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# Embedding Green Infrastructure into Local Government Streetscapes: Best Practice Review

The City of Yarra 2016

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# 1 Introduction

This *Embedding Green Infrastructure Best Practice Review* forms part of the larger Embedding Green Infrastructure Best Practice Toolkit project, funded by the State Government of Victoria and supported by the City of Yarra, the City of Moreland, the City of Melbourne, Brimbank City Council, the University of Melbourne and the Northern Alliance for Greenhouse Action as Project Partners.

The aim of this Best Practice Review is to define Green Infrastructure (GI) and to understand what constitutes best practice in its delivery. In doing so the document aims to identify and define aspects of delivering GI that Councils need to develop to embed best practice delivery of GI into their organisation.

It is recognised that the maturity of GI delivery varies across Melbourne's metropolitan landscape, from Council to Council. This Best Practice Review is designed to support practitioners whose aim is to improve their Council's performance and begin the journey of embedding GI within local government practice. It recognises that local government needs best practice guidance and toolkits to help them efficiently and effectively create real change for their local communities.

## 1.1 Aim

The aim of GI is to improve the environmental and social quality and amenity of an area and to contribute to the longer term aim of improving the liveability of our cities and communities. There is a strong push at the moment to make cities more adaptive and resilient through GI implementation to counter the effects of climate change (e.g. the urban heat island effect). The implementation of GI should respond to strategic drivers to 1) ensure implementation is co-ordinated to realise the greatest benefit for the community overall and 2) GI can respond to more specific requirements depending on the objectives of the site and its physical constraints.

There is also a recognition that this type of infrastructure is likely to remain a legacy for 50 to 100 years and represents a significant capital and ongoing investment for Councils. It is therefore important that organisations get GI right, that is, these assets are effective and cost efficient, and exhibit their potential benefits.

## 1.2 Definitions

For the purposes of this project:

- **Green Infrastructure** (GI) refers to trees, shrubs, grasses, and Water Sensitive Urban Design (WSUD) in urban environments.
- **Embedding** refers to the ability for Council staff to integrate Green Infrastructure into other streetscape projects in the public realm (such as road and drainage works). In other words this is the integration of planning, design, construction and maintenance of GI so that it becomes business as usual.

## 1.3 Best Practice refers to Industry leading examples of the planning, design, implementation and maintenance of green infrastructure.

This document is written for council practitioners who are involved in or planning to become involved in implementing green infrastructure within their municipalities. The best practice framework that was developed as part of this project (included below) is intended to assist practitioners identify aspects that may be required or improved upon to better deliver GI. Importantly, the document recognises that there are different levels of understanding and technical knowledge across municipalities and this document is written to be able to be understood by all.

## 1.4 Scope

The scope of the project was to investigate and summarise the feedback from four local governments across metropolitan Melbourne: the City of Yarra, City of Melbourne, City of Moreland and Brimbank City Council and to understand what best practice looks like and to explore their GI stories. This information was gathered via interview and workshops with Council staff. We also received valuable input from Melbourne University and the Northern Alliance for Greenhouse Action describing their activity in this field. This was supported by a literature review and follow up conversations.

## 1.5 Benefits of GI

There are a number of benefits associated with GI, a number of which are summarised below.

### Physical and mental health

Within the expansion and densification of our cities is the risk that we are designing landscapes that don't support physical and mental well-being. Ideally GI (including open spaces, WSUD and water bodies) deliver a connected network that provides access to open space that can result in physical activity and encourages people to use outside spaces more and, once outside, these green spaces help to promote positive social interactions (Farnham, 2010). By linking and connecting existing green assets GI aims to deliver multiple benefits: enhancing public use opportunities including physical activity that in turn is linked to reduce health problems and mental health issues, improving urban ecosystem health and countering habitat fragmentation (Ely, 2012). Interactions with natural environments have been shown to reduce stress and symptoms of depression and anxiety as well as being associated with improving recovery from illness (Bowen, 2015).

The City of Melbourne's Urban Forest Strategy notes that improved mental well-being is a relevant community benefit of the strategy.

### Water cycle improvement

GI mimics the natural water cycle by reducing stormwater run-off volumes, increasing potential for evapotranspiration, improving surface and groundwater connectivity and reducing pollutant loads to receiving environments. This results in healthier urban waterways, cooler cities and the potential to provide alternative water sources for irrigation (Ely, 2014).

- *Improved water balance:* Water that is intercepted by GI is either evapotranspired to the atmosphere or infiltrated into the soil profile into groundwater and ultimately nearby waterways mimicking the natural water cycle. GI contributes to reconnecting surface and groundwater through the removal of paved areas. Street trees also play a role by intercepting rainfall, especially associated with low rainfall events.
- *Healthier urban waterways:* Stormwater carries pollutants from urban catchments to local creeks, waterways and bays. GI can intercept and slow that flow, capturing and removing nutrients, sediments, heavy metals and gross pollutants before they enter the waterway.
- *Reduced flood volumes:* Any water that is captured, infiltrated, evapotranspired or used at source reduces water from flowing downstream, reducing stormwater volumes and potentially peak flowrates. The impact of GI on flood peaks can vary considerably from negligible to quite significant depending on a number of hydrologic and hydraulic factors within the catchment.

### **Liveability and climate change**

GI and water within the urban environment reduces the urban heat island effect within cities primarily through shade and evapotranspiration, reducing the likelihood of heat related stress and mortality. Green infrastructure also contributes positively to the appearance and amenity of urban streets and neighbourhoods.

- *Cooler microclimates:* GI has the potential to reduce urban temperatures by providing shading and evapotranspiration. The increased proportion of green surfaces (and corresponding reduction in paved area) reduces the heat generated from darker surfaces.
- *Reduced urban heat island:* related to the above, when applied at a larger scale green infrastructure can contribute to a reduced 'urban heat island effect' that can see cities warm by up to four degrees more than less urbanised areas around them (City of Melbourne, 2012)..
- *Safer streets:* GI can be employed to calm traffic and create an environment that encourages slower driving and better road safety. GI can also promote pedestrian comfort and make walking a more attractive and safer option.

### **Ecosystem services**

GI delivers ecosystem services through water cycle improvements (described above), providing habitat and materials through green spaces, under storey vegetation and tree canopy. Water bodies provide habitat for aquatic organisms while infiltration of water improves soil health.

- *Biodiversity benefits:* Increased green spaces, landscapes, and canopies provide habitat for a range of biodiversity within the urban environment. The Brimbank City Council recognise this value by including conversation zones that contribute to the preservation of threatened species within their definition of GI.
- *Improved soil health:* GI requires practitioners to encourage healthy soils and employ mechanisms that continually improve soil health including allowing infiltration of rain and stormwater. As an example, the City of Melbourne use structural soils to improve vegetation growth and performance of GI.

### **Economic benefits**

GI can make cities more desirable places to live and work, reflected for example in increased surrounding property values (Rosetti, 2013). The economic valuation of GI also takes into account metrics that reflect air pollution reduction, nutrient removal and carbon abatement.

- *Pollution reduction:* Depending upon the context within which it's installed, there may be potential for an economic benefit associated with pollution reduction including reduced nitrogen going to Port Phillip Bay or carbon capture associated with tree growth.
- *Influence property values:* Research shows that property value increases, and people are prepared to pay more for streets and suburbs with increased green infrastructure.

*Economic development:* GI creates more appealing places for people to visit, socialise, live and work.

Attracting people to places is the backbone of commercial and retail businesses and GI encourages economic activity in those areas. GI can also improve worker focus and productivity.

### **Embedded Streetscape benefits**

There are many additional streetscape benefits of embedding green infrastructure into existing streetscape works in the urban environment including Improved asset life, traffic calming, increasing pedestrian accessibility, and reduced costs.

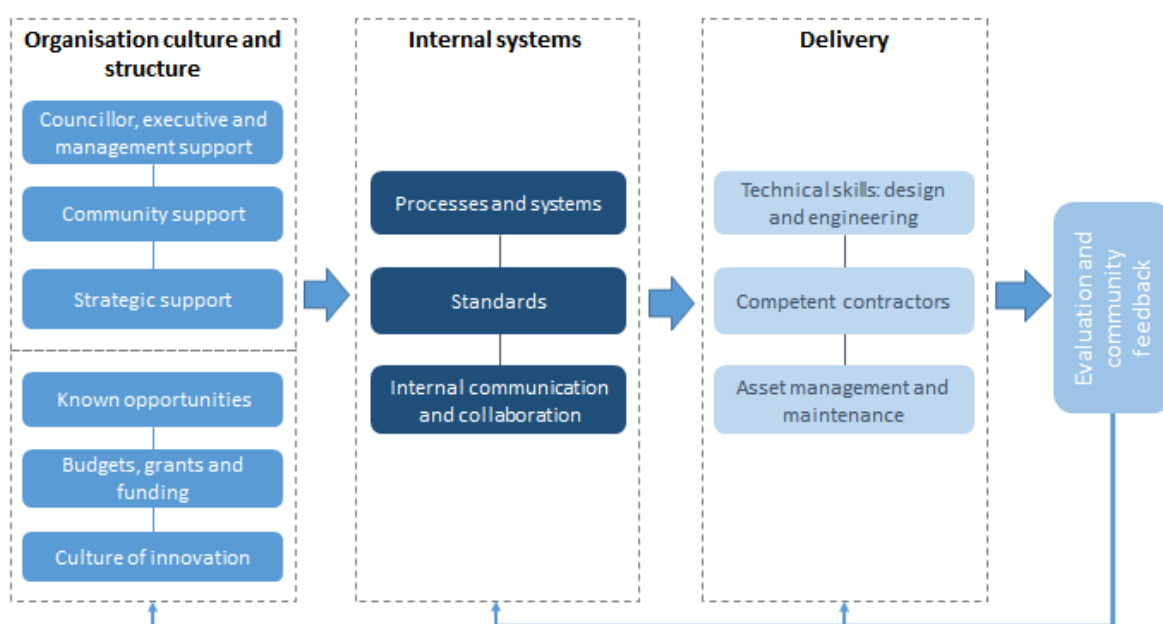
- *Improved asset life*: Shading contributes to extended asset life for pavements, road surfaces and buildings. Canopy cover associated with GI has the potential to extend the life of existing public and private assets.
- *Safer streets*: GI can be employed to calm traffic and create an environment that encourages slower driving and better road safety. GI can also promote pedestrian comfort and make walking a more attractive and safer option.
- *Walkability & Cycleability*: Shading and greening make streetscapes more inviting and engaging for the local community. Streetscapes can also be redesigned with GI in mind to ensure pedestrians and cyclists are safe and comfortable.
- *Reduced costs*: Council infrastructure costs are reduced when green infrastructure is constructed in conjunction with other streetscape works rather than in isolation.

## 2 A framework for Best Practice Embedding Green Infrastructure

The framework for embedding GI (Figure 1) was developed and sets out three stages (plus evaluation and community feedback) and 12 Aspects that contribute to the embedding of GI into Council practices. The framework stages include:

1. Culture and structure
2. Internal systems and processes
3. Delivery

A more detailed discussion of each Aspect is included below and discusses why each are important and where good examples have been identified.



**Figure 1.** Framework for embedding GI into Council operations

This Framework (Figure 1) describes requirements for an organisation to embed GI. Whilst some organisations may excel in some areas over others, and there is no clear hierarchy proposed here, embedding GI is likely to begin with support from Councillors, executive and management and the community. This is more likely to lead to the development of strategies that call for the implementation of GI.

Once that support is gained and strategies are developed understanding GI opportunities is required to allow budgeting and the seeking of external funding.

The true embedding of GI comes with the establishment of shared and transparent processes, systems and standards that reflect the ‘mainstreaming’ of GI. This is dependent upon internal communication and collaboration across departments.

Innovative organisations will take the feedback from community, contractors and designers to improve next time.

## 2.1 Organisation: Culture and structure

In the framework above we have highlighted six aspects of GI delivery related to Organisation: Culture and Structure. Whilst not listed in a strict hierarchy, support from within the organisation, across Councillors, executive and management, the community and organisational strategy is critical.

**Table 1. Framework summary**

Aspect	Description
Councillor, executive and management support	<p>To be successful, organisations require an influential champion to support the implementation and embedding of GI. Officers aiming to win support from higher management can do so by:</p> <ul style="list-style-type: none"> <li>• Expressing GI as a key plank of climate change adaptation works</li> <li>• Providing evidence of community support for existing GI assets</li> <li>• Developing a vision for a greener community to sympathetic managers</li> <li>• Highlighting the good examples that other Councils provide implementing GI successfully (getting competitive!) and opportunities for collaboration</li> <li>• Identifying opportunities for funding and capacity building through Melbourne Water and other agencies.</li> </ul>
Community support	<p>The community needs to accept and be happy with the outcomes of GI designs and works to gain ongoing support and investment. Council's GI champions can support community groups to drive GI projects. Examples of this include the Edwards St case study where resident's supported GI assets for the benefits that they deliver to the streetscape and community. Champions can also inspire the community by promoting the outcomes of successful GI projects. Supporting and running programs such as 'Better Block' or 'Sustainable Streets' can also help to identify supportive communities for projects. Running competitions such as City of Melbourne's Laneway Greening program also helps to identify receptive communities and opportunities. The City of Moreland's High St Coburg and Edgars Creek Wetland projects were both community driven and wouldn't have occurred without the communities energy and persistence.</p>
Strategic support	<p>Council should have a clear strategic direction that sets out:</p> <ul style="list-style-type: none"> <li>• the benefits of GI</li> <li>• why it is a priority</li> <li>• what the objectives and targets are, and</li> <li>• who is responsible?</li> </ul> <p>A specific GI strategy is appropriate to ensure implementation, however a review may identify where language that supports and incorporates GI could be incorporated into existing Council strategies including the Council Plan, Water related plans (e.g. Integrated water management plans and stormwater management plans), open space and urban forestry strategies and climate adaptation strategies.</p> <p>A specific GI strategy would be well placed to go to the next level of detail and identify areas of vulnerability within the local government area (LGA) and the opportunities and benefits of installing GI in those locations. These steps are highlighted by Norton et al. (2013) and lead onto 'known opportunities', discussed below.</p>



Known opportunities	<p>Successful Councils have a good understanding of where their GI opportunities exist.</p> <p>The Brimbank City Council has developed WSUD Prioritisation Plans that identify and prioritise GI opportunities. There is also recognition across the business of the opportunities that exist in association with traditional Council activities e.g. road or pavement renewals or open space upgrades. The engineering team understands what is possible and expected and seek out these opportunities rather than viewing them as a burden.</p> <p>The City of Melbourne has a program of works and can implement individual projects when funding is made available. The CoM program approach is also flexible enough to incorporate opportunities as they arise e.g. if underutilised space is to be rejuvenated then GI can be incorporated due to a shared understanding between engineering and urban design.</p> <p>Norton et al (2013) also support development of priorities that respond to community need (i.e. what areas, streets and locations are experiencing the greatest thermal discomfort).</p>
Budgets, grants and funding	<p>Capital and maintenance budgets need to be allocated once GI programs and opportunities are identified. Importantly, clearly defined opportunities (including their costs) provide powerful support for external funding applications.</p> <p>Further, embedding GI means integrating GI budgets and costs into the overall budget for traditional Council activities (including road or paving improvements). GI can then be viewed as a small addition to existing works, rather than requiring approval as a standalone project. This philosophy leads to GI maintenance budgets being 'mainstreamed' when GI assets are defined in the same way as other 'hard assets'</p> <p>The Brimbank City Council has been successful in achieving this and this is discussed more within the "Maintaining Green Infrastructure" case study.</p>
Culture of innovation	<p>Innovation refers to the implementation of a new idea, method or product. It also implies drawing in ideas from other disciplines to improve the way things are done in other areas.</p> <p>The culture of innovation refers to an organisations ability and willingness to try and apply something new. For organisations at the early part of their GI journey, a culture of innovation will help in the process of accepting mistakes and overcoming problems.</p> <p>The City of Portland is a good example here. The key driver for GI in Portland is to keep stormwater out of the combined sewage / stormwater system. The evolution of GI can be seen across its city streets, with prototypes and designs for GI that have evolved over time. This illustrates a willingness to experiment and innovate. These examples contributed to the development of Portland's Stormwater Management Manual that sets out stormwater management and maintenance requirements.</p> <p>A critical element of innovation from a GI perspective is collaborating across departments. This is a great place to start and has been shown to be effective both in the Brimbank City Council and City of Melbourne examples. Multi-disciplinary collaboration can give rise to innovative ideas that come from different places engineering, urban design, parks and gardens and other teams truly working together. This is also important for re-thinking how GI is retrofitted into existing urban environments.</p>



## 2.2 Internal systems

Once there is support for GI, internal processes need to be established that ensure that consideration of GI opportunities are embedded into business as usual activities.

Stage	Description
Processes and systems	<p>The first requirement is to provide clarity around process all of those involved in the collaborative effort to identify and develop GI opportunities. Processes need to be collaboratively developed so that each team involved in delivery GI can own their part of the process, that would include:</p> <ul style="list-style-type: none"> <li>• Identification: How are opportunities identified (who can identify them. What do they do when they do?)</li> <li>• Strategy: where is the strategic support? How can this opportunity be justified (in budgetary terms)</li> <li>• Collaboration and design: Who will be involved in developing the idea, who will co-ordinate this effort and what are the steps to progress this from concept through to detailed design. Are there existing design standards that are relevant (see below)?</li> <li>• Construction: Do we have trusted contractors?</li> <li>• Maintenance: How are GI assets accounted for when it comes to maintenance budgets?</li> </ul> <p>The processes need to be visible, transparent and well known so that each time is the same. Explaining this process could be part of a broader internal GI awareness campaign or part of induction training activities.</p>
Standards	<p>Council strategies need to be translated into development requirements (e.g. stormwater quality, open space areas, infiltration areas, canopy cover etc.) so that there is a clear driver to employ GI.</p> <p>There is evidence that agreed design and engineering standards provide an advantage when translating opportunities and concepts to successful assets. Design standards are the basis of a shared technical understanding and can also chart the evolution of the Council’s development of GI assets as each project is used to develop new standards or refine existing ones. An excellent example is the City of Melbourne, who used the redevelopment of the Docklands as an opportunity to collaboratively develop GI standards. The benefits of this are that for the next project Council doesn’t start from zero. Council staff begin to better understand the requirements and restraints that their collaborators have to manage including maintenance requirements.</p> <p>Large redevelopments present this opportunity such as the Amcor redevelopment in Alphington (City of Yarra).</p> <p>Technical and design standards can also be used to share the detail of best practice examples, where the design has delivered upon its desired outcomes. An example of this may be the City of Melbourne as they move away from tree pits to alternative designs due to the high maintenance costs of litter removal. It is also important to share what hasn’t worked so that others don’t make the same errors.</p>
Communication and collaboration	<p>To compliment the technical processes and standards in place, communication structures connect the right people.</p> <p>Strong relationships and clear lines of communication are critical. Brimbank City Council has established a GI working group that includes members from urban design, engineering, landscape architecture, roads, risk environment and asset services. The working group has mapped out internal processes so all understand how GI is progressed and implemented with an understanding of the implications for the organisation. Regular meetings of this group build relationships, highlights works being done and where these works are in the process. Management champions support this group.</p> <p>Co-ordination of works and teams across departments is critical. This may require a dedicated role to co-ordinate this communication. The City of Melbourne has a very successful template for this having developed the Green Infrastructure co-ordinator role. This role is quite unique and calls for engineering experience and an understanding of urban design to oversee the GI program and the collaborative required to ensure delivery of GI projects.</p>

## 2.3 Delivery

The previous stages provide support to the successful delivery of GI, through detailed design and construction.

Stage	Description
Technical skills	<p>The delivery of GI requires technical skills in the fields of civil infrastructure design, landscape design, landscape architecture, urban planning and water sensitive urban design. Co-ordinating the delivery of GI is likely to require a working understanding of these disciplines. Ideally these skills will exist within the organisation and co-ordinating them (discussed above) will be the key challenge.</p> <p>If there isn't internal capability other options include external training, seeking funding (external or internal) to employ a GI co-ordinator, or another critical technical role or getting a consultant in to manage the technical elements of the project and transfer that knowledge. Gaps in technical skills can be reduced through collaborative project design and implementation incorporating the development of design and engineering standards.</p>
Competent contractors	<p>Contractors will need to be engaged to deliver capital works. Building a relationship with the contractor is important to ensure they understand the objectives and purpose of the asset and that the finished product is consistent with the design intent. Contractors who follow designs through can also stay abreast of and contribute to innovations. This may be a point of difference for contractors that they can use to build their relationships with Council and to win ongoing work.</p> <p>The City of Melbourne have an ongoing relationship with their contractor, whose capacity builds along with the design team at each project and design iteration. There is a level of understanding and trust that has developed that improves construction outcomes.</p> <p>Sound construction is also critical in gaining positive community feedback that encourages Councillor, executive and management support.</p>
Asset management and maintenance	<p>The feedback from consultations suggests that successful maintenance of GI begins by defining them in terms of process, in a similar way as hard assets. Of course GI can cover a range of asset types that require different maintenance skill sets, further GI responds to climate and weather and therefore the timing of maintenance is an important consideration. This is a key point: GI are living assets and if not maintained they (or the service they deliver) is likely to depreciate faster.</p> <p>The Brimbank City Council provided a good example of this. Having introduced teams to the drivers and for GI, their benefits and risk and the process for their implementation the question of their maintenance was addressed. In their case GI assets are entered into the assets register alongside hard assets with corresponding maintenance requirements, schedules and budgets. They are also depreciated and renewed as per traditional civil assets. In the case of Brimbank risk was a key driver in developing this process, and recognising the potential risk of GI to the community and the role of maintenance in reducing risks to the community. Assets can be mapped to illustrate to Executive and Management the cumulative impact of the GI investment and reinforce their support. Maintenance of GI is of course important to ensure that assets meet the design intent and contribute to strategic outcomes as intended.</p>

## 2.4 Feedback and evaluation

Feedback and evaluation is an important step in the ongoing delivery of green infrastructure. The evaluation process should:

- capture the performance of the asset
- capture the community's response to the asset
- confirm how the GI asset/s contributes to and helps meet Council's strategic intent, and
- use this information to verify that the GI assets are delivering their intended benefits.

Positive feedback can support embedding by reinforcing Councillor, executive and management support as well as encouraging internal working groups to continue their work in delivering these assets. The City of Yarra GI case studies highlight the positive feedback that has been received for both the Cremorne St WSUD project and the Apperley St example.

Poor feedback can be used within an innovative organisation to review commitment, processes, design standards and contractor implementation to ensure future improvement. It is critical to seek and share feedback.

### 3 Examples of Best Practice Embedding Green Infrastructure

Through the course of consulting with project partners, we identified a number of examples of best practice that are highlighted and summarised within the Case Studies provided as additional attachment. The case studies celebrate the process of evolution that has occurred within some Councils, through the introduction of new processes for example, as well as the results of well designed and constructed GI.

By highlighting identified examples of best practice GI in embedding GI, the aim is to

- encourage those at the beginning of their GI journey
- provide examples that practitioners can learn from and
- inspire organisations to follow the lead of others and to engage with them.

#### 3.1 What does best practice look like?

Some examples of what best practice looks like and the lessons that have been learned are summarised below. More detail is provided within the case studies below.

**Table 2. Example of best practice**

Best practice (Case study title)	Lesson learned
There is strategic support for GI	Strategic documents are needed to provide critical support and direction for the effective implementation of green infrastructure by establishing the big picture vision, encouraging a partnership approach. This has allowed partners to leverage the strategic direction to progress and promote their own GI strategies and projects (Greening the west).
There is a process (and budget) to maintain GI	Cost and process of asset maintenance can be a barrier to GI adoption. Best Practice processes to ‘mainstream’ GI (along with grey assets) involve broad and early engagement to deliver transparent processes. Best practice recognises that everyone has a role and that cross departmental trust is critical. (Maintaining GI, Brimbank City Council).
Make the most of your opportunities	Good design can incorporate GI into limited spaces to achieve multiple objectives and deliver multiple benefits. So while installing GI can mitigate urban heat or treat stormwater it can also activate and improve community spaces. (Apperley St Wetland, Cremorne St and Godfrey St).
Someone needs to co-ordinate the process	A GI co-ordinator brings people and knowledge together around the shared goals of GI. Ideally a co-ordinator will have a technical understanding across the strategic aims of GI as well as its design challenges: they understand the issues and can develop and co-ordinate solutions. It’s also good to have a ‘go to person’ so people can present or suggest opportunities (Driving change – the GI Co-ordinator).
GI can be driven by the community	Community groups and Council can work together to establish and maintain GI projects. Environmental stewardship can be transferred to the community creating habitat and community relations through better use of open space (Edward and Union St, and Hall St)

## 3.2 GI Opportunities

GI practitioners need to be able to identify GI opportunities that are aligned with and can contribute to the organisation's strategic direction. GI opportunities are likely to require space (particularly underutilised space), natural sunlight and access to water (including but not necessarily stormwater) and appropriate soils.

Opportunities are likely to be within public space managed by local government, however they may be in space managed by other agencies (e.g. VicRoads, VicTrack, Melbourne Water) or private land. Consultation with Councils that regularly implement GI identified the following opportunities:

- As part of road upgrades including road resurfacing works
- As part of drainage upgrades including using GI to replace or be part of a drainage solution
- Reclaiming median strips and parking bays i.e. greening existing paved areas by installing grass or trees
- Car parks: implementing GI in large paved areas
- Within pocket parks by contributing shade or landscape features where there is none
- Within and around community facilities (e.g. recreation centres, pools, maternal health centres)
- As part of large capital works (e.g. aquatic centres and libraries)
- Retail strip upgrades, and
- Open space associated with new developments.

From a funding perspective, opportunities can be found in:

- Capital budgets: where savings in capital works associated with applying GI solutions can be identified (e.g. reduced asphalt costs, reduced sub-surface drainage requirements, reduced excavation requirements, traffic calming infrastructure)
- Incorporated into Council's traditional works including road and paving works, drainage and traffic management.
- Grants and external funding including Melbourne Water's Living Rivers program.

## 4 Conclusion and recommendations for improved embedding of green infrastructure

The following sets out recommendations for improving the embedding of green infrastructure in Local Governments. The key recommendations are;

1. Identify a champion
2. Develop a strategy and action plan
3. Appoint a co-ordinator
4. Develop Specifications
5. Monitor and measure core data on performance of GI

### 4.1 Identify a champion

Stage	Recommendation/s
What	An internal 'champion' is required to energise the move toward installing more GI. The champion needs to be passionate, energetic, respected internally and able to influence, with or without authority.
Why	<p>For most Councils GI is not business as usual. To get it to that point requires someone who genuinely wants to see it happen and is excited about making it happen. In Councils where GI has become embedded it is evident that passionate support from one or more individuals was key to gathering endorsement and support.</p> <p>A champion need not be senior although that may have its advantages. Rather the champion needs to be able to frame the benefits of GI in such a way as to gain broader support and to energise colleagues. They need to be able to build energy around the successes of GI, internally and externally. They also need to be brave enough to innovate, learn from others and make mistakes.</p>
How	<p>The champion selects themselves to a degree. Once a champion emerges they need to be supported in terms of:</p> <ul style="list-style-type: none"> <li>• Time to progress the GI agenda (including the recommendations below)</li> <li>• Support to engage with partner Councils and external organisations (e.g. Melbourne Water)</li> <li>• Receiving training where appropriate.</li> </ul>

### 4.2 Develop a strategy and action plan

Stage	Recommendation/s
What	Develop a strategy (specifically for GI, or that can be used to drive GI) and have that strategy endorsed by Executive and Councillors)
Why	<p>Strategy provides a mandate for all council staff to focus on how green infrastructure is going to be built and will tie together ad-hoc GI works and link into other Council and regional documents including the Council Plan, water and open space strategies.</p> <p>The strategy will clearly articulate the perceived benefits and provide a basis for data gathering and assessment to gauge success.</p> <p>A key to the success of GI is connectivity. The long game is to have not just a street but a community that is resilient to climate change. A strategy ties into a bigger picture, where targets drive the desired community and regional benefits. The strategy should ideally guide a Council toward up-scaling the delivery of GI over time.</p>
How	<p>Be clear about what the strategy aims to achieve including criteria for evaluation:</p> <ul style="list-style-type: none"> <li>• clearly defines GI within the Council context and articulates GI benefits,</li> <li>• set out existing knowledge and baseline data</li> <li>• identifies opportunities (including through internal collaboration)</li> <li>• identifies roles and responsibilities</li> </ul>

- set targets and be clear about what's being measured, with reference to the strategic objectives and defines feedback mechanisms

### 4.3 Appoint a co-ordinator

Stage	Recommendation/s
What	<p>Appoint a co-ordinator whose role it is to co-ordinate internal project delivery</p> <p>The professional will have a background in engineering and capital works and may sit within the policy, urban design or strategy area of Council.</p> <p>An existing role could be redefined to dedicate part time resources to the co-ordinator role and as GI activity grows so can the time commitment.</p>
Why	<p>A number of teams and technical areas are involved in successful GI delivery. Best practice GI delivery requires co-ordination and some understanding of these roles. The role requires the co-ordinator to own the role, follow it through and monitor its progress.</p> <p>The coordinator role at the City of Melbourne (refer Case Study ??) is the model for this recommendation given its critical role in delivering Best Practice GI by bridging the gap between strategy and design, planning, engineering and capital works.</p>
How	<p>Define the roles of 'internal client' and 'engineer' (i.e. the urban design team want and output and the engineering team needs to deliver (within constraints) for their client, urban design)</p> <p>Establish processes based on this example and promote this process with relevant teams</p>

### 4.4 Develop Specifications

Stage	Recommendation/s
What	Develop specifications and standards for the range of GI assets that Council designs and constructs.
Why	<p>This is a critical recommendation that makes expectations clear to internal and external clients and contractors.</p> <p>It enables Council to continually build on the understanding of the GI they deliver and the quality of those assets, in the same way that there are specifications for civil assets like stormwater pits and road pavements.</p> <p>It also allows Council staff to be clearly stipulate specifications with tenders. Many practitioners in local government are seeking to reduce uncertainties in what they construct and this project identified variability in what is being requested and built. There is also a large amount of time and resources consumed in defining and redefining these requirements.</p> <p>As an example, the WSUD Engineering Guidelines has enabled engineers from across the country to design better WSUD assets.</p>
How	<ul style="list-style-type: none"> <li>• Set clear objectives for each GI asset</li> <li>• Outline barriers and risks that need to be considered (including the physical constraints of the location)</li> <li>• Document algorithms or rules required to size GI (based on the objectives and drawing on industry standards (e.g. WSUD Engineering Guidelines)</li> <li>• List appropriate and approved materials and vegetation species (categorising them according to soil type and conditions e.g. shady locations verses full sun)</li> <li>• Outline a typical maintenance program for GI assets</li> <li>• <i>Importantly:</i> use each project as an opportunity to refine or introduce new specifications and standards</li> </ul> <p>VicRoads, Melbourne Water and other State Government agencies are important in this process, as many local governments refer to these agencies for guidance in the development of specifications.</p>



## 4.5 Monitor and measure core data on performance of GI

Stage	Recommendation/s
What	<p>Collect and track core data relating to the performance of GI that: Informs whether the assets are achieving their objectives. If positive, data can build confidence in the assets and support an increase in the delivery of projects.</p>
Why	<p>With the wide range of projects being delivered by engineers, planners and landscape architects, there is a lack of quality data that ensures projects are evaluated and the broader industry learns about the effectiveness and performance of the assets. Performance data also determines how assets collectively contribute to a longer term target.</p>
How	<p>Establish performance criteria (City of Melbourne use a 10 point checklist to determine asset performance) Establish corresponding data templates and databases, determining frequency and nature of measurement Incorporate measurement requirements into maintenance activities Collate and report regularly. Some key measures may include:</p> <ul style="list-style-type: none"><li>• Canopy cover</li><li>• Temperature reduction</li><li>• Growth rate of trees</li><li>• Reduced stormwater runoff</li><li>• Stormwater pollution reduction</li><li>• Change to permeability</li><li>• Soil moisture</li><li>• Water quality</li><li>• Community expectations and feedback</li><li>• Community usage (e.g. how many interacted, stayed within the space)</li></ul>

## 5 References

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