VICTORIA INSTITUTE OF STRATEGIC ECONOMIC STUDIES

INVESTING IN GROWTH: UNDERSTANDING THE VALUE OF GREEN INFRASTRUCTURE WORKSHOP REPORT

CELESTE YOUNG, JOHN SYMONS, ROGER JONES

VICTORIA State Government · Banyule · City of Kingston · Victoria University Melbourne Australia · City of Melbourne · City of Moonee Valley

Suggested citation: Young, C. K, Symons, J. and Jones, R. N. (2015) Investing in Growth: Understanding the Value of Green Infrastructure Workshop Report. *Climate Change Working Paper No*. 22. Victoria Institute of Strategic Economic Studies, Victoria University, Melbourne.

Acknowledgements: This paper contributes to the project the project Assessing the Economic Value of Green Infrastructure. Yvonne Lynch, Renee Walton, Emily Boucher, Ian Shears, John Milkins, David Callow, Adrian Murphy, Michelle Gooding and Ben Johnston have been integral to the development of this project along with the support of many teams at City of Banyule, City of Kingston, City of Melbourne, City of Moonee Valley and the Victorian Department of Environment, Land Water and Planning. For workshop support we would like to thank Yvonne Lynch, Renee Walton, Michelle Gooding, David Callow, Tanya Susan Lengyel, Tania MacLeod, Alison Gibbs, the staff at the City of Melbourne, Margarita Kumnick and James Ricketts, for their assistance in organising and facilitating on these workshops. Bruce Rasmussen, Geoffrey Lipman and Stephen Chapple for their contributions to Investing in Growth Workshop and all the participants who attended and contributed. This project is supported by funding from the Government of Victoria.

Cover images: Bigstock and James Burrell, Flickr.

ISBN: 978-1-86272-708-3

Victoria Institute of Strategic Economic Studies
Victoria University
PO Box 14428
Melbourne Vic 8001
Ph. 03 9919 1340

Contents

Introduction

"Green infrastructure is dynamic – it must be strategically planned for, invested in and managed at local and regional levels, if it is to function in underpinning and providing for a prosperous and sustainable economic future."

Dr Will Williams, Program Director, Natural Economy Northwest

Cities are complex, dynamic systems that depend on the resilience of their people, their economies and their natural environments for ongoing sustainability. Green infrastructure is a key aspect of the total infrastructure that supports this. It underpins our economy in areas such as health, liveability and industry. Green infrastructure protects and rejuvenates liveable communities by providing essential services such as clean air and water and healthy ecosystems. It can also help reduce the impacts of climate events such as flooding and heat waves. Communities who successfully maintain these assets are more likely to be resilient and able to adapt more effectively to future shocks and changes.

To date, planning for green infrastructure has largely been opportunistic, taking advantage of funding opportunities, rather than being a strategically managed portfolio sustained by ongoing funding. This has meant that tools and methods to integrate green infrastructure with other types of infrastructure have not been developed fully. Decision-makers find it difficult to properly evaluate the type of investment needed, why it is needed and how it is needed. As a result, green infrastructure is viewed as a peripheral aspect of infrastructure planning so is often underutilised and undervalued. This has meant that opportunities to improve these assets or maximise their benefits have been not been taken up.

As part of the Victorian Adaptation and Sustainability Partnership Program, Victoria University is developing an economic framework for green infrastructure in collaboration with four local government bodies. This framework aims to provide a foundational step in addressing this lack of progress. It will do this by developing an economic framework that will help local government decision makers step through the decision process. It will also identify how and where aspects of this framework can be integrated into the mainstream decision-making process of organisations.

The framework aims to create better understanding of:

- The value and benefits of green infrastructure.
- The available options and how these options support the future viability and liveability of our communities.
- The development of business cases for preserving existing and investing in future green infrastructure.

This report is a synthesis of a series of four research workshops, three individual workshops undertaken with Kingston Council, Moonee Valley Council and City of Melbourne and one integrated workshop which included all the participating councils and other key stakeholders. This report also contains some of the background research undertaken to support these workshops. The purpose of these workshops was to assist the understanding needed to develop the economic framework.

Workshop Summaries

Green infrastructure is emerging as a growing area of practice at local government level. This is primarily being driven by the need to maintain the future livability and prosperity of communities and build resilience to environmental, social and economic changes. This need is driving a new phase of innovation in infrastructure, which requires a more integrated, systemically-based approach. This approach is more complex, as green infrastructure can have different requirements to conventional infrastructure and assets. It requires an understanding of the different types of infrastructure, the specific characteristics of each area and the interactions between them. In particular, specific characteristics and needs of green infrastructure are:

- It is dynamic and subject to surprises and change.
- Benefits and services from green infrastructure and the value of these assets can increase as it grows through its lifecycle.
- It often requires the use of new and innovative technologies and changes in thinking frameworks.
- Knowledge in this area is evolving. The tools, methods and operational processes needed to support the comprehensive valuing of these assets are still being developed.
- Current tools and operational frameworks do not always address the needs of green infrastructure as they can lack the flexibility or reflexive processes needed.
- It is not currently an area that is considered as an asset in its own right and is often seen as an add-on to other areas of infrastructure.

During this process a number of barriers and opportunities were identified that will be used to inform the development of the economic framework for green infrastructure by the research team.

Innovation, and monitoring and evaluation were the two key areas identified during the workshops as opportunities for improvement. Currently the management of innovation depends upon the expertise of individuals within councils and it is not an explicit part of the operational processes. The identification of innovation in project and clarification of innovation processes will reduce the risk associated with these types of projects and assets. It will also assist decision-making in areas of appropriate investment and management required to achieve effective outcomes. There are areas of innovation in all councils which can be used to build upon and inform how this can be best undertaken.

The development of additional monitoring and evaluation through the lifecycle of all green infrastructure assets, and its consideration in the planning phase, is crucial for valuation for the following reasons:

- The collation of data in relation to benefits and services generated is needed to support future business cases. This is particularly important where innovative technologies are being used, because the benefits and processes supporting them may not be fully understood or there may be unanticipated outcomes. It can be an effective tool for measuring and reporting the return on investment to the broader community.
- It is needed to support decision-making in relation to future investment and effective management of assets.
- Urban environments are subject to a variety of unpredictable pressures, so the condition and response of these assets and the services they provide need to be tracked.
- Assets can respond in unforeseen ways

Although green infrastructure assets provide social, environmental and economic benefits, these benefits are still not fully understood. As a result, the opportunities they offer are not fully realised. Barriers to achieving this understanding were articulated in all the workshops. Key barriers were a lack of long-term integrated planning, policy and inconsistent investment. The lack of robust business cases needed to counter the perception of green infrastructure being of less value than other forms of infrastructure was also seen as a major barrier. Key needs identified were the development of appropriate valuation tools and operational mechanisms (policy, systems, funding) to develop, maintain, monitor and evaluate these assets. There was also a need for collaboration, knowledge development and ongoing education to support the changes needed and develop areas of practice.

All councils who participated in the workshops are developing initiatives to improve areas of operations such as project and asset management. This offers a key opportunity to embed green infrastructure needs into the changing operational matrix. Other areas of opportunity articulated during the workshops were:

- Greater inclusion of green infrastructure at the beginning of the development process for all types of infrastructure.
- Whole of life-cycle planning of new projects through an integrated asset management structure, with particular attention paid to the post-development stages.
- Improvement of ongoing monitoring and evaluation of green assets.
- Integration of innovation practice into the management framework, in particular reflexive practice where new knowledge is captured and shared.
- The development of more robust business cases through improved reporting practices and diversification of methods of assessment.
- Enhance systems and tools already in use, such as current valuation and maintenance programs.
- Communication, engagement, ongoing learning and education in relation to the needs, use, benefits and value of green infrastructure.
- Clearer classification of assets.
- Greater collaboration between private, public and research sectors to enable further development in this field.

The final workshop highlighted the complexities of the valuation task and the need for systemic approaches to assess the multiple values attached to each action and asset. It also reinforced findings from the individual council workshops in relation to the need for long-term visions, collaboration, funding and policy to support effective implementation of project designs. Flexibility and integration in management frameworks and structures were also seen as important, because of the length of the time between inception, implementation and completion.

The exercises exploring the valuation of green infrastructure elicited diverse benefits across social, environmental and economic value categories. Of particular note is the number of allocations in the social category (47 allocations) and the similar numbers for the economic (38 allocations) and environmental categories (35 allocations). This was reversed in the avoided losses category allocation where the smallest was to the social category (20 allocations) with equal allocations to the economic (26 allocations) and environmental (26 allocations) categories. In regard to groups of benefits within these categories, the largest group was natural hazard impact and risk reduction (11%) and employment (11%) with resource efficiency (9%) as next largest group. The largest groups in the area of avoided losses were those associated with natural hazard impact and risk (18%). Efficiency (17%) was the next largest group.

It is interesting to note that there were fewer avoided losses (72 allocations) than benefits (119 allocations) by the workshop participants, which may indicate a knowledge gap in this area. As saved costs and costs of inaction are important for business cases, this area may benefit from further research to clarify the cause of this variation. The value of intergenerational equity was also nominated in the consolidation discussion as important.

Overall, these workshops showed that green infrastructure is an area of growth, innovation and opportunity for local government that can provide multiple benefits to communities now and in the future. In particular, the benefit of reduced natural hazard risk, (especially those related to climate change) and increased resilience to their associated impacts. Investing in green infrastructure was also seen as an effective way of maximising resource use and efficiency.

Local government's use of green infrastructure is increasing, so there is a need to understand how to best manage the dynamic nature of this asset in a way that realizes its full potential. How effectively local governments are able to do this will depend upon their ability to work within their constraints and collaborate beyond these; also how willing they are to embrace new ways of thinking as to how infrastructure can best address the changing needs of their local environment and the communities who live within them.

The policy landscape

Policy is useful for understanding how the underlying values are driving particular agendas within councils. It has a key role in determining the type of projects selected and developed. At the commencement of the project, a survey was undertaken with the participating councils (see Attachment A for questions). This was used to inform the development of the research workshops by identifying the key policy aspects relevant to the operational aspect of green infrastructure.

Sustainability was the most common value present in the overarching policies and was reflected in all four councils' visions. This was supported by other values associated with liveability such as diversity, safety, connectivity, prosperity and the natural environment. Progressive communities were also prominent with vibrant, dynamic and inspirational values articulated in individual council visions. Policies more directly related to green infrastructure were dominated by resilience, conservation, enhancement and equity values.

Council policies and green infrastructure

Policies, strategies and plans that relate to and support green infrastructure were listed by each council. Many are relatively new, having been developed in the last 7 years (see Table 1 overleaf). The majority of these plans and strategies provide long-term commitment and guidance for the planning, implementation and management of aspects of green infrastructure.

Table 1. Key policies related to green infrastructure			
Banyule	**Moonee Valley**	**Melbourne**	**Kingston**
Planet, people, place and participation policies and strategies (green infrastructure work is referenced in these plans). (2013 -2017)	Moonee Valley, next Generation 2035	Future Melbourne 2020	Living Kingston 2035
	Council Plan (2013-2017)	Urban Forest Strategy (2040 targets)	Energy Efficiency Strategy (2012 -2017)
	City Sustainability Policy (2012-2035 scope)	Total Watermark - storm water harvesting (2020 targets)	Public Health and Wellbeing Plan (2013 -2017)
	Water Strategy 2010 (2012 & 2020 targets)	Open Space Strategy (2012-2027)	Integrated Water Cycle Strategy (2012-2040)
	WAGA CC Adaptation Risk Assessment (Risk scope 2030 –2070)	Growing Green Guidelines (2014)	Kingston Green Wedge Plan (2012)
	Western Alliance for Greenhouse Action Climate Change Adaptation Strategy: (2013-2020)	Climate Change Adaptation Strategy 2009 (No specific targets but scope of risks up to 2070)	Kingston Biodiversity Strategy (2007-2012)
	Greening the West Strategy (2030 & 2050 targets)	Tree Removal and Retention Policy (2012)	Kingston Open Space Strategy (2012)
	Open Space Strategy 2011 (2020 -Strategic vision)		Mordialloc Creek Master Plan (2012)
	Green House Strategy 2010 (2020 targets)		Kingston Foreshore Vegetation Management Plan (2010-2015)
	Urban Ecology Strategy 2014 (strategic vision to 2035)		Kingston Foreshore Aboriginal and Cultural Heritage Study (2000)
Stormwater Management Plan (2003)	Tree Management Strategy (2013-17)		Kingston Coastal Management Plan (2014)

"When will people start realising that it is not an add-on anymore, it is important, really important."

For the most part, these policies and their links to non-environmental policies are still developing. This may be due to operational silos and the separation of green infrastructure from mainstream infrastructure at a planning and implementation level but may also reflect the degree of evolution. Policy integration and linking of agendas is progressing due to the complexities of interactions needed to enable projects; also informed by the need to align key stakeholder agendas. An example of how policies are integrated internally can be seen in the Moonee Valley Urban Ecology Policy (2014), which links biodiversity to the following policies:

- MV Next Generation 2035 – Community Vision
- Council Plan 2013-2017
- Municipal Strategic Statement
- Municipal Public Health and Wellbeing Plan 2013
- City Sustainability Policy 2013
- Open Space Strategy 2011
- Tree Management Strategy 2013
- Playspace Plan 2011
- Greening the West Strategic Plan 2013
- Water Strategy 2011[1]

[1] Moonee Valley City Council, Urban Ecology Strategy 2014, Moonee Valley, p4.

All councils have the potential to more fully integrate green infrastructure into policy areas such as: health and wellbeing, adaptation, resilience, assets and infrastructure and economic development.

"You can't just keep doing projects all over the place without planning them properly otherwise you end up with more problems than you solve"

The growth of municipal strategies that relate directly to green infrastructure suggests that the need to strategically plan these projects is being increasingly recognised. This helps to ensure effective development and management of not only future projects but also of the assets they create and the benefits they provide. The value of long-term policies in supporting action can be seen through examples such as Banyule City Council's Water Management Plan 2003, which provided a framework for the development of innovative storm water projects. These strategies are also important to ensure appropriate whole of life planning is undertaken, as some green infrastructure projects can have unanticipated management legacies. For example, the need to burn indigenous grasslands to maintain ecological health.

The external policy and legislative environment

There are a number of external environmental policies and regulations that relate to and shape the type of projects selected and how they have been undertaken by local government (see Attachment B for details).

Currently at a federal level the political environment is in transition from conservation to resource use, with the review and replacement of a wide range of environmental legislation and policy. This creates a particular challenge for local governments who are planning and implementing green infrastructure initiatives that require long-term funding and support to achieve actions which stretch beyond normal political cycles. The increasing focus on resilience to natural hazards at the federal level is also relevant for planning green infrastructure at the local level to cope with climate change related impacts such as the urban heat island and increased flooding.

At the state level, Victoria has a number of long-term policies that support the development and implementation of green infrastructure. However, other policy areas related to development and economic growth are often given greater priority and value in decision-making. This may be largely due to the difficulties in being able to effectively value intangibles within current Government decision making processes.

This often results in local government taking an opportunistic approach to developing and implementing green infrastructure based on funding opportunities rather than strategic directives. As stated previously, this kind of reactive approach can lead to unexpected legacies if the full life-cycle of the asset developed is not properly accounted for. However it can also be a lever for positive change, for example, the 14-year drought in Victoria led to a large number of innovative green and blue infrastructure projects by local government.

"The drought really made us think about what was happening and the need to rethink what we were doing with water and the community got it because they could see what was happening – trees were dying…some of the recent extreme events such as heatwaves and storms have done the same thing with heat and flooding risks in particular, it is not about exploiting the tragedy it is about ensuring that we don't ignore the lessons".

However, it is worth noting that this type 'feast or famine' funding environment can also act as a barrier to the sustainable development of green infrastructure projects, which often require long-term planning and investment to achieve optimal outcomes.

External changes in the environment due to climate change, population increases and decreasing resources are also creating more complexity and growing dependencies between both internal and external policies. Much of this is being driven by the systemic nature of these issues and the need to bring together a number of agendas to address these issues. This requires greater alignment between diverse policies to achieve outcomes, as illustrated in the following figure from the Kingston Draft Coastal Plan (2014).

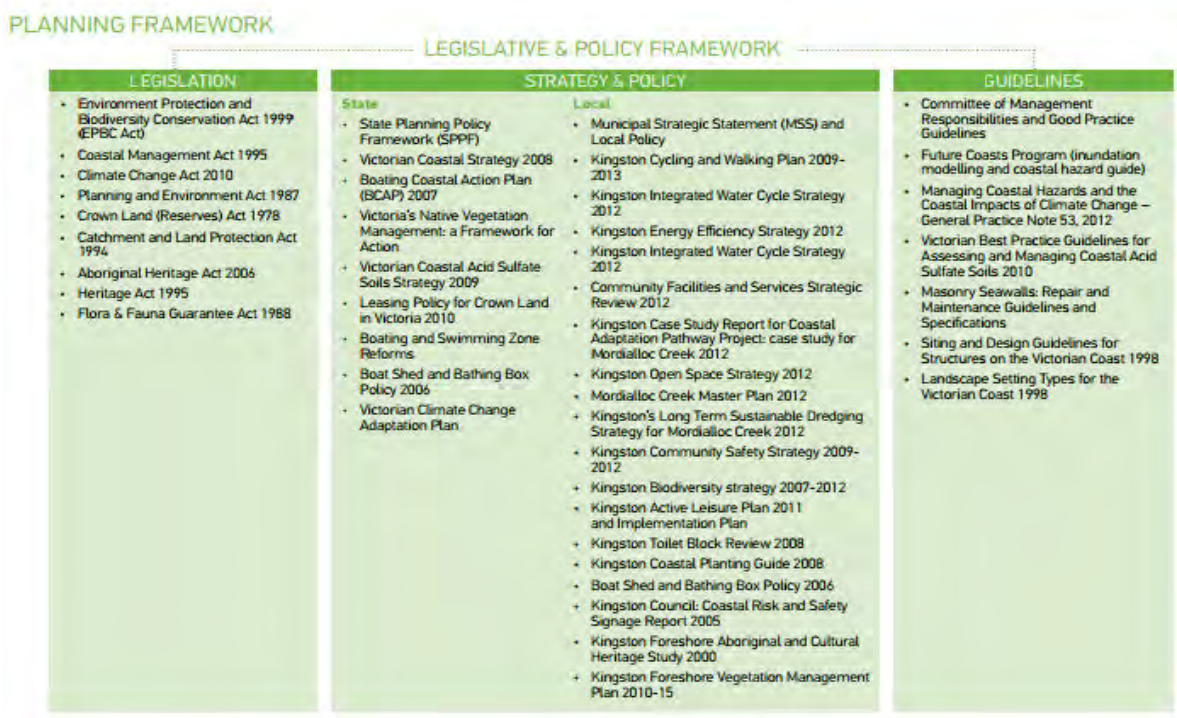

Figure 1: Legislation and policy framework for coastal management, Kingston City Council [2]

Integration across policy frameworks requires local governments to be able to collaborate with both public and private entities to realise these new opportunities. This can create challenges, as these types of collaborations often require different skills and knowledge than for standard projects and can be time-consuming to manage. As a result, less well-resourced councils who rely more heavily on external funding and resources are likely to more be sensitive to policy changes and find it more challenging to instigate large or highly innovative projects related to green infrastructure.

The need bring green infrastructure and assets on a more equal footing with more established mainstream assets and infrastructure raises questions at both local and state government levels in relation to how this should be achieved. This has to be considered in the broader context of the National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management (2007) and aspects of the Local Government Act 1999 which pertain to asset and infrastructure management.

[2] Kingston City Council , DRAFT Coastal Management Plan 2014, p7.

In particular, consideration needs to be given to:

- The types of policies and financing arrangements needed.
- The information needed to inform these policies
- Whether current monitoring and evaluation mechanisms will need to be adjusted or transformed to enable effective development and management of green infrastructure into the future.

Council workshops

Individual workshops were undertaken with Kingston Council, Moonee Valley Council and City of Melbourne to provide a basis for the inter-council workshop. The key aim of these workshops was to:

- Ascertain how decisions were made in relation to green infrastructure in their organisations and the criteria currently used for decision making.
- Identify successful activities to date and lessons learnt from previous green infrastructure projects.
- Understand the overall decision-making process in relation to assets within each council and the systems that support this.
- Identify areas of opportunities to embed aspects of the framework being developed within the organisation.

These workshops were designed and facilitated by VISES researchers Celeste Young, John Symons and Roger Jones. Through presentations from the research team participants were guided through a series of questions (for details see Attachment C).

During the workshop participants were asked to select projects they had worked on or were currently working on to use in the exercise. The groups were asked to select where possible three different types of projects:

- A green infrastructure project.
- An integrated infrastructure project.
- A standard grey infrastructure project.

We then undertook three exercises that examined different aspects of current operations, as listed below:

Exercise 1: Selection of projects
Participants were asked to detail key aspects of the decision-making process answering questions using templates.

Exercise 2: Approval of projects
Participants were asked to map the key decision points and tools used during this process using mapping techniques.

Exercise 3: Implementation of projects
A series of questions were provided as prompts and participants were asked to outline key considerations and aspects of management during implementation of projects

A facilitated discussion was then undertaken to consolidate thoughts and identify barriers and opportunities, (for details see Attachment C).

Successful green infrastructure projects to date

"We spend a lot of time talking to our councillors, the local politicians and our community – if you have your ducks lined up it is easier to get them through the door when it opens."

A number of common components surfaced in relation to green infrastructure projects that had been successful to date. These fell into four broad categories of: opportunities, key needs, enablers and outcomes. Although there was great diversity amongst all the projects the common aspects for successful projects are listed in Table 2. In particular, the following traits were common:

- Agility and ability to capitalise on opportunities as they arise.
- Ability to effectively collaborative with private and public bodies and the community.
- Ability to respond to and solve unanticipated problems.
- Effective education and communication before, during and after the project is completed.
- Ability to obtain and maintain support from key personnel and stakeholders.
- Ability to effectively communicate benefits and value of projects to a diverse range of stakeholders.
- Good management of expectations.
- A champion to drive the project.
- The ability to effectively make decisions and manage risks.
- Flexibility.

Table 2. Key aspects nominated by councils for successful projects to date.

Opportunity	Key needs	Enablers	Outcomes
External funding to support projects.	Political support – need to be aware of and balance the external agenda with current needs.	Good project planning – you need to be able to deliver the project effectively and within desired timeframes.	Good return on investment e.g., Banyule reduction in pollution and increase in ability to service water needs of their community through WSUD project.
Nimbleness to respond to the funding and partnership opportunities as they arise.	Buy-in and support from key stakeholders throughout the whole project cycle, e.g., councillors and community support for projects crucial.	Leveraging current situations to enable action e.g., loss of landscape and trees during the drought enabled the Urban Forest Strategy at the City of Melbourne	Multiple expected and unexpected benefits being obtained by one project – social, environmental and economic, e.g., Afton Street Conservation Wetlands, increase in biodiversity and attendance to park.
To show leadership and initiative through action.	Balancing risk and the need to work in new ways with new technologies to address emerging and future needs. Understanding how much to invest and when is a key.	Champions to drive initiatives. This is particularly important in areas of innovation.	Legacy – creating something that provides benefits for the current and future community. Also ensuring maintenance of asset is considered.
To think smart by using what is there in new and innovative ways, e.g., City of Melbourne repurposing of road for Errol Street green space rather than purchasing land.	Strategic approach to ensure long-term sustainability of projects and initiatives.	Policy - alignment with current policy and development of strategic policy to support actions.	Transferability important as this improves return on investment and helps build acceptance adoption of new technologies and behaviour change.
Build trust with communities by responding to community needs.	A good business case is needed to engage through the different levels of council and to gain effective approval of projects.	Using historical examples, e.g., foresighted planning of Melbourne's parks can show how these values have provided benefit. Listening to the community.	Repurposing an asset or area in way that either enhances or transforms the current asset, e.g., Moonee Valley – Green Precinct Project
Targeting niche audiences e.g., private developers to use sustainable design.	Evidence based cases to support action. Relationships with universities can enable this.	Being able to overcome the unexpected and effectively problem solve.	Enhancing reputation and building community pride through successful projects. (Winning awards is particularly good for this).

Opportunity	Key needs	Enablers	Outcomes
To integrate into an existing agenda. E.g., Kingston rain gardens were included as part of the roads project.	Ability to reflect and share lessons learnt from pilot projects. E.g., City Of Melbourne – sharing tree core data related to importance of when trees are watered. Kingston City Council sharing lessons learnt from rain gardens. A Snapshot of Projects within the City of Kingston, October 2005 [3]	Having the skills and resources (staff, money time) to facilitate these projects. Also and the ability to develop new skills as the projects proceed.	More informed and engaged public who understand better the value of these assets.
To educate and build understanding in relation to the value of the natural environment and these projects. E.g., City of Melbourne Bioblitz project.	Ability to be able to effectively engage and communicate across a number of diverse stakeholders. E.g., community social media, forums and activities.	A willingness to engage with the unknown and adjust work patterns in line with project needs.	New collaborations that support development of future projects.
To create new ways of seeing and operating both internally and externally.	A vision to work towards and stamina, bravery & commitment to support the actions	Framing to suit agendas. E.g., being able to show cost saving makes it much easier to gain support.	Seen as leading change in communities and beyond.

Exercise 1: Selection of projects

Selection of projects strongly reflected the prior discussion with key determinants being:

- To meet a policy requirement (either local or external).
- Financial opportunity, e.g., types of funding becoming available that match current needs or 'wants'.
- A combination of both of the above.
- Driving need – e.g., such as an increasing population and the need to maintain liveability in an area when circumstances are changing.
- Fulfilling expectations, e.g., maintaining amenity of parks and streets through tree planting programs.
- An opportunity to innovate.
- Affordability and return on investment.
- Improvement of an existing asset, e.g., wetlands projects that provide water for sports fields all year round.
- A vision for the project.
- Benefits that could be clearly articulated.
- A champion within the organisation driving the project.

When comparing the selection process of grey infrastructure and green infrastructure projects, the key points of difference were:

- There is a substantial dedicated budget for standard capital works projects.
- The technologies used were seen as more acceptable than green infrastructure because they were well understood and perceived as less risky.
- The benefits and values are more straightforward and easier to quantify – As one participant observed "we have the tools and systems to do that".
- Grey infrastructure was commonly seen as a priority; green infrastructure was often seen as an addition to this, not a different form of infrastructure within its own right.

Selection processes across all councils were diverse. One key determinant was the size of the budget needed and the potential sources of funds. For example, some councils selected a

[3] West, A. (2005) Water Sensitive Urban Design Projects, A Snapshot of Projects within the City of Kingston, October 2005, Webpage Water sensitive design, Kingston Council file:///C:/Users/e5104722/Downloads/Document-A-a-Snapshot-of-WSUD-Projects.pdf . Accessed 13th of November 2014.

series of smaller projects that could be approved within their own department's delegation; these were often driven by the department agenda. This approach has been successful for undertaking discrete projects that are consistent with, or are integrated into, ongoing council policy and strategy. For example, the Green Council Building program at Kingston Council was part of the building betterment program to improve energy efficiency. However, at times this approach has led to a lack of cohesion amongst programs and left unexpected legacies.

The City of Melbourne's process of competitive tendering for capital works projects that are outside of the allocated budgets was particularly interesting. Proposals for projects are presented to a committee who then decide which projects will be funded. This year their general budget allocation was decided by a citizen's council.

Exercise 2: The approval process

The approval processes varied between each project did not appear to be directly related to the type of infrastructure, but rather other factors that surround them. Larger projects had far more external processes, with council and funding bodies dictating aspects of the approval process. Key determinants for the type of approval process needed were dependent on:

- The size of expenditure (this was primarily related to delegation allocations). Smaller projects had less signoff points and generally remained within the council structure.
- The funding source (internal/external). Also whether it was part of a competitive tendering process either externally or internally.
- The complexity of the project (more complex projects required more collaboration to achieve). Also the complexity of technical aspects of the projects and the level of design of the project (complex/simple).
- Levels of risk associated with the project.
- Who was undertaking the work - the council staff or a sub-contractor.
- Key stakeholders and partner requirements.
- The level of community interaction.
- Who was leading the project.

Key approval areas were:

- **Project design approval** – includes the concept design
- **Design approval** – could include more than one area of approval depending on the complexity of the design/s required.
- **Funding approval** – included both internal and external approval points including milestone and key financial approval processes.
- **Stakeholder approval** – can include community, internal and external partners during all stages of the project and fell into three key groups, council, key stakeholders and funding bodies (see Figure 2 overleaf)
- **Project commencement approval** – included resource allocation approval, project plan, sub-contractor and budget approval
- **Project completion approval** – can include sign off from multiple internal and external stakeholders at the end of the process depending on the size of the project.

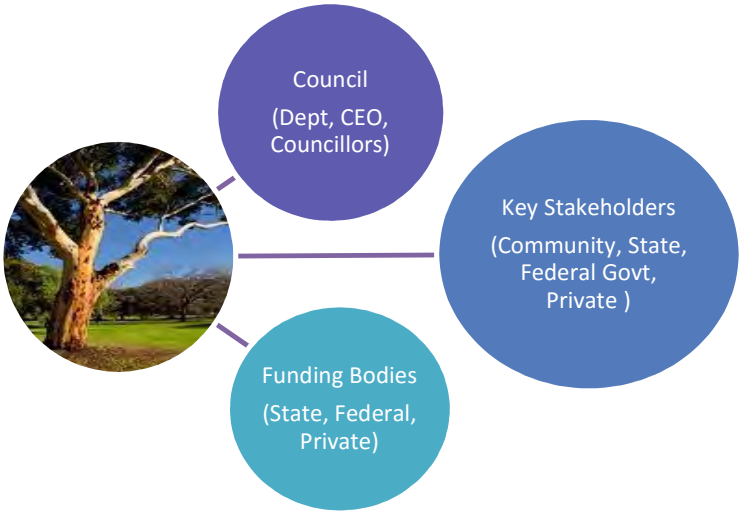

Figure 2: key stakeholder groups in the approval process.

Exercise 3: Implementation

Implementation also varied between councils. Councils had a diversity of operational systems, with the key ones being:

- Risk management
- Engagement and communication
- Budgeting
- Project planning
- Subcontractor management
- Reporting
- Asset management
- Quality control

The City of Melbourne had a centralised system for project management and are currently consolidating a number of their other systems and processes related to service delivery and asset management. This has been in part driven by the lean management approach adopted by the council, which is focusing on improving effectiveness of council operations. Both Moonee Valley and Kingston Councils are in the process of developing and implementing centralised project management systems to enable a more integrated and consolidated approach to managing all council projects. These transitions offer a key opportunity to embed green infrastructure needs into project management systems.

Key areas of consideration

In terms of the key areas of consideration during project implementation, the main differences between the established areas of infrastructure projects and the green infrastructure had a higher use of new technologies and pilot projects which required:

- Education both within and external to council in relation to maintain support and engagement throughout and following the project.
- Ability to solve unexpected problems and maintain direction.
- Reflexive and transparent feedback systems.
- High level of collaborative capacity.
- Diverse communication and stakeholder strategies.
- Establishment of a shared vision.

Other consistent considerations were more general such as the need to deliver projects on time within the budget, logistical issues of how to maintain functionality of areas during implementation of projects and effective risk management.

Innovation

Innovation was raised as a key part of green infrastructure projects during all the workshops. All councils had areas of innovation excellence. Innovation potential was not necessarily tied to the size of the council but how the council used its resources. However, although innovation is recognized and celebrated, it was not identified as an explicit part of operational procedures. This means that at operational levels these projects are often assessed following the same rules as more conventional projects. From a management perspective, successful innovation often relied on individual know-how rather than organisational approach.

There are opportunities in all councils to:

- Identify and strategically plan for innovation.
- Improve understanding of the monitoring and evaluation needed for innovation-based projects and why this is necessary.
- Improve understanding of how to manage innovation risks appropriately during the different phases of the project.
- Increase understanding of the type of resources needed (e.g. funding, policy, skills and time) to support innovation projects.
- Identify skills and education needs both internally and externally.
- Continue to improve engagement and communication tools and skills in this area to share new knowledge.

Ongoing management

"Once we finish a project we are on to the next…. we don't get time to really think about what we have just done".

Handover of projects after completion was an issue that arose in all workshops. In most cases, there was little reflective evaluation of projects to collect lessons learnt or ongoing monitoring to see if the asset was performing as expected. Reflexive and learning practices that were undertaken were often the result of an individual's initiative and not part of a particular operational process. This practice is particularly important in relation to green infrastructure due the high level of innovation required and the need to manage unexpected outcomes, assist learning and build capacity and skills.

Each council has examples of reflexive practice where knowledge is shared; for example, the City of Melbourne has established knowledge sharing networks and Moonee Valley, community forums. The City of Kingston webpage for Water Sensitive Design Projects[4] has an appraisal of their water gardens projects that shares both the challenges and benefits.

Education and communication of the value, benefits and use of green infrastructure throughout all phases of the project was raised in all workshops as crucial to ensure support and ongoing uptake of programs. The City of Melbourne's Urban Forest Program[5] is a particularly good example of how these benefits can be conveyed, using diverse communication through social media and other forms of engagement across their communities. Moonee Valley Green Precinct Project webpage is another example of where

[4] West.A. (2005) Water Sensitive Urban Design Projects, A Snapshot of Projects within the City of Kingston, October 2005, Webpage Water sensitive design, Kingston Council file:///C:/Users/e5104722/Downloads/Document-A-a-Snapshot-of-WSUD-Projects.pdf . Accessed 13th of November 2014.

[5] City of Melbourne, Urban Forest Program webpage, http://www.melbourne.vic.gov.au/sustainability/urbanforest/pages/urbanforest.aspx. Accessed 13 November 2014

benefits of projects are clearly articulated.[6] Active practices such the City of Melbourne replacement value for tree removal was also extremely effective for raising awareness as to the value of street trees and for ensuring that more cost-effective arrangements are considered.

The management of green infrastructure assets varied widely between councils. Assets were listed under differing categories such as parks and gardens, buildings and roads. Ownership appeared to depend upon the primary area where the green infrastructure was located. Although it is clear that green infrastructure needs to be integrated more fully into the development and approval process as an asset in its own right; it is not clear how to integrate this into the general asset register most effectively.

Monitoring and evaluation

"It is really hard to include ongoing monitoring because if you do then it can blow out the cost and this can be the difference between a project getting up or getting canned".

Project monitoring and evaluation appeared strong during the implementation phase but was limited in extent following project completion. For example, tree assets are monitored primarily in relation to whether they pose a risk to the community, so if a tree is considered low risk it receives minimal monitoring. Tracking of the service aspect or benefits derived from maturing assets is currently not undertaken with most green infrastructure assets. The exception to this is the monitoring of water quality and quantity related to WSUD related projects. This is important, because in many cases the benefits will increase as the asset grows. The key barriers to achieving this are available resources and the tools, systems and methods to enable this.

Adding new features into current monitoring and evaluation systems will support the better development of future business cases. This will also improve community reporting of asset progress, quality and service delivery. This is important because:

- Green infrastructure is dynamic and is subject to surprises.
- New, unfamiliar and innovative technologies often need tighter monitoring than standard assets.
- These assets are responding to changing conditions, so their status and responses will needs to be monitored.
- Primary and secondary benefits are often not monitored or reported on.

Additional categories can potentially be incorporated into existing operational systems (e.g., the significant tree register, quality assurance, maintenance programs) and integrated into the established operational matrix. Current valuation tools such as i-Tree may also be enhanced to include additional services provided by green infrastructure, which may also require additional data collection.

Barriers, risks, synergies and opportunities

Consistent themes in relation to barriers, risks, synergies and opportunities arose during the council workshops and are detailed in Table 3 overleaf. The most dominant theme was the lack of consistency in relation to policy and funding, and the perception that green infrastructure was an "add-on" option, not an essential class of infrastructure. The limited control of councils over state-run public and private land was also raised as a barrier.

The key opportunities were to develop/improve the integrated planning process for infrastructure and post-project management. The further development of collaborative working relationships across public and private agencies would enable and support green infrastructure projects through shared understanding, ownership and investment.

[6] Moonee Valley City Council, About the Council Green Precinct Project webpage. http://www.mvcc.vic.gov.au/about-the-council/environment/green-precinct-project.aspx.Accessed 13 November 2014

Table 3: Barriers, risks, synergies and opportunities			
Barriers	**Risks**	**Synergies**	**Opportunities**
Green infrastructure is currently perceived as an add-on to other infrastructure, not an area of infrastructure in its own right.	Green infrastructure is an emerging field that is a key part of ensuring resilience. If it not well understood it can lead poor management, reputational damage and waste of resources.	Consolidation and efficient use of resources requires better understanding and use of green infrastructure.	To integrate green infrastructure into the policy, development and planning of all infrastructure projects.
Current valuation tools are primarily based on cost benefit analysis which is not able to fully value the benefits of green infrastructure.	The value and benefits of green infrastructure are not fully understood – poor planning and development decisions may be made as a result.	Councils already assess some intangible community and environmental values. Key policies support sustainable development and livability.	To identify and clarify appropriate tools for valuation. To develop a framework and processes to support the comprehensive valuation of green infrastructure.
Innovation, which is a key part of green infrastructure, is not clearly identified or understood.	The risks and benefits are associated with innovation (such the use of new technologies) are not managed in a systematic way. Reputational risk.	Councils are currently improving their operational systems in relation to asset and project management. A number of pilot projects have been undertaken by council.	To embed innovation practices in systems as processes as they are be developed and rolled out. To develop more pilot projects.
The business case for green infrastructure is weaker than the case for conventional forms of infrastructure.	There are fewer green infrastructure projects as a result leading to lower resilience and less effective risk management.	The recognition that economic tools in this area need to be developed to strengthen business cases.	The development of new frameworks and processes to build business cases. To show cost a range of alternatives and trade-offs. To enhance existing tools such as i-Tree.
Lack of skills and knowledge in this area.	Poor decision-making and loss of opportunity to capitalise on potential	The recognition of the need to build capacity in the development and management of assets and infrastructure.	To develop reflexive processes and peer-to - peer learning programs that build knowledge and skills.
People within and outside council do not really understand green infrastructure leading to a lack of support for projects.	People will not value or use green infrastructure to its full potential. They make poor decisions in relation to its management and development.	Education and knowledge-sharing is a key part of internal and external service delivery for councils.	To continue to develop diverse and new ways to educate and engage people in relation to green infrastructure.
Funding and investment for green infrastructure is not a priority in some areas of local and state government.	Green infrastructure is not developed and supported in a sustainable manner. Wasted resources contribute to less livable and resilient communities.	Support and understanding of the importance of green infrastructure is growing.	Advocate and educate for the allocation of strategic long-term funding for green infrastructure across all areas of government.
Lack of resources.	Fewer projects and poorer outcomes.	Increasing collaborative projects at a regional level across both private and public areas that pool resources.	To develop collaborative partnerships which engage and enable activities.

Barriers	Risks	Synergies	Opportunities
Changing political agendas at all levels of government. Lack of long-term policy and commitment in this area.	Inability to strategically plan and optimise green infrastructure opportunities.	Development of and commitment to long-term strategies and policies that support green infrastructure.	Continued advocacy for the need for long-term policy externally. Continued development of council policies.
Lack of data on values and benefits to support the business case.	Poor decision-making outcomes.	Research is growing in this area.	Further develop collaborative relationships with researchers.
Lack of council jurisdiction in areas of private development and state-owned areas of open space.	Inability to make some decisions in relation to how areas of open space are developed within municipalities.	Similar agendas in organisations between state, private and local government for projects.	Development of further collaborative partnership projects.
High level of innovation.	Risk of unexpected outcomes, uncertainty.	Councils are keen to show and develop leadership in their communities.	To showcase innovation through developing pilot programs and sharing knowledge as it is developed both internally and externally.
Operational silos in council.	Inconsistent approach to the whole lifecycle management of green infrastructure.	Councils are taking consolidating and integrating approaches to project management and assets.	To ensure that green infrastructure is embedded in the new operational frameworks matrix.
Limited monitoring and evaluation of projects following completion and handover.	Not ensuring that projects are working as expected. Likelihood of repeating mistakes, poor management and reporting back to the community outcomes.	Councils wish to show communities how their investments are tracking. Will also contribute data to support business cases for green infrastructure.	To include and extend additional monitoring into current maintenance activities and embed it into the operational matrix. To map multiple benefits so they can be properly evaluated.
Perceived cost can prohibit investment.	Projects are not approved or funded and this remains an underdeveloped area of infrastructure. Less resilient communities.	Resilient communities are a key theme across all councils. Communities in some council areas are listing the environment and trees as a priority agenda item.	Develop better business cases to show more comprehensive return on investment. E.g., show cost of not undertaking action.

Consolidation discussion

The key issues that arose in the final discussion with the council workshops were:

Selection, development and approval of project

- The need to include and consider green infrastructure in early planning stages of all infrastructure projects.
- The importance of long-term strategies, policies and support.
- Commitment of consistent and adequate resources and funding.
- The need to cost and plan the whole of lifecycle of an asset.
- Flexible arrangements that allow for responsive rather than reactive actions to funding opportunities.
- Evidence, knowledge and collaboration.
- Ability to balance agendas and find synergies.

- Robust business cases and ability to be able to 'sell the project'.
- Understanding of particular innovation needs associated with projects; e.g., education in relation to new technologies.
- Education and engagement from the beginning of the project with key stakeholders.
- Support from key stakeholders, in particular communities and councillors.
- Need to map the multiple benefits; e.g., health, financial, environmental.

Implementation

- The need to work with existing areas of operation such as risk, assets and infrastructure management, and build green infrastructure requirements into them.
- The need for practices that are reflective and capture and encourage new knowledge and sharing.
- The need for effective communication, stakeholder engagement and ongoing education.
- Systems and processes that account for unexpected outcomes and surprises.
- The need for transparency and honesty to allow for problems to be addressed as they emerge.
- Stamina and commitment.
- How to effectively manage project management.
- Post-project management.
- Clarification of green infrastructure as a defined and valued asset class.
- The importance of feedback to initial project group of ongoing outcomes in relation to the project.
- The need for ongoing monitoring and evaluation of the value and benefits of the asset.
- Identification of tools needed to assist benefit and value data collection.
- Knowledge sharing of lessons learnt and ongoing education in relation to green infrastructure.
- Celebrating and promoting these projects within communities.
- Showcasing what works, "the education is good for investment".

Potential opportunities

The following opportunities were identified as possibilities to embed green infrastructure into key areas of the process shown below.

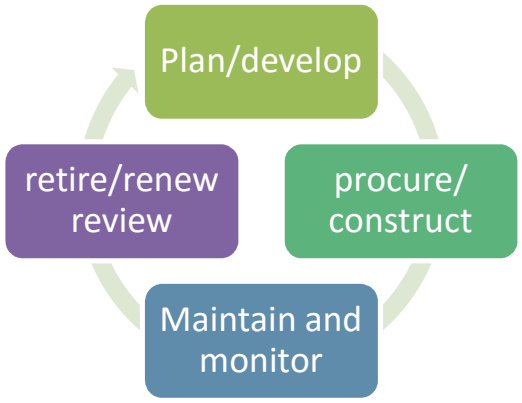

Figure 3: General asset/infrastructure process

Table 4: Process opportunities for embedding economic aspects of green infrastructure.

Phase	Opportunity	Questions
Planning		
Develop	Consider green infrastructure in the development of all projects.	Is green infrastructure applicable to this project? How is it applicable? What policy, strategic objectives does it fulfill? Can green infrastructure enhance performance of other infrastructure or asset? If so how? How will this asset be listed?
Build the business case for new assets	Identify and map benefits to build business case. Clarify changes in value or benefits provided by the asset over its life time.	What tools, methods, systems are required to ascertain the benefits and value of the proposed asset? What benefits/services does this asset provide? What is the value of these benefits (tangible and intangible)? Will these benefits increase over time?
Costs, benefits and value of asset	Costs during development. Benefits and value of expected asset during the life of the asset.	What is the cost of developing this asset? What costs are likely to be incurred if this project is not developed?? What is the expected life of the asset? What is the projected value of the asset and will this increase over time? What is the cost of insuring this asset? When is the asset expected to mature? What services does this asset provide? What is the value of these services?
Costs, benefits and value of asset continued	Maintain the asset.	What are the upkeep and maintenance costs and are these expected to increase or decrease over time? What resources (e.g., water) does this asset require, and are there any concerns over possible resource restrictions over the lifetime of the asset? What monitoring and evaluation will be needed to effectively manage the asset and reporting requirements? Are there environmental factors that could affect the maintenance needs of this asset? If so how?

Phase	Opportunity	Questions
Planning		
Project planning	Identify innovation.	What are the project constraints? Does this project involve areas of innovation in any of the following areas: ▪ the use of new technologies? ▪ the application of a technology in a new context? ▪ the adaptation of current technology? ▪ behaviour change or change management? ▪ the generation of new knowledge? ▪ transformation or adaptation of current operational systems? ▪ new operational processes or practices? What actions will be taken post-project to evaluate the effectiveness of the action and how long will they need to be maintained following project completion?
Procure/Construct		
	Include innovation management into projects.	If this phase contains aspects of innovation, how will risk be managed during development? What are the risks in relation to procurement of components needed for construction or the asset itself? What skills, knowledge or resources are needed to manage this activity effectively? If new knowledge is developed in relation to the asset during the development how is this to be captured and shared?
Maintain and monitor		
	Extend current maintenance programs to include monitoring of benefits and service level.	What is to be measured and how? What tools/systems/processes are needed? What current monitoring tools/systems/processes do we have that can be used? What can be achieved with these? What new tools methods/systems/processes are needed?
Retire, renew, review		
	Ability to strategically plan this phase to maintain level of services provided by this asset.	Will this asset be retired or renewed at the end of its projected life cycle? At what point will the benefits/services provided by this asset start to decline? What is the strategy for renewal to maintain benefit service level? How will this be undertaken? What resources, planning will this require?
	Review asset to ensure whole of lifecycle assessment lessons are captured and shared.	What future policies, strategies and operational arrangements are needed to support the development of these types of assets?

Conclusion

Across the three councils who participated in the three workshops, a number of common themes arose as barriers to developing and implementing green infrastructure:

- Lack of robust business cases to support projects.
- Lack of appropriate tools and systems to determine the values.
- Lack of ongoing monitoring and evaluation to confirm the value and benefits of green infrastructure.
- The use of new technologies.
- Reactive planning and lack of consideration for long-term needs of green infrastructure assets.
- Constrained resources – time, money and people.
- Lack of integration into current infrastructure and asset systems.
- Projects have to be cost-effective and affordable.
- Diverse stakeholders and multiple agendas.

At the time of these workshops, integration and consolidation of the infrastructure and asset project life cycle in all councils was a key activity. This was manifesting in centralized project management processes being developed by both Moonee Valley and Kingston and the process of consolidation of assets and infrastructure by the City of Melbourne. The transition of these processes and systems offers an opportunity to reassess current approaches in a more holistic way; in particular, to mainstream green infrastructure into the main council systems and processes.

There were a number of synergies identified between the green and mixed infrastructure projects selected, such as the need to collaborate, diverse stakeholders and the often innovative nature of these projects. The main differentiation between grey and green infrastructure was that grey infrastructure had established and accepted systems, process, policy and internal funding to support new and ongoing projects. Because green infrastructure has a high level of innovation, there is a need to manage the risks associated with it through reflexive and systems-based operational systems and processes.

Key areas for opportunity are:

- Greater inclusion in the development process of all types of infrastructure.
- Whole of life-cycle planning of new projects through an integrated asset management structure with particular attention paid the post-completion stage.
- To improve ongoing monitoring and evaluation of green assets.
- To integrate innovation practice into the management framework, in particular reflexive practice where new knowledge is captured and shared.
- To better define business cases through reporting practices and different methods of assessment.
- To enhance systems and tools that are already in use such as current valuation and maintenance programs
- Communication, engagement, ongoing learning and education in relation to the needs, use, benefits and value of green infrastructure.

Investing in growth – understanding the value of green infrastructure workshop

This one-day workshop was the last in a series of research workshops examined decision-making in relation to valuation of green infrastructure at local government level. This workshop was designed by VU researchers Celeste Young, Professor Roger Jones and John Symons. Professor Bruce Rasmussen, the Director of VISES and Yvonne Lynch, Team Leader of Urban Ecology, Urban Landscapes from the City of Melbourne presided over the workshop. The key aim of the workshop was to inform the development of the economic framework and Green Paper outlining important issues through:

- Ascertaining how green infrastructure benefits were perceived within local government organisations. Also what these benefits were
- Identifying the current needs and barriers to ascertaining the value and benefits of green infrastructure.

Fifty six participants attended the workshop from different areas of local and state government.

Presentations by Stephen Chapple, National Chair, Economic Development Australia, Professor Geoffrey Lipman, Director of Greenearth.travel and President of International Coalition of Tourism Partners (ICTP) and Professor Roger Jones from Victoria University were used to frame the context of the conversations, (for details see Attachment D). Yvonne Lynch, John Symons and Celeste Young also gave introductory presentations for each of the exercises.

The Exercises

Four exercises were undertaken using 3 scenarios which were developed for these exercises. These scenarios used a brownfield, mixed and greenfield development basis. Each scenario comprised of a map, and descriptions of the surrounding conditions and constraints were provided, (see Attachment F). Every table was allocated a scenario and a host to facilitate the exercise and assist participants.

Exercise 1: Creating the design
Each table was given a specific map and scenario to work as group to redevelop these sites. They then worked together to develop design solutions using green infrastructure.

Exercise 2: Identifying avoided costs and benefits
Using the design that was been developed by the group and a template provided, the table hosts worked with the table to identify:

- Avoided costs (what loss has been avoided by this action) – list what potential losses environmentally, socially and economically will be avoided as a result of this project, e.g., loss in biodiversity in the area.
- Benefits (what is gained by this action) – identify the potential social, environmental and economic benefits of this design. Also specify if these benefits are likely to increase, e.g., trees will sequester more GHG as a tree matures and whether this is short or long-term.

Exercise 3: Needs barriers and opportunities
Looking at the design that was to be implemented, the participants were then asked to identify:

- What is needed to enable this activity, e.g., skills in water engineering and botany, insurance, support from the upper management?
- Possible barriers to implementation. e.g., lack of upper management support.
- Opportunities to improve or innovate during implementation. E.g., develop new processes for integrated projects.

Exercise 4: Consolidation exercise
This was a facilitated conversation to capture final thoughts regarding the exercises particularly in relation to identifying opportunities to integrate this knowledge and improve asset management and infrastructure planning.

Scenario exercise outcome overview

The results from each table are described as follows.

Table 1: Brownfields scenario

The approach taken by table 1 was to "start with community needs and worked out what infrastructure we needed from there". The key objective was to create a safe and functioning community for the future.

Key focuses were:

- Local food – ensure food security with sustainable food.
- Accessible transport.
- Travel infrastructure connecting people at different scales – through bike paths, walking areas.
- Education and learning.
- Employment.
- Health people and healthy environments.

Design elements selected:

- Market gardens.
- Maintain open space.
- Eco village like Westwick – local shops on every corner.
- Vertical schools on several levels with roof gardens, mixture of high rise and medium density houses.
- Use of green infrastructure along road, bike and rail infrastructure and also using it as a possibility to link urban forest areas.
- Tree lined streets to create a tourist trail.
- Connection to the beach.
- WSUD-storm water capture with green border along in low lying areas, tanks under sport fields.
- Collection of water in wetland and trialling algal and sea grass treatments to treat contamination.
- Sustainable transport infrastructure bike trail, light rail, walking paths, light rail corridors, pedestrian mall.
- Education and employment programs (re-skilling).

Host observations
An innovative culture was felt to be the most important need for this project. It was also seen as a major opportunity for urban renewal to take place by developing new industries and

focusing on building a vibrant, proactive community. The key economic benefits would be developed through innovation and sustainable industries. The key opportunity was to create a liveable, more resilient community through the 'smart' design that considered community needs and enhanced the surrounding environment.

Table 2: Brownfields scenario

Table 2 took a problem-solution approach to the issue of the brownfields scenario. Once they had identified the problems, they then identified the risks and the infrastructure needed.

Key issues discussed were:

- What the appropriate scale would be for the proposed developments – per dwelling or per block.
- How to keep the development affordable whilst at the same time keeping it liveable. In particular how to avoid recreating housing commission flats when building high-rise units.
- How best to deal with contaminated soil in a way that was affordable.
- How to overcome land being less profitable in the short term because it was not being developed.
- Private space lower density housing and decreased public space versus increased public land with increased density in housing.
- Reduction of risk such as urban heat island and flooding.

Design elements selected:

- Sporting fields.
- Bird sanctuary.
- Mixed housing – high density mixed with medium density.
- Maintain open space where possible.

Key support mechanisms:

- Funding - Developer pays either per dwelling, floor area, % of land – this goes into a pool of funding.
- Government pays residents/business sites pay
- Crowd funding
- Conference centre
- Golf course – golf course
- Money for precinct goes to infrastructure not owner's profit.

Host observations

Beacon projects that provide best practice examples were felt to be an important part of making this project work. Political support was seen as especially important particularly in the long-term. Both cost and support required in the long-term were key needs and also barriers. Having a master plan was seen as a major opportunity to be able to develop a long-term project rather than incremental and reactive planning developments.

Table 3: Mixed development scenario

Table 3 approached the exercise by looking at what would draw people into the area first and then looked at what they would build around them with the central concept of maintaining and enhancing what was there.

Key issues discussed were:

- Political aspects were seen as particularly important and the need for a vision and strategy to support the long-term nature of the project.
- Inclusion was seen as central as they did not want exclude anyone from being able to enter the area.
- The balance between passive and active space.
- The development of a commercial area first to draw people into the area

- Self-sufficient (food and energy).
- The need to develop local guidelines.
- The need for a live business case that could be adapted as the changes occurred (this is due to the long-term time lines).
- Retaining fragments and enhancing these aspects.
- Mitigate the risk of pollution.

Design elements selected:

- Industry recreation centre in pre-existing industry area – also childcare centre in adjoining area.
- Focus on active and passive open space
- WSUD – wetlands, retarding basin ,CH4 generation water catchment and recycling in areas prone to flooding
- Market gardens
- Recreational areas – sporting, swimming pool, amphitheatre
- Apartment blocks maximising green space
- Wind breaks and tree lined streets – double canopy cover
- Timber plantation
- Recycling water- use of Methane gas to power local electricity, mining landfill to recover copper, gold, metal and rubber.

Host observations

The basis for this approach was to provide a robust reason for people to come and stay in the area. A vision was considered central due to the long-term nature of the project. Key barriers were the need for sustainable funding, community buy-in and long-term planning. It was also considered important to have a business case flexible enough to be adjusted as the project progresses. The key opportunities related to a self-sufficient and sustainable community that created greater resilience through better connectivity.

Table 4 & 5: Greenfields scenario

This Table approached the exercise by looking at the surrounding area, which was environmentally highly sensitive and subject to risks such as flooding and sea surge. They then looked at who the key stakeholders might be and what their needs were and developed the area in relation to this. The central aspect of this design was a community that could work from home.

Key issues discussed were:

- The need to maintain open spaces for active recreation whilst still maintaining sensitive design that protected the pristine environmental areas.
- How to address deficits such as lack of public transport infrastructure in a way that did not create a reliance on cars.
- How to use technology and nature together for good outcomes.
- How to maintain the character of the area whilst still developing it.
- How to address risks – fires from local grass area, flooding etc.
- Creating a special place where nature was a feature.
- The cost of development.

Design elements selected:

- Dense moonah fringe lands
- Community hub with school
- Biodiversity links
- Minimal mixed density housing
- Low-level public lighting so that adjacent areas where migratory birds are not affected.

- Minimisation of areas to be developed.
- Tour bus route
- Vegetation buffer to shelter the bird habitat from the housing development.

Host observations
The main driver for this design was how to best protect what was there. Key needs were governance, knowledge, planning, education and social infrastructure. Cost was considered one of the biggest barriers. The design was innovative and required substantial investment over long periods of time and was complex on a number of different levels. The group felt if they had a choice that they would not develop this area but repurpose areas that were already developed. However, it was also seen as an opportunity to create an area that was unique by maintaining nature and building to preserve what was there by not imposing a standard design template.

Table 6: Greenfields scenario

This group approached the exercise through a risk perspective "working with nature to preserve and enhance what was there". They were particularly interested in how you could use natural forms to reduce natural hazard risks such as excessive wind and urban heat island.

Key issues discussed were:

- How to address the need for connection in the community.
- How to ensure inclusion for all people such as people with disabilities.
- The need for education.
- A connected community and the need to ensure ongoing services.
- How to implement in stages.

Design element selected were:

- Levees with pumps.
- Buffer zone from sea level which would not be developed.
- Community gardens and orchards.
- Wetlands to treat runoff.
- Wind turbines – also maintain sea breeze as it is an asset for reducing UHI
- Swales along streets instead of gutters.
- Bike paths and walking paths, sports field (water storage underneath), also community hub near sports field.
- Broadband network and electricity underground.
- Inclusive design – e.g., use flat areas for people with disabilities.
- Environment education centre.
- ESD core part of house design – solar panels, coastal tolerant materials, water recycled and used in the development.
- Using a water course as a fire break – also considering what roads would be needed to ensure there was more than one way out in case of fire.
- Transitional development – creating diversity in lots of sizes and housing stock – this should be sensitive to environmental impact and area.
- Biolinks, green infrastructure through all street development.

Host observations
This table decided to take a risk approach to the exercise and look at how the natural environment could be used to mitigate natural hazards such as bushfires, urban heat island, flooding, wind and extreme weather impacts. Energy security and connectivity was seen as important aspects of this exercise. Diversity in housing stock and ESD was key to this design. The idea was to have a community that worked and lived within the natural environment rather than one that imposed on it. The key benefits were seen as reducing risk and the main opportunity was to "start from scratch" and incorporate the multiple opportunities.

Table 7: Mixed Development Scenario

This table chose to use the exercise as an opportunity to develop a design of what was possible. The participants chose to utilise existing land and assets in a way that created diverse opportunities across the area. The key focus was to create liveable and sustainable communities and to repurpose what they could within, as well as adjacent to the area.

Key issues discussed were:

- How to mitigate potential pollution from the pre-existing landfill and industry.
- The need to mitigate flood risk.
- The need for food and energy security.
- Transport infrastructure that supported activity such as bike riding and walking (light rail).
- The need to use it as an opportunity to revitalise the area and increase local jobs in both the development and adjacent areas, social procurement and training programs were seen as a key part of this.
- The need for key policies to support the development.
- Precinct planning where shops were integrated into each street.
- Education.
- Best practice and innovation
- The need to make nature 'part of the economy'.

Design elements selected:

- WSUD wetlands, water capture and storage, retaining basins and permeable surfaces.
- Eco-education Centre with wildlife sanctuary.
- Recreational open space – sporting fields
- GI used to reduce wind and also dust from industry.
- Solar farms on capped landfill and adjacent industrial area.
- Creating a best practice industrial precinct with local industry.
- Mix medium and high density buildings with 12–15% public open space requirement in all development

Host observations

This development was seen as a key opportunity to create a community that could use sustainable technologies as a way of increasing security for the local community. Key needs were funding, ownership, engagement, education, innovation and long-term planning. Political aspects were seen as major barrier as were community attitude to change and innovation. Lack of resources, upper management support and ongoing costs and business cases to support this were also seen as challenges to achieving this project. The key opportunity was seen to rejuvenate this area from lagging to leading through collaboration and to build a better-connected community through clever use of technology and nature.

Values

The values assessed in this summary are based on the primary value group associated with the benefit selected by the workshop participants. It does not show the full value chain of benefits provided by these assets and actions, which are more extensive. Its purpose is to provide a 'broad brush stroke picture' analysis of the values selected for to gain some insight as to how values were currently used and understood by the workshop participants. There were 25 value groups (see Attachment E for details) which fell into three categories (social environmental and economic) used to assess the outputs of this exercise.

Overall, 187 separate allocations were made by the participants during the exercises undertaken. Benefits had the highest, with 119 allocations compared to 72 allocations in the avoided losses area. Aggregated allocations across the categories were reasonably consistent with the highest allocations in the social value area (67 allocations), economics (63 allocations) and environment (61). There were more values groups used when allocating to benefits (24) than avoided losses (20). The higher diversity and allocation of values in the benefit area could indicate less understanding in the area of values related to avoided losses and the need for further education in this area. This is relevant, because showing potential future savings as well as the benefit of an action is a key part of developing business cases.

In terms of the different social, environmental and economic value categories, the social value category was found to be the most diverse with 20 different value groups selected for benefits and 13 value groups for avoided losses. This may point to an opportunity to position and use more diverse social values in developing the case for green infrastructure in the future. Natural hazard and efficiency values were the most dominant values in both the benefits and avoided loss values.

What is interesting to note is the variation of allocations across the value categories and the benefits and avoided losses. The social category had the highest allocations in relation to benefits with 47 allocations. However it had the lowest allocation in relation avoided losses with 20 allocations (see Figure 4 below). This raises a number of questions in relation to why this is the case and would benefit further from further investigation to determine if there are actually less avoided costs or there are other possible determinants for this result.

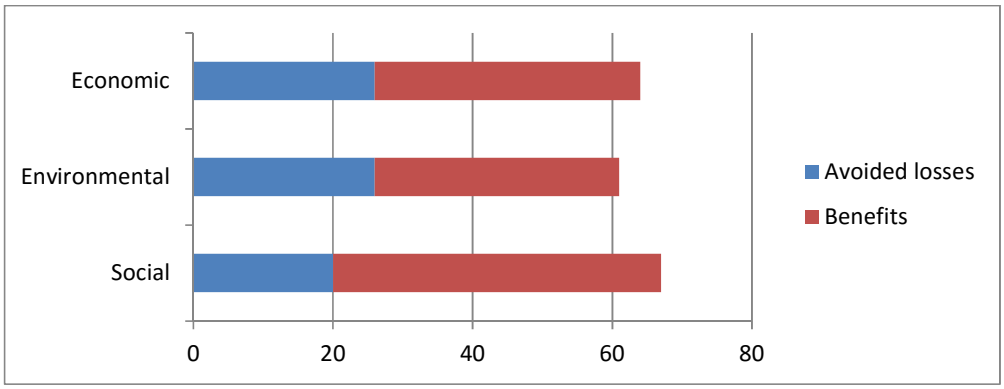

Figure 4: Allocation of values per value category.

Avoided loss values

There were 72 allocations associated with avoided losses allocated during the scenario exercises. Natural hazards risk & impact reduction (18%) and efficiency (17%) were the largest group of avoided loss values selected with connectivity(10%), financial wealth (8%), habitat (7%) and health (6%) being the next largest allocations (see figure 5 overleaf).

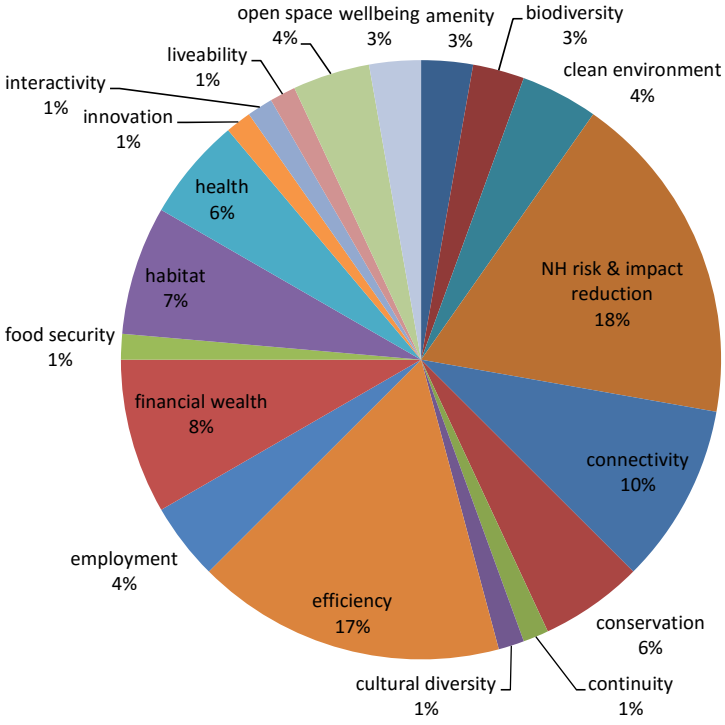

Figure 5: Aggregated avoided losses value.

The individual categories showed some consistency between the economic and environmental categories (28%/23%)with natural hazard risk and impact reduction and efficiency values (23%/19%) being the most allocated groups and both showing the same percentage of allocation for habitat (8%). The main variation in the avoided losses were in the social category (see figure 8 overleaf) where connectivity (20%) was the priority value with amenity, financial wealth, employment and health being equally allocated (10% of allocation) as the next most prioritised areas in this category.

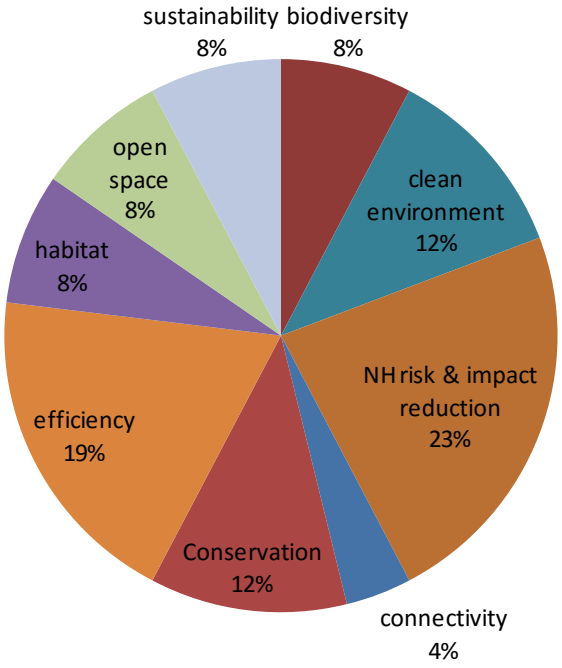

Figure 6: Avoided losses values – Environmental.

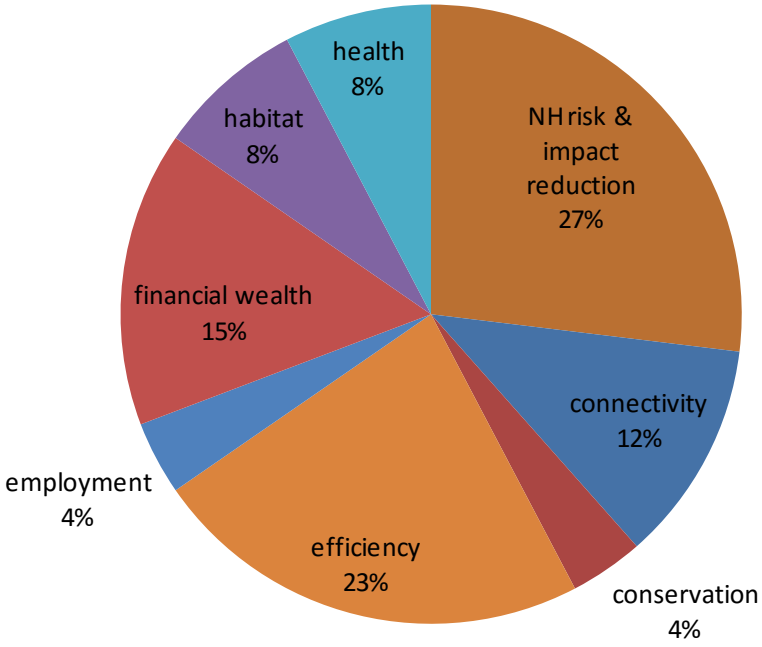

Figure 7: Avoided losses values – Economic.

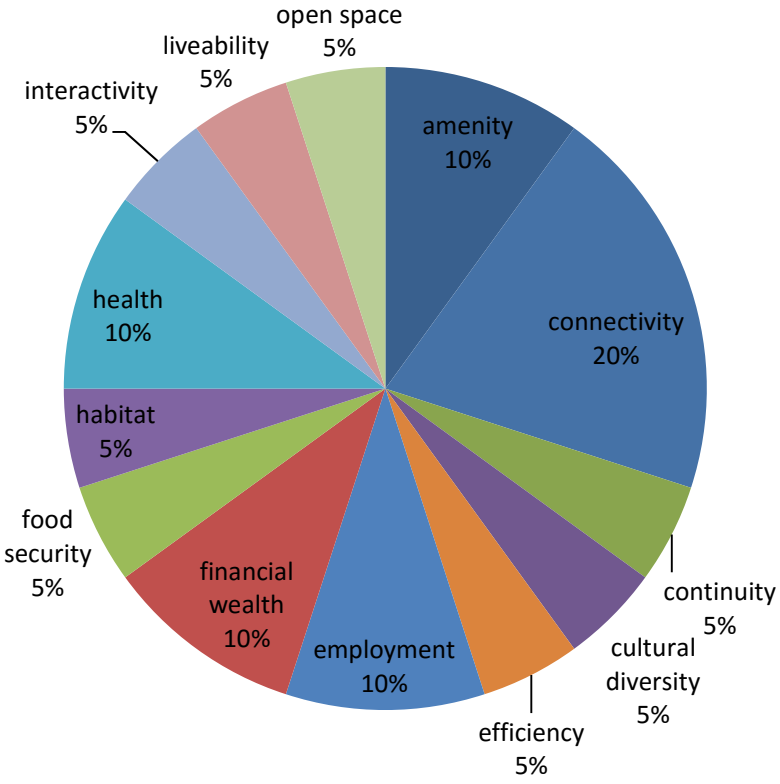

Figure 8: Avoided losses values – social.

Benefit values

There were 119 allocations to the benefits area during the scenario exercises. Natural hazards risk & impact reduction (12%) as the largest areas of allocation with efficiency and innovation (8%) education/knowledge (7%) being the next highest areas of allocation.

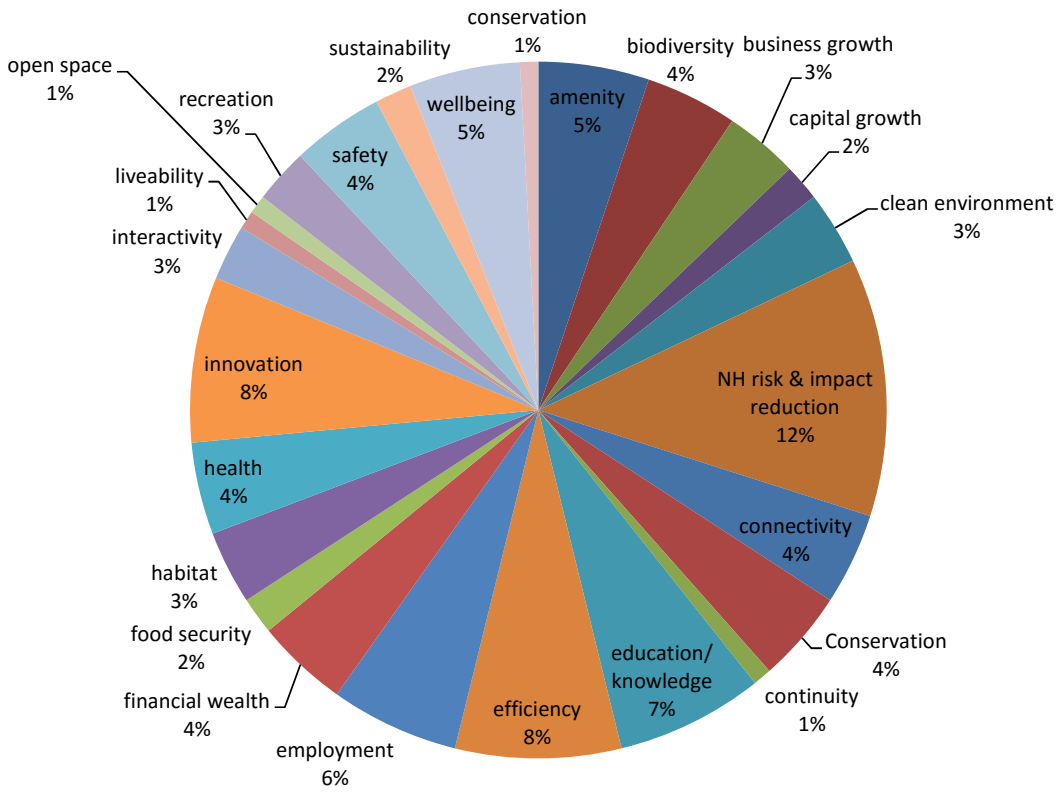

Figure 9: Aggregated benefit values.

The individual value categories varied quite a deal. The largest value groups in the social categories were natural hazard risk & impact reduction (11%) and connectivity (11%) with other prominent areas of allocation being education and knowledge, amenity and health all with 9%, (see figure 10). Natural hazard risks & impacts reduction (20%) were also the largest group of allocated values in the environmental category with other prominent areas of allocation being conservation (11%), efficiency (11%) and habitat, biodiversity and habitat all being allocated 9% (see figure 11 overleaf). The largest allocations in the economic category were to the innovation (17%) and employment groups (14%). Other prominent allocations were to business growth and sustainability with 11%, (see Figure 12 overleaf).

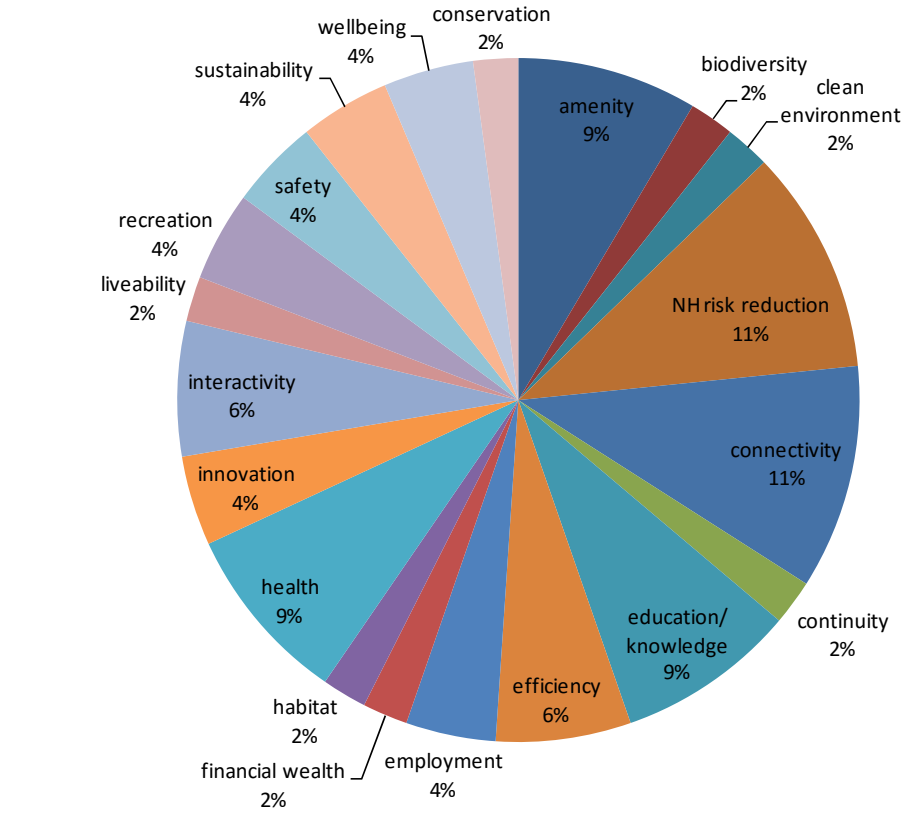

Figure 10: benefit values – social.

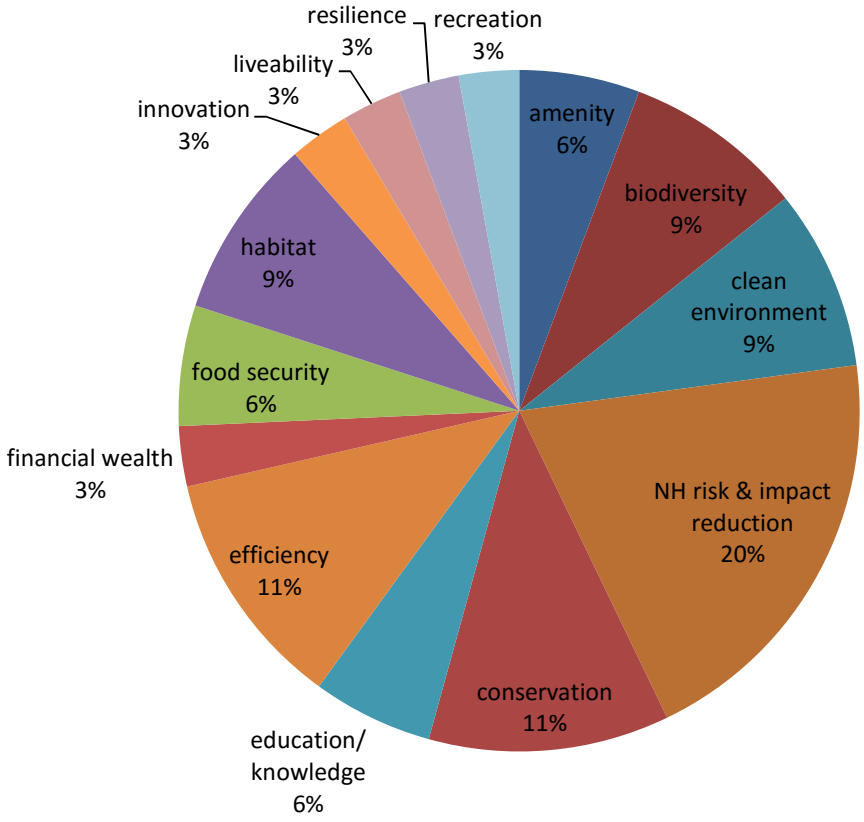

Figure 11: benefit values – environmental.

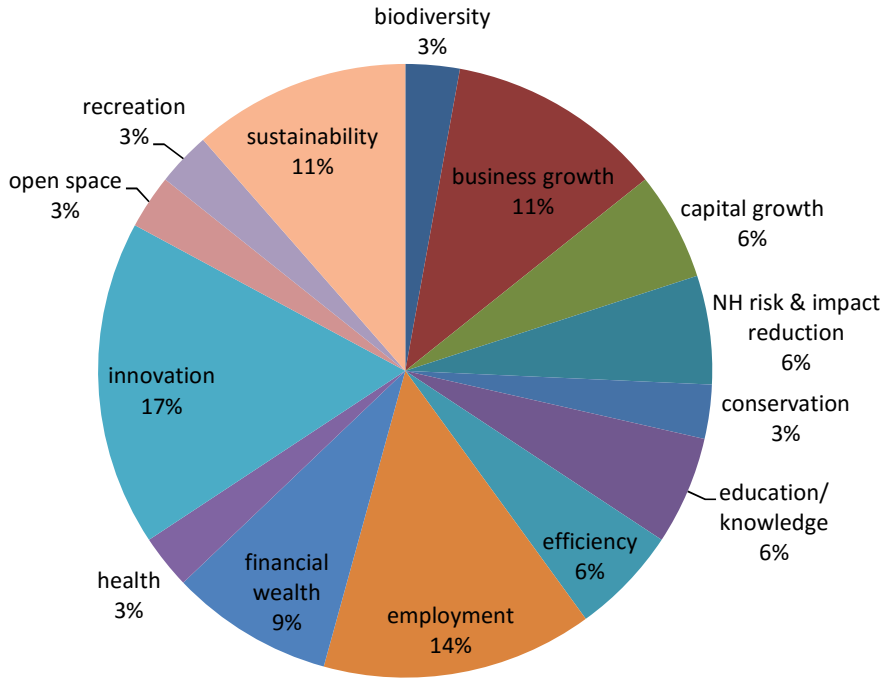

Figure 11: Benefit values – economic.

Key needs, barriers and opportunities

Due to the long-term and innovative nature of the scenario designs, these projects have a number of specific needs that differ from conventional projects (for details see Attachment G), in particular, the need for different types of policy and regulation that were outside the current political cycles. Long-term visions and plans were seen as central to securing the support and investment from communities and private and public investors needed to achieve these projects and maintain them in the long-term, as well as ensuring ownership of the projects and governance to support this. Collaborative mechanisms that created buy-in and commitment to projects from the community and key stakeholders was also seen as crucial. Developing new ways of communicating and engaging such as demonstrating new technologies through pilot and beacon projects was seen as important, as was ongoing education and learning.

Key areas of needs were:

- Funding and investment over long-term time frames.
- Long-term policy and regulation, strategies, vision and planning
- Social and operational change and transformation.
- Buy-in, ownership and accountability.
- Frameworks and physical, social and operational infrastructure to support actions.
- Enterprise – the ability to ascertain the benefits and value of the project.
- Engagement and communication across both internal and external stakeholders.

Barriers

Financial arrangements, policy stability, long-term planning and strategy and the need for changes in ways of thinking were the key barriers. Financing and resourcing the projects and the maintenance and legacy aspects of the assets created over the long-term was seen as

a major barrier. A particular issue raised was how to maintain cost effectiveness without compromising affordability. The current attitudes and perceptions towards aspects of the designs in both public and private sectors were seen as a hurdle to acceptance and uptake of some of the proposed options. A lack of comprehensive ways to value the benefits was also perceived as a barrier to being able to develop robust business cases needed to gain support for the projects. The complex and collaborative nature, the blending of multiple areas of knowledge, the balancing of diverse agendas, multiple levels of engagement and the future uncertainty that is inherent in these sorts of projects, were also articulated as potential barriers.

Key areas for barriers were:

- Lack of long-term policy, regulation and strategy.
- Financial aspects - investment and funding. The cost of projects and who pays for this. This issue of how to maintain affordability whilst still addressing environmental and social issues.
- Support, buy-in, need for good business cases.
- Current operational systems, processes and methods of assessment.
- The environment – particularly the difficulty of working with degraded or polluted environments.
- Risk and uncertainty about outcomes and the future.
- Ability to gain long-term commitment to vision and resource allocation to enable projects.
- Challenges related to innovation such as change, transformation and uptake of new technologies and ways of doing things.

Consolidation of thoughts

"There is a real art in working within the constraints we currently have in way that allows us to act for the future."

The final discussion for the day consolidated the key areas discussed during the day.

Key points from this discussion were:

- The need to integrate green infrastructure knowledge into mainstream operations and infrastructure planning so it not only has a "seat at the table" but is given equal consideration as other forms of more conventional infrastructure.
- This is an asset that we are not currently using in an effective way, there are so many opportunities.
- There is a need to rethink land use – "just because it is not developed, it doesn't mean that it should be developed".
- There is a real need to think about intergeneration equity and how our choices will affect future communities.
- Current perceptions of value and expectations of what is a priority agenda do not necessarily support green infrastructure, we need better business cases, clearer communication and long-term collaborations to support this.
- There is a need to think and plan long-term to enable these sorts of projects but we also need committed finance and funding to achieve this. You can't just stop projects like this half-way through because there is a change in politics - we need long-term political support to do these types of projects.
- A need for better valuation tools so we can identify and monitor projects.
- This is a long-term issue; it requires long-term thinking, long-term collaborations and long-term management of assets.
- Reframing the issue is key to being able to develop and realise these types of communities.

Conclusion

The workshop exercises illustrated the complexity and challenges of the economic aspects of valuing green infrastructure. They also illustrated the potential of green infrastructure to provide important economic and social benefits for communities. The complexity of interactivity across stakeholder groups, policy and operational aspects needed to enable these projects was also highlighted during these exercises. This indicated a need for greater integration and interaction throughout internal and external processes and systems to facilitate development and management of green infrastructure projects and assets.

The main opportunity articulated was to create communities that had the infrastructure and design they needed to be fully sustainable into the future by maximising and enhancing their natural and built infrastructure. There were a number of opportunities with the designs developed to increase and enhance social aspects of communities such as health and connectivity. The collaboration with both the community and public and private sectors was seen as a key opportunity to develop future markets through innovative projects and new technology, in a way that created employment and supported the develop of the local economy. It was also seen as a way of renewing areas that may have suffered stagnation and supported the building of resilience against future risks whilst maintaining levels of equity for future generations.

Key areas for opportunities:

- To provide more fully for future community needs through long-term planning and design that improves health, the environment, social interaction and connectivity.
- Innovation; the development of new industries and jobs.
- Collaboration; an opportunity to bring multiple stakeholders together to develop shared visions and investment.
- Risk reduction and increasing resilience to natural hazard impact and risks such as flooding, urban heat island and fire.
- To use what is already there in new and more effective ways to reduce cost and maximise resource use.
- To develop new ways of thinking about and working with green infrastructure.
- Renewal of neighbourhood and also local industry.
- Development of a new urban model.
- To create new ways of working with stakeholders such as a people's panel to create greater engagement and buy-in.
- To connect, inspire and transform.

Attachment A: VASP – Assessing the Value of Green Infrastructure Survey questions

1. Please provide the Name of your Council.
2. What are the key priorities for your Council?
3. How important is environmental sustainability for your Council? Please rate on a scale from 1-5 , 1 being not important, 2 being somewhat important, 3 being important, 4 being very important and 5 being extremely important.
4. What are your Council's core values?
5. Please tell us your Council vision as articulated in your Council Plan.
6. What aspects of your Council Plan, if any, relate to this project?
7. What current Council strategies and policies are related to this work? Please provide a web link to each document if possible.
8. Please provide brief detail on the nature of the relation of those strategies and policies to this work.
9. List other projects (within your council and other councils agencies and organisations) that you are aware of that are related or connected to this project.
10. What is the nature of relationship of your Council projects and what are the timeframes, if any, that are related to those projects?
11. Please list the key internal stakeholders, by title, team, branch or department that you consider important to engage with during this project.
12. Please list the key external stakeholders that you consider important to engage with during this project.
13. What methods are you currently using to cost the ROI for your Green Infrastructure projects?
14. What data do you have that you think would be useful to provide for this project?
15. Please list the current barriers to catalysing green infrastructure projects within your municipality – these may include internal and external factors.
16. Who are the key decision makers on your Council when it comes to budget allocation?

Attachment B: State and Federal legislation related to green infrastructure

Policy	Purpose
Direct Action Plan (Cth) (forthcoming)	Proposed plan to reduce GHG emissions through the Emissions Reduction Fund (ERF) to provide incentives for abatement activities across the Australian economy. It will include targeted funding for urban trees.
National Sustainability Framework for Financial Reporting and Asset Management Approach to Asset Planning and Management 2007 (Cth)	The framework is designed to evaluate progress with implementation of the Local Government Financial Sustainability Nationally Consistent Frameworks (LGPMC Financial Sustainability Frameworks) initiated by the Local Government and Planning Ministers' Council (LGPMC) and adopted in 2007.
Natural Disaster Resilience Framework 2008 (Cth)	The aim of this framework is to support measures to strengthen communities, individuals, businesses and institutions to minimise the adverse effects of disasters on Australia. This improves the ability to prevent, prepare, respond to and recover from disasters across social, economic, environmental and governance element
Victorian Climate Change Adaptation Plan 2012 (Vic)	A framework to support building resilience to climate change impacts through improving the resilience and preparedness of communities, the environment and the economy.
Regulation	
The Local Government Act 1999 (Cth)	Aspects of this act have pertain to the effective development and management of assets and infrastructure. This includes the need to have an I&AMP, covering the management of infrastructure and other major assets of the Council for a period of at least 10 years -Section 122 (1a)(b)and have a long-term financial plan covering a period of at least 10 years (Section 122 (1a)(a).
The Environment Protection and Biodiversity Conservation Act 1999 (Cth)	Provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places
The Local Government Act 1989 (Vic)	States that a Council must promote the social, economic and environmental viability and sustainability of the municipal district.
The Water Act 1989 (Vic)	Governs the way water entitlements are issued and allocated in Victoria. It defines water entitlements and establishes the mechanisms for managing Victoria's water resources.
The Environment Protection Act 1970 (Vic)	Supports preventing pollution and environmental damage by setting environmental quality objectives and establishing programs to meet them.
The Flora and Fauna Guarantee Act 1988 (Vic)	Conserves threatened species and communities and manages potentially threatening processes.

Policy	**Purpose**
The Wild Life Act 1975 (Vic)	This act aims to protect and conserve wildlife and also to ensure sustainable use and access of wildlife, through regulation of activities.
The Litter Act 1987 (Vic)	Prohibits and regulates the deposit of litter in the environment and provides enforcement of this Act.
The Catchment and Land Protection Act 1994 (Vic)	(a) sets up a framework for the integrated management and protection of catchments; (b) encourages community participation in the management of land and water resources; (c) sets up a system of controls on noxious weeds and pest animals; (d) repeals and amends various Acts concerning catchment and land management.
The Planning and Environment Act 1987 (Vic)	A framework for planning the use, development and protection of land in the present and long-term interests of all Victorians.
The Native Vegetation Permitted Learning Regulations 2013 (Vic)	Require landholders to apply for a planning permit to remove, destroy or lop native vegetation.
Coastal Management Act 1995 (Vic)	a. to establish the Victorian Coastal Council; and b. to provide for the establishment of Regional Coastal Boards; and c. to provide for co-ordinated strategic planning and management for the Victorian coast; and d. to provide for the preparation and implementation of management plans for coastal Crown land; and e. to provide a co-ordinated approach to approvals for the use and development of coastal Crown land.
The Aboriginal Heritage Act 2006 (Vic)	Provides for the protection and management of Victoria's Aboriginal heritage with processes linked to the Victorian planning system.
Climate Change Act 2010 (Vic)	Developed to provide a regulatory framework for strategic responses and support mechanisms needed to address the mitigation of climate change causes and impacts.
National Parks Act 1975 (Vic)	A regulatory framework for management of National Parks and the natural assets and resources contained within them.
Crown Land (Reserves) Act 1978 (Vic)	A regulatory framework for the management and use of crown reserve land.

Attachment C: Council research workshop questions

1. Ascertain how decisions are made in relation to green infrastructure in your organisation and the criteria for the current decisions that are being made.
Key questions:

- How are decisions currently being made in relation to green infrastructure in your organisation?
- What are the key areas considered when making green infrastructure management decisions?
- What systems are currently used for green infrastructure management and who uses them?
- How is monitoring and evaluation being undertaken?

We will explore these questions through using is a process mapping exercise which will map key decision points and values used in the decision-making process.

2. Identify successful activities to date and lessons learnt from previous GI projects.
Key questions:

- Why have the projects to date been successful in obtaining funding?
- What projects haven't been successful to date and why?
- How would you rate the importance of the projects to your community you have been able to gain funding for?
- How would you rate the importance of the projects to your community that you have been unable to develop due to lack of funding?
- What are the key benefits of current projects?
- What are the key benefits of projects you were unable to obtain funding for?

This will be undertaken in the form of a facilitated conversation with the group.

3. Understand what the overall decision-making process in relation to assets is within each council and the systems that support this.
Key questions:

- How are decisions currently being made in relation to general infrastructure in your organisation?
- What are the key areas considered when making general asset management decisions?
- What systems are currently used for asset management and who uses them?
- How is monitoring and evaluation being undertaken?

We will explore these questions through using a process mapping exercise which will map key decision points and values used in the decision-making process.

Identify areas of opportunities to embed aspects of the framework being developed within the current organisation.
Key questions:

- What the synergies?
- Which elements of green infrastructure (if any) are considered to be part of the general asset portfolio?
- What is not being considered, why is it not being considered?
- From an asset management point of view, what could help improve decision-making in relation to green infrastructure project management and approval decisions?
- What are the opportunities for embedding green infrastructure into the mainstream system?

Attachment D: Agenda for Investing in Growth Workshop

Investing in growth – understanding the value of green infrastructure workshop
Agenda

Time: Thursday 18 September, 9.30am – 3.00pm

Venue: The Swanston Room, Melbourne Town Hall, 90–120 Swanston Street, Melbourne

9.00am	Registration	
9.30am	Workshop introduction	Prof Bruce Rasmussen, Director, Victoria Institute of Strategic Economic Studies, Victoria University
9.40am	Welcome	Arron Wood, Councillor, City of Melbourne
9.50am	Surviving and thriving: balancing needs for sustainable futures	Stephen Chapple, National Chair, Economic Development Australia
10.10am	Green growth and travelism – the infrastructure imperative	Prof Geoffrey Lipman, Director of Greenearth.travel and President of International Coalition of Tourism Partners (ICTP).
10.30am	Turning green into gold – understanding the value of green infrastructure	Prof Roger Jones, Professorial Research Fellow, Victoria Institute of Strategic Economic Studies, Victoria University
10.50am	Discussion with panel	Panel discussion with speakers
11.10	Morning tea	
11.30am	Green infrastructure: what is it? What does it do?	John Symons, Research Fellow, Victoria Institute for Strategic Economics Studies, Victoria University
11.40am	Exercise 1 Mapping	Group Activity
12.30pm	Lunch break	
1.15pm	Understanding values at a local level	Yvonne Lynch, Team Leader, Urban Forest & Urban Ecology City Design, City of Melbourne
1.25pm	Exercise 2 Identifying avoided costs and benefits	Group Activity
2.00pm	Riding the wave, opportunities and barriers of implementing green infrastructure	Celeste Young, Collaborative Research Fellow, Victoria Institute of Strategic Economics Studies, Victoria University
2.10pm	Exercise 3 Needs, barriers and opportunities	Group Activity
2.45pm	Final observations	Group Activity
3.00pm	Close	

Attachment E: Values groupings

Group	Benefits included
Amenity	visual and physical amenity
Biodiversity	Flora and fauna diversity
Business Growth	Increase in either businesses or an individual business
Capital Growth	Increases in house prices
Clean Environment	Clean air, water,
NH Risk & Impacts Reduction	Flood, fire, heat waves (Urban heat Island), extreme weather drought, wind, climate change related events
Connectivity	Physical and social connectivity
Conservation	Protection of areas or things of value
Continuity	Lack of disruption of services
Cultural Diversity	Different socio-economic and demographic
Education/Knowledge	Education knowledge hubs, exchange or generation
Efficiency	Resource efficiency, includes reduction in car use
Employment	Job creation
Financial Wealth	Increase in wealth through money not spent
Food Security	Local sources of food
Habitat	Natural habitat
Health	physical
Innovation	New technologies and innovation hubs
Interactivity	Community interactions
Open Space	Open spaces
Resilience	Only allocated if it is specifically listed
Recreation	Sports, activities
Safety	Physical safety
Sustainability	Only allocated if it is specifically listed
Wellbeing	Connection to environment, spiritual wellbeing

Attachment F: Scenarios

Scenario 1: Green Fields Development

Coastal setting with fringing wetlands and remnant grasslands adjacent to an area of former grazing land. A developer has been contracted to build ~450 houses on a 300 hectare site, mostly low profile.

As planners and project developers and managers, you have an opportunity to recommend the overall makeup of infrastructure on the site with the goal of making it as resilient as possible. However, the Minister has called in the development and stipulated that the number of dwellings is non-negotiable. You may however, be able to persuade the developer to modify their configurations of the site if it can be shown to increase house and property prices.

Your task is to integrate green infrastructure into the development and its surrounds as much as possible.

As a guideline, the following developer contributions totalling $268,000 per hectare are available:

- A capped Community and Recreation component of $80,000 per Net Developable Hectare;
- A variable Transport Construction component of $77,000 per Net Developable Hectare; and
- A variable Public Land component of $111,000 per Net Developable Hectare

The site adjoins a RAMSAR wetland (mainly saltmarsh) harbouring protected species. The site is 23 km to the city and has access to car transport with the potential for new bus routes.

Risks

- Coastal flooding – the seaward part of the site is subject to a 1 in 200 storm surge, which will become a 1 in 40 storm surge with 30 cm of sea level rise
- Poor drainage in the area makes it vulnerable to large downbursts
- The flat terrain and seaside location lends itself to extreme winds, on occasion exceeding 100 kmh
- Heat waves affect the region in summer and there is little natural relief except for an afternoon sea breeze
- The soils have little water holding capacity and have poor drainage
- Grassfires can potentially threaten the site from the southwest

Scenario 2: Brownfields Development

The old auto manufacturer and biscuit maker Carnotts has closed its doors in an old industrial site of 250 hectares close to the port. The original plan had many aspirations to be a key community-led urban renewal site, but this has been altered to a more commercially-oriented model as the government has allocated some of the funds to infrastructure elsewhere.

You have been brought in as a crack team of urban renewal planners and project developers and managers to bolster the argument for getting extra funds on site through your innovative and persuasive strategies for integrated urban green infrastructure. The mix of approved heights for the site ranges from 6–25 storeys, but you have the freedom to propose various site mixes.

The site is affected by toxic contamination of 35% of its area. The stormwater outlets for the area are also subject to back-up due to combine high water levels in the adjacent river and storm surge on a 1 in 50 year basis, but this is expected to rise to 1 in 15 by 2025. The development is bordered by a major truck route though one side of the development.

Risks

- Stormwater outlets subject to back-up due to combined high water levels in the adjacent river and storm surge on a 1 in 50 year basis, expected to rise to 1 in 15 by 2025
- Site affected by high urban temperatures and radiative heat due to industrial neighbours
- Little green infrastructure onsite except for some bordering street trees planted about 15 years ago, a sports ground and general reserve
- Stormwater and local water infrastructure will all need to be refurbished or built again

Scenario 3: Mixed development

This urban site of 300 ha contains a mix of low-income housing and industrial, light industrial mixes, open land and market gardens. The area has a number of sand quarries and landfill, several active and several capped. Methane is being collected from one which is closed. You can assume the others are stable and can be developed for open space (this scenario does not assume knowledge of EPA regulations and hydrogeological and environmental waste knowledge). Participants can stipulate add their own environmental details consistent with the visual details on the satellite map.

The site has an open drain on its east side, which has poor water quality. This drain, and some adjoining stormwater trunk systems are subject to flooding, which is projected to become worse with urban infilling.

Many immigrant groups have moved here because of the cheap housing but some streets are without footpaths, especially those close to light industry. Old warehousing is beyond refurbishment and has been let degrade as other areas with better transport have been preferred. Several market gardens are holding on.

The region has been identified for urban renewal as many CALD groups have made their homes here and the region is one of high unemployment. You have been called in as a team of urban renewal planners and project developers and managers to integrate green infrastructure through the area, as it has been identified as a relatively cheap way to conduct urban renewal which will prompt private development of the existing and future housing stock. The potential for green infrastructure on old landfill can also be considered.

Risks

- The drain and adjacent properties are subject to flooding on a 1 in 30 year basis. Most properties are industrial but a few houses are affected.
- Heat waves affect the area, but existing open space also provides relief
- Roads have few street trees or footpaths
- Several truck yards are local sources of pollution
- There is a lack of sporting facilities in the area and few linked path or cycle ways

Attachment G: Scenario exercise outcomes

Table 1

Avoided losses (what losses have been avoided)	Benefits (what is gained by these actions)
Social ▪ Avoided health impacts from dealing with toxic soil. ▪ Avoided decline in population diversity due to closure of industry by using green infrastructure make a place which will attract new types of people to the area to work, live and play. ▪ Avoiding stagnation of suburb using mixed housing stock to enliven and integrate adjoining populations.	▪ Better connectivity and accessibility of surrounding communities to the city ▪ Increased amenity – reduction in stress. ▪ Decreased travel times. ▪ Increased street activation.
Environmental ▪ Avoided health impacts from dealing with toxic soil. ▪ Avoided decline in population diversity due to closure of industry by using green infrastructure make a place which will attract new types of people to the area to work, live and play. ▪ Avoiding stagnation of suburb due using mixed housing stock to enliven and integrate adjoining populations.	▪ Better connectivity and accessibility of surrounding communities to the city. ▪ Increased amenity – reduction in stress ▪ Decreased travel times. ▪ Increased street activation.
Economic ▪ Avoid – health impacts and associated costs. ▪ Avoid loss of heritage – using what is there, e.g., local biscuit factory Carnotts. ▪ Avoid waste through repurposing and re-use of existing building fabric/materials into "Highline" style development through ▪ Linking urban forest roof over rail ▪ Biodiversity links and trails ▪ reducing costs of waste disposal	▪ Urban ecology. Aquaculture – new jobs. ▪ R&D hub – intellectual hub – draws in innovation. ▪ Development and operation on-site attracts variety of job opportunities. ▪ Development and operation of site. ▪ Knowledge centre, techno-centre, using local people. ▪ Attracts variety of job opportunities.

Needs	Barriers	Opportunities
Short term Precinct structure plan and shared vision: ▪ Onsite analysis ▪ Costed ▪ Community buy-in ▪ Business ▪ Zoning and planning agreements ▪ Funding ▪ Training ▪ Negotiation ▪ Investment in infrastructure	▪ Clean up/capping for contamination areas and study. ▪ Feasibility of addressing energy needs for the district. ▪ Lack of skills – need for training and reskilling of residents and workers.	▪ Innovate trade-offs – negotiate and incentivizing green infrastructure. ▪ Residential buy-in to master plan community. ▪ Opportunity for industry clean-up and develop renewable energy. ▪ Infrastructure supported by R&D. ▪ Local food distribution via railway. ▪ New urban renewal model focused on liveability and green infrastructure.

Long-term ▪ Green infrastructure delivery mechanisms ▪ R&D ▪ Working relationships ▪ Wetland ▪ Innovative culture ▪ Building a village	▪ Industry converting Community responsiveness – cohesiveness and appropriate innovation model. ▪ Culture change, need for education for partner adoption. ▪ Light rail infrastructure. ▪ Planning for renewable green energy development.	▪ Cash for clunkers. (Take back cars and repurpose for homeless. Create employment and training as part of this). ▪ Completion of conversion of industry sheds. ▪ Transport connection to existing suburbs and city.

Table 2

Avoided losses (what losses have been avoided)	Benefits (what is gained by these actions)
Social ▪ Wetland avoided infrastructure damage and upheaval for business/residents.	▪ Wetland cooling, public health, walking cycling connections ▪ Storm water management, reduced flooding, harvesting and amenity ▪ Wetland biophilia, recreation, air quality ▪ Green spaces, cooling the environment ▪ Building design, vertical gardens, amenity, nature connection
Environmental ▪ Storm water management, treating contaminants within the site, avoiding pollution downstream. ▪ Building design, more high rise, more open space	▪ Wetland habitat, ecosystem services, cooling ▪ Storm water reduced flooding, harvesting and amenity.
Economic ▪ Green spaces reducing heating and cooling costs, reduce radiant heat. ▪ Wetlands, avoided infrastructure damage.	▪ Wetland international bird sanctuary, tourism $. ▪ Preference to use contaminated land for sporting reserves or less sensitive uses.

Needs	Barriers	Opportunities
Short term ▪ State government support. ▪ Vision and purpose. ▪ Beacon projects.	▪ Lack of certainty. ▪ Toxic land. ▪ Additional cost. ▪ Valuing benefits. ▪ Who pays? ▪ Political support.	▪ New skills ▪ Learning collaboration ▪ Education across primary, secondary and tertiary
Long-term ▪ Ongoing support.	▪ Ongoing support. ▪ Affordable housing. ▪ Lack of project. ▪ champion/leadership.	▪ Master planning ▪ Healthy city ecology and population ▪ Desirability

Table 3

Avoided losses (what losses have been avoided)	Benefits (what is gained by these actions)
Social ▪ Lack of food security. ▪ Loss of jobs. ▪ Loss of amenity. ▪ Loss of vegetation.	▪ Low crime rates. ▪ Jobs from bioenergy. ▪ Market gardens – education generate social and community benefits. ▪ Water recreation. ▪ Creation of corridors for people. ▪ Community hub – pool social. ▪ Health – sports fields, parks – take pressure off health systems.
Environmental ▪ Reduction energy consumption shading through impacts of UHI. ▪ Avoided GHG. ▪ Water shortages – water retention in landscape and water reuse. ▪ Loss of water quality and vegetation.	▪ Air quality. ▪ Biodiversity. ▪ Habitat. ▪ Creation of corridors for habitat.
Economic ▪ Financial stress/cost through increased insurance premiums. ▪ Reduced pressure on health and grey infrastructure.	▪ Increasing property prices. ▪ Methane capture for power generation. ▪ Flood mitigation. ▪ Attracting tourism, shopping. ▪ Aquaculture. ▪ Flood warning system – IT jobs. Jobs: ▪ Commercial ▪ Retail ▪ Construction ▪ Hospitality ▪ Open space ▪ Market gardens

Needs	Barriers	Opportunities
Short term ▪ Soil testing. ▪ Community support political support – rezoning. ▪ Relocation of industry development services scheme. ▪ Transport infrastructure ▪ Resourcing – technical planning, logistical. ▪ Culturally appropriate planning facilities. ▪ Develop long-term vision ▪ Sensitive transition of land use. ▪ Guidelines.	▪ Business case. ▪ Funding source. ▪ Transport , routes, trucks, dust. ▪ Investment, timing, political will. ▪ Engaging a community that does not exist. ▪ Land ownership and tenure – insurance. ▪ RISK- development certainty, contamination ▪ Perception of reclaimed land and water.	▪ Recreational areas for neighbouring councils. ▪ Locally sourced goods/services. ▪ Local employment. ▪ Neighbourhood renewal ▪ Partnership – continued learning. ▪ Marketing.
Long-term		

▪ Strategic planning for land use. ▪ Change. ▪ A reason for people to be there and for them to stay there.	▪ Ongoing funding for maintenance. ▪ Chemical leakage from market gardens and water ways. ▪ Maintenance of the vision in long-term planning. ▪ Long-term planning ▪ Quality of designs – housing ect.	▪ Self-sustained. Community food production – H2O. ▪ Energy – jobs ▪ Community connected to nature and to each other. ▪ Healthier society, better educated population. ▪ CO2 sequestration. ▪ Forest products. ▪ Enhancement of biodiversity. ▪ Protection of downstream water ways. ▪ Water security. ▪ Reduction of UHI

Table 4 & 5

Avoided losses (what losses have been avoided)	Benefits (what is gained by these actions)
Social ▪ Community engagement - Involve people in developing urban green amenity, pocket gardens and parks. ▪ Loss of open space - Group strongly argues for more mixed development improve potential for green space. ▪ Connectivity - Need shuttle or maybe light rail to train line.	▪ Social cohesion, pocket gardens and community gardens. ▪ Education on environment. ▪ Address nature deficit disorder. ▪ Integrated energy and environment innovation.
Environmental ▪ Loss of topsoil, erosion control. ▪ Well-shaped precincts with ESD. ▪ Potential unavoidable loses of bird habitat through encroachment. ▪ Local solar and rooftop wind.	▪ Enhanced vegetation for birds. ▪ Bio Biolinks added some diversity also wetlands. ▪ Community education for high quality migratory bird habitat.
Economic ▪ Vegetated housing areas save energy. ▪ Buffered storm surge. ▪ Storm water collected onsite.	▪ High property values from intelligent, sustainable design.

Needs	Barriers	Opportunities
Short term ▪ Soil testing ▪ Community support political support – rezoning ▪ Relocation of industry development services scheme ▪ Transport infrastructure ▪ Resourcing – technical planning, logistical ▪ Culturally appropriate planning facilities ▪ Develop long-term vision ▪ Sensitive transition of land use ▪ Guidelines	▪ Business case ▪ Funding source ▪ Transport , routes, trucks, dust ▪ Investment, timing, political will ▪ Engaging a community that does not exist ▪ Land ownership and tenure – insurance ▪ RISK- development certainty, contamination ▪ Perception of reclaimed land and water	▪ Recreational areas for neighbouring councils ▪ Locally sourced goods/services ▪ Local employment ▪ Neighbourhood renewal ▪ Partnership – continued learning ▪ Marketing

Long-term ▪ Strategic planning for land use ▪ Change ▪ A reason for people to be there and for them to stay there	▪ Ongoing funding for maintenance ▪ Chemical leakage from market gardens and water ways ▪ Maintenance of the vision in long-term planning ▪ Long-term planning ▪ Quality of designs – housing ect	▪ Sustainable community – e.g., food production, H2O ▪ Energy – jobs ▪ Community connected to nature and to each other ▪ Healthier society, better educated population ▪ CO2 sequestration ▪ Forest products ▪ Enhancement of biodiversity ▪ Protection of downstream water ways ▪ Water security ▪ Reduction of UHI

Needs	Barriers	Opportunities
Short term ▪ Increased knowledge planning system. ▪ Governance structures protect values (ie environment, habitat) ▪ Enviro- infrastructure to go in early. ▪ Planning hierarchy, planning scheme design guidelines to protect and enhance environmental values. ▪ Social infrastructure critical for first stage. ▪ Increased knowledge ecosystems.	▪ Central wetland to be built first. ▪ Livability difficult to achieve. ▪ Complex knowledge needed. ▪ Low density reduces opportunity for mixed use. ▪ Local planning boundaries driving inappropriate development. ▪ Management structures? Public or private? ▪ Local and expert knowledge. ▪ Car orientated development.	▪ Walkable communities. ▪ WSUD and native trees/plants. ▪ Integrated network of open space and biodiversity corridors. ▪ Market as a special place, education network, shared infrastructure. ▪ Integrated networks provides for children, elderly, exercise, relaxation. ▪ Increased opportunity for social interaction and engagement.
Long-term ▪ Cater for ageing in place – build more in time ▪ Environmental change in surrounds	▪ Not a good place for development, poor resilience ▪ Low density so inadequate facilities unless very high price point ▪ Sea level and climate rises uncertain ▪ Maintenance costs ▪ Social infrastructure costs	

Table 6:

Avoided losses (what losses have been avoided)	Benefits (what is gained by these actions)
Social ▪ Creating hub, avoiding social isolation. ▪ Creating community connections.	▪ Enhancing peoples knowledge. ▪ Connection to natural species. ▪ Community hub, social cohesiveness and connection. ▪ Access to sports fields at all times due to available water. ▪ Fire break. ▪ Reducing risk. ▪ Protecting.
Environmental ▪ Maintaining and improving habitat around current Ramsar site. ▪ Reduced biodiversity loss. ▪ Reduce urban heat island effect through water to the surface. ▪ Ensure fast broadband to enable people to telecommute.	▪ Storm water treatment, less environmental damage through treatment in retarding basin. ▪ Consolidating urban growth means conservation areas are protected. ▪ Community garden, locally grown produce and food miles, education awareness of food source, local economy, ▪ Local and easy access for walking and cycling paths.
Economic ▪ Levees preventing loss due to flooding both inland and coastal. ▪ Wind, changing landform to reduce wind velocities and damage to infrastructure ▪ Undergrounding services i.e. electricity and internet.	▪ Reduced ongoing costs, due to solar panels on every building, smart ESD and reduced energy consumption and wind turbines. ▪ Reducing ongoing maintenance costs by ensuring smart design and appropriate materials (coastal tolerance). ▪ Fire breaks, reducing insurance premiums by reducing risk.

Needs	Barriers	Opportunities
Short term ▪ Responsible authority having a clear vision and sticking to it ▪ Policy commitment by responsible authority to achieve their vision ▪ Changes to legislation to mandate stronger ESD	▪ Because of location ability to grow large shady trees is limited. ▪ Perception by developers that doing it this way will cost more and decrease profits. ▪ Developers having appropriate overlays to retain the initial vision. ▪ Developers adapting current design to meet higher ESD expectations. ▪ Funding approach and role of councils in building infrastructure.	▪ Comparison between BAU and resilient to heat community, economic, health costs, costs and benefits ▪ Study reduced health cost on society from being a resilient community ▪ Create demonstration example of how built environment can impact on the immediate area/green space ▪ Demonstration of good native gardens to inspire residents

Long-term ▪ Long-term education about the value of green infrastructure for community members, developers, councils and politicians ▪ Changing people's values to desire these feature versus controlling these through government.	▪ Developers having appropriate overlays to retain the initial vision	▪ Advocate for stronger public transport links ▪ Connection and stewardship of residents of the green spaces/environment ▪ Hugely complicated to plan developments of this scale, bring developers on the journey ▪ Importance of involving the stakeholders early to ensure it meets their needs and desires ▪ Starting from scratch means you can incorporate lots of opportunities

Table 7

Avoided losses (what losses have been avoided)	Benefits (what is gained by these actions)
Social ▪ Avoid poor health and associated costs. ▪ Loss of visual amenity. ▪ Loss of community cohesion. ▪ Avoid increasing unemployment.	▪ Amenity transportation and health. ▪ Liveability and social interaction safety education. ▪ Local food – sustainability. ▪ Aquaculture jobs.

Environmental
▪ Avoid increased pollution.
▪ Loss of biodiversity.
▪ Losses of increasing climate change. impacts e.g., flooding.
▪ Increasing GHG.
	▪ Reduction in GHG.
	▪ Urban cooling.
	▪ Biodiversity increase and protection.
	▪ Reduction of pollution though the following actions:
	  ▪ Rehabilitation of creek
	  ▪ Solar farms
	  ▪ Permeable paths

Economic ▪ Reduced flooding costs to community ▪ Reduction in infrastructure damage. from extreme events such as flooding. ▪ Reducing loss of production and life during heatwaves. ▪ Avoided losses through unproductive land. ▪ Reduce losses through unemployment.	▪ Reduction in health costs. ▪ Capping methane – possible resource. ▪ Employment cluster and linkages – creating employment opportunities. ▪ Leading practice in innovation, development of new markets. ▪ Through: Solar farms, best practice parks, ecopark.

Needs	Barriers	Opportunities
Short term ▪ Funding to achieve goals. ▪ Education. ▪ Expertise. ▪ Pilot projects. ▪ Consultation. ▪ Establish ownership.	▪ Ownership issues. ▪ Lack of money to achieve aims. ▪ Lack of upper management support. ▪ Political agendas – changes in legislation and policy. ▪ Lack of support for innovation. ▪ Lack of education ▪ Uncertainty about the future demographic. ▪ Lack of staff and resources. ▪ Need to communication across large range of stakeholders – time consuming. ▪ Qualifying benefits. ▪ Business cases. ▪ Ongoing maintenance needs.	▪ Increase WSUD assets. ▪ People's panel to create greater community by in and ownership. ▪ Use IT on site – ecological apps for education. ▪ Collaboration. ▪ Education. ▪ Collective management across councils. ▪ Working with community groups to create change. ▪ Innovation industry – leading new markets. ▪ Use of existing tools.
Long-term ▪ Funding to achieve goals. Consultation - ownership ▪ Appropriate management. ▪ Communication across many sectors. ▪ Engagement and buy-in, marketing. ▪ Collaborative mechanisms. ▪ Design for sustainability at all levels. (economically, socially and environmentally) for the long-term.	▪ Environmental and economic stress. ▪ Community opposition – want to stay the same ▪ Stubborn industry. ▪ Big business can cause barriers. ▪ Lack of uptake of systems. ▪ Political change. ▪ Lack of qualification of benefits.	▪ Improve communication with broad range of stakeholders. ▪ Governance. ▪ Qualifying benefits. ▪ Mainstreaming across organisations and communities. ▪ Monitoring and evaluation.

Victoria Institute of Strategic Economic Studies
College of Business, Victoria University
Level 13, 300 Flinders Street, Melbourne Victoria Australia