River from the south. The history of the city can be traced back to 1803 as the main regional hub and port for Western Victoria. Eventually, Geelong became a key trade centre as well as an industrial hub. A variety of industries dominated, including wool and paper manufacturing and later Ford automobile production. Currently, the city has transitioned from its industrial character to a high-technology based region with vibrant education and health facilities. In addition, it became a hub for various research initiatives including epidemiology,

gene technology, clinical trials, advanced materials, nanotechnology and fibre technology that grew to be strong driving economic forces. The Centre Business District of Geelong (Figure 2), which is faced with sharp decline, combines a variety of shopping, investment opportunities, health and education facilities, as well as cultural assets including the Geelong Performing Arts Centre, gallery, museums and the botanic gardens (Vision-II, 2013).

3 BACKGROUND: VISION I URBAN REGENERATION PROJECT

Preceding Vision II, 'Vision I' project involved redeveloping Geelong's waterfront, as one area of focus for regional growth, under the leadership of both the Victorian State Government and the City of Greater Geelong. The project commenced in the 1990s and involved converting the city's industrial and maritime precincts to a recreational and touristic site characterised by its vitality, which was positively reflected on the economy of the city. To improve the public realm, Keys Young in collaboration with urban initiatives and the city of Greater Geelong created a master plan document: the 'Waterfront Geelong Design and Development Code 1996' (Keys-Young-and-Urban-Initiatives, 1996). These improvements included the waterfront that was remodelled into a high quality public realm with investment in public art and infrastructure including restaurants, swimming area, a new skate-park and other waterfront attractions. The development also involved private investments such as Deakin Waterfront Campus that occupied the original 1893 wool stores as well as a number of residential developments, an earlier attempt to maintain sustainable use of the Geelong's built environment.

4 VISION II: ECOLOGICALLY BASED URBAN REGENERATION PROJECT

Roberts and Sykes (2000) defined urban regeneration as "a comprehensive and integrated vision and action which leads to the resolution of urban problems and which seeks to bring about a lasting improvement in the economic, physical, social and environmental condition of an area". This definition suggests that urban regeneration is a strong means of achieving future sustainable cities. Accordingly, the concept has been a key focus for research, planning processes and public policies (Colantonio & Dixon, 2011; Tallon, 2010). Following the public realm achievement of Vision 1, and in conjunction with the G21 Regional Growth Plan under development as well as the growing quality of the city, it was vital for the city of Geelong to build on progress with a further urban development project. Vision II inaugurated in 2011 aiming to reach a shared smart future vision for the Centre Business District (CBD) of Geelong city; as well as identify areas, strategies and opportunities to provide a vision, momentum and investment for the growth of central Geelong. The vision was directed to neutralise the industrial character of Geelong and intensifying its viability and significance. The main challenges facing the project involved the conversion to a knowledge-based global economy focusing mostly on the education and health sectors – education led regeneration, creating a sustainable future with an ecologically sensitive urban environment as well as building on the sense of community and the distinctiveness of place.

The project's outcomes were to produce integrated scenarios for change between 2011 and 2031 to support Geelong in becoming sustainable, smart and healthy, which were developed by leading industry professionals, state and local government in addition to the local community. To accomplish this, it was crucial to initially develop a powerful Partnership with effective leadership, which was creative, imaginative and risk-taking. The establishment of this framework addressed economic, social, environmental and cultural issues, which are central to providing a sustainable Geelong city of 2031 (Vision-II, 2013).

5 VISION II: THE PROCESS

Vision II was established in 2011 with a Memorandum of Understanding (MOU) signed by the local council of Greater Geelong (COGG), the State Government- Department of Planning and Community Development (DPCD), Deakin University (DU) and the Committee for Geelong (CFG) who represented the business group. The project was governed by this unconventional collaborative partnership to develop a vision for future development of the Central Business District of Geelong city (Figure 2). The aim was to build a close working relationship to develop a vision of bold ideas for future development. Therefore, it was crucial to work in a creative environment to generate ideas, images and plans that could be explored and challenged through stimulating non-binding conversations that might be held outside of formal roles, with the flexibility to debate ideas without holding to a position. Being funded by the state government (DPCD), the project was

expected to follow the usual structure of urban regeneration projects of the parliamentary procedures. With such imprecise aims, the challenge laid in obtaining funding: unless it could be realised that funds were a prerequisite for a crowd-sourcing initiative. Additionally, some significant challenges associated with ecological principles and population dynamics were addressed. Unifying partnership perceptions was a core goal of this crowd-sourcing performance. This helped to solidify the partnership, create the catalyst for the crowd and prevent outsiders to manipulate the process. As shown in Figure 3, starting the project with the partnership as one unit acted as the catalyst around which other layers were built up. These layers helped in obtaining information from different parties who could work together as a hub. The process then reached the wider audience from moving out to the contest of the concept towards aggregation ending with the choice of the preferred option.

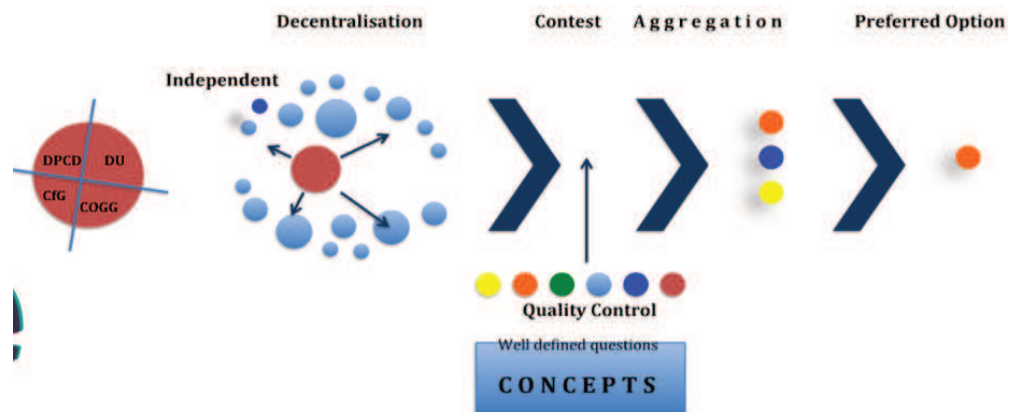


Fig. 3 The Vision II Process

Following the initial decision to collaborate, Vision II aimed to develop a process and scenarios for change. To reach full potential, a shared vision and communication between stakeholders was required. The project partners ensured a transparent process to which the public were engaged and aware of its development. The project's timeframe included a series of workshops (Figure 4) encompassing international, national and local professionals from a wide variety of disciplines. The workshops design and composition were supported by clear ecological principles as will be described later in this article. These workshops operated in parallel with a series of community engagement events. The whole process was also supported and validated by international experts, who also helped to frame the appropriate questions for different stages of the project.

Following the second workshop, the Vision II Studio group was formed to display the output of the two first workshops as well as facilitate community engagement. The wide array of outputs produced was managed in the studio to produce visual material reported to the implementation strategy. These materials ensure a level of understanding between the partnership and wider interest groups with regard to the final vision. The key themes and scenarios are detailed in Figure 5.

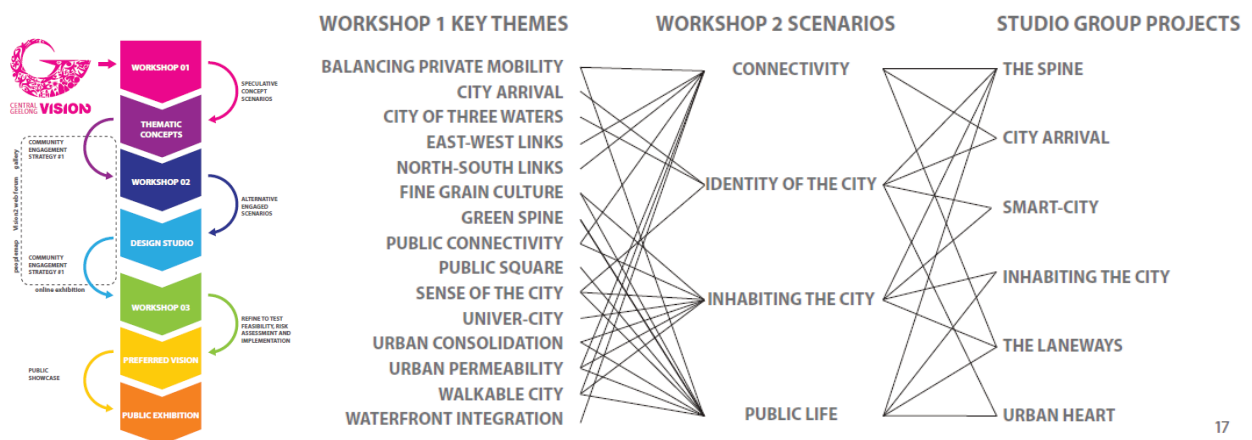


Fig. 4: Vision II Workshops and process (Vision-II, 2013), Fig. 5: The workshops and studio group projects' outcomes

6 ECOLOGICAL APPROACH TO REGENERATION

Geelong, as many parts of Victoria, suffers from cycles of droughts and floodings. Key principles of the Vision II was to provide response to climate change with an ecological approach that would provide a smart sustainable and healthy future for the city. A more innovative ecological approach approach to resilience was needed; one that is more in line with natural principles rather than engineering solutions. Crawford Stanley Holling (1996) distinguished between engineering and ecological resilience. Davoudi (2012) interpreted the difference to be the ability and time required to bounce back in engineering applications on one hand, and the magnitude to absorb disturbances to ecological systems on the other. Sir Michael Pitt (2011) also defined resilience as: “The ability of a system or organisation to withstand and recover from adversity. The diversity of interpretation of resilience in the two fields, i.e. engineering and ecology, raises the question of our understanding of what a city is. Vision II project has attempted to build scenarios around questions; Is the resilience of Geelong well-defined that it should bounce back to normality in the face of adversities? Should the emphasis be on maintaining well-being of inhabitants regardless of loss of assets and infrastructure? How can we develop resilient societies that have a positive outlook despite challenges? How can we ensure infrastructure is adaptable in the face of change?

Cities, similar to Ecosystems, are complex, diverse, resilient and unpredictable (Holling et al 2002). Development of cities should therefore aim to follow ecological systems; where change is both discontinuous and gradual; where surprise events are normal; where processes of creative destruction are essential for renewal; and where there are many possible steady states. Ecosystems are more flexible to their reactions to disturbances and stress. Because systems do not operate near equilibrium, resilience is associated with the change the system can tolerate and the ability to reorganize or renew (Carpenter et al. 2001). Under light to moderate stress, ecosystems gradually returned to their original status. Under repeated stress or large disturbance, ecological systems persist and evolve and do not return to their original status. Similarly, we argue that coastal Cities that are exposed to small and repeated stress needs to develop new sets of aspirations and principles that would guide their resilience against future gradual, small, and cumulative ecological challenges; where adaptation and evolution replace rigid control in order to build meaningful urban resilience. Liao (2012) demonstrated the limitations of the engineering approach to resilience in his attempt to develop more resilient urban patterns against river flooding. Klein et al defined resilience of coastline more flexibly with their reference to preservation of potential as well as actual functions (Klein et al, 1998:263).

	Engineering resilience	Ecological resilience
Theoretic construct	Resilience = resistance + recovery	Resilience = tolerance + reorganization
Assumption	One equilibrium (one regime)	Multiple equilibria (multiple regimes)
	Predictability	Unpredictability and uncertainty
Concerns	Deviation from the ideal level of system functionality or stable state	Regime shift
Focus	Stability/consistency – returning quickly to the equilibrium	Persistence—remaining within the current regime
Measurement	The speed of recovery to the previous stable state	The magnitude of disturbance the system can undergo before shifting to a different regime
Disturbance role	Disturbances as threats	Disturbances as learning opportunities

Table 1: Differences between engineering resilience and ecological resilience (based on Liao 2012)

Whether we refer to the spatio-temporal ability or the magnitude to bounce back, there is a need first to define cities as integrated systems in a relative steady state or integral systems that volute and mutate in an attempt to achieve a steady state. The earlier would take us to the engineering realm while the later highlights the ecological foundation of cities. Alberti et al (2009) have attempted to define the characteristics of urban ecosystems as follows:

1. Hierarchies: Patches and Parcels—near decomposable
2. Emergent properties: Self-organisation – set of rules and laws
3. Multiple equilibria: Self monitoring and self correcting (Sprawl)
4. Non- linearity: disproportion of input-output relationship
5. Discontinuity: Episodic dynamics
6. Spatial heterogeneity: ecology still lacks a theory of ecosystem function that is spatially explicit (Turner and Chapin, 2005)

- 7. Path dependency: evolution and mutation
- 8. Resilience: Capacity of the system to absorb shocks without re-organising.

7 EVOLUTION OF CITIES

In order to predict the impact of those identified ecological principles on the possible future scenarios, we need first to understand their applications on the historic evolution of cities. Since its inception in over the centuries, cities have been developed based around food and material sources. Cities have evolved from walking cities to those that spread across the rivers and waterways. Cities were then expanded during the industrial revolution with the use of electricity and internal combustion engines. The fourth wave of cities were modified as a result of the cheap oil prices and the domination of car mobility. The digital technologies replaced the old industrial manufacturing centers with knowledge jobs in the following wave of cities. Cities, in this fifth wave, the resilient cities, continued however to be dominated by car mobility. The ecological challenges and resources depletion have focused the mind of planners and city developers on sustainable growth of the sixth wave of cities, the eco cities, using the developed sustainable technologies. New models of eco and sustainable cities were tried. We are now on the threshold of a new wave of cities; emerging from the expansion of disruptive, smart and renewable technologies, the emphasis on health and well-being for future generations, and the implications of the fourth industrial revolution. The question remains of the framework that would guide urban regeneration in order to achieve integrated smart solutions to Geelong societal and ecological challenges while ensure economic prosperity. Models for future of cities have been widely discussed in the literature. It was decided to check those models against the principles of urban ecology as developed by Alberti (2009) (Table 2). Table 2 shows the properties, in relation to the ecological principles, that would characterise the different future models of cities; The collapsed, the ruralised, the divided, the resilient, and the eco cities. Such understanding have focused efforts in developing 6 different large catalysts projects for Geelong (Table 3). The six main catalysts projects are:

7.1 The Green Spine

The Green Spine Connects Geelong’s two key civic green assets. The aim was to develop a spine that connects the two with jogging and cycling loops could restore these assets to their original civic function and regenerate underutilised recreational facilities. The Spine would also embrace water sensitive urban design, through the use of integrated systems to deal with stormwater. The Johnstone Park detention basin was originally a wetland in 1853. This could be reinstated to detain, treat and reuse storm-water within the precinct and catchment area.



Fig. 6: The Green Spine in Geelong

7.2 The City of arrival

The project aims to develop subtle visual strategies to celebrate the main arrival points to and from the city. The project is well integrated in the Green spine as it would Unlock access to the park by removing the internal road network and bus thoroughfare. The project would also extend the Spine as a visible marker and entry statement and reinstate Johnstone Park to its original boundary.

7.3 The Laneways

Laneways are unique half-hidden spaces that lend themselves to be treated differently to the main streets. laneways add a new and exciting dimension to the fabric of the city and give the city a finer grain and different scale of space for people to discover and enjoy. The proposed designs aim to enhance the urban fabric of the spaces and celebrate each laneway’s distinctive environment. Laneways provide the fine gredients patterns of the urban fabric that allow the city to absorb difficulties of flow or economic shocks of high street. Re-activating the shop frontage throughout the laneways would therefore improve the spatial heterogeneity and the resilience of the city.



Fig. 7: Expansion of Johnstone Park in the City arrival project, Fig. 8: Unlocking the spatial potentials through active laneways

7.4 Inhabiting the City

The project aims to reduce waste and invigorate the City centre with incentives for new development through facilitation and review of planning policy. Between 2006 - 2010 the population of Greater Geelong grew by 3,595 people per year. If this trend continues; by 2030, Geelong will need to house an additional 64,714 people

Currently, 18.3% of Geelong’s housing stock is unoccupied; that alone can house up to 52,732 people .

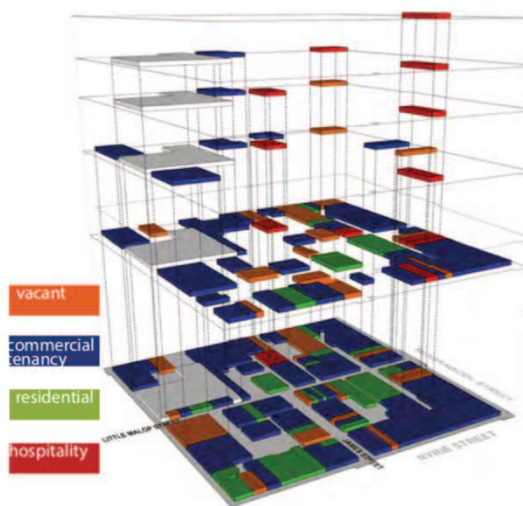


Fig. 9: Example of multi layer analysis of occupancy in Geelong city centre, Fig. 10: bringing life to the heart of Geelong CBD

7.5 Urban Heart

The urban heart is about creating a space for Geelong which is central to its urban identity, surrounded by active and lively street frontage, and that can become the go-to place for impromptu community gatherings.

It is important that any new civic space for Geelong considers an appropriate scale for the context of the population that will use it. Opportunities for above ground new development could be also explored capitalising on the central CBD location. This will not only reinforce the urban heart with a captive audience, but look to synergise the aims for a mixed use vibrant centre by providing new facilities. These could be a luxury hotel, conference centre, serviced apartments, etc. By unpicking the heritage components the original clocktower, for example, a laneway once existed to the west of this central building would be revealed.

7.6 Knowledge City

University towns allow the university to play a strong role both economically and socially in the city. Students often breathe life into cities by occupying them at times of low-usage, allowing the city to have a more even period of use and incentivising the broader offering of activities within that area. Growing our university precinct allows for more students to live and study in the city, acting as a catalyst to occupy and thus ameliorate the city's core. The project aims to promote and develop a more "disbursed" model for the central city's higher education presence, where this presence (and its "out of hours" activities) are fully integrated into the fabric of the central city's daily life. The project would blur the lines between "education precincts" and the central city through the direct integration of both by dispersing education facilities throughout the city's central area. The project also promotes a wider range of active and visible recreation options within the central city, associated with its student population and develops strategies to increase the range of affordable student accommodation, of a good standard, within or around the periphery of the central city.



Fig. 11: The green spine as a connector; facilitating expansion and synergy of health, education, and research

8 CONCLUSION

Governments, urban designers and planners would benefit from an assessment framework when planning for ecological approach to regeneration of cities. Employing the Alberti urban ecological principles coupled with Liao (2012) analysis of the limitations of the engineering approach to resilience, this article drafted an assessment matrix. The matrix enables analysis of planning objectives and what are the likely future scenarios for the overall process adopted. Geelong Vision II explored the possibility to drive a number of regeneration catalysts that would support a more resilient and smart future for the city. The analysis shows that Vision II alignment with Alberti's urban ecological principles. The article also shows that Vision II approach would benefit from further strategies that aim to strengthen the city's spatial heterogeneity, an ongoing issue of concentrated socio-economic disadvantage particularly in the northern suburbs. The Vision II was based on the concept that in fragile socio economic and environmental landscapes like Geelong, a smaller, self-organising, decentralised, multi equilibrium, and fragile city ecosystem would be more effective than a large hierarchical, integral, and stable one in endangered landscapes. Six catalysts projects were developed to reinvigorate the City centre. De-infrastructurise the heart of the city with the development of the Green Spine, with its interconnected projects, has served Geelong well. Recent economic indicators showed that in 2016-17, Geelong witnessed a record of building activities of \$1.5B (15% increase) with dwellings numbers increase by 51%. Geelong decline of the population was reversed with expectation of increase by 80,000 by 2036. Almost all the projects mentioned in the Vision II master plan was either developed or planned, including the development of the Green spine. This article shows that an integral

ecological approach to regeneration of cities, if properly articulated, could lead not only to healthy resilient environment but also to population satisfaction as well as economic prosperity.

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