IPWEA

The Green Infrastructure Management Manual

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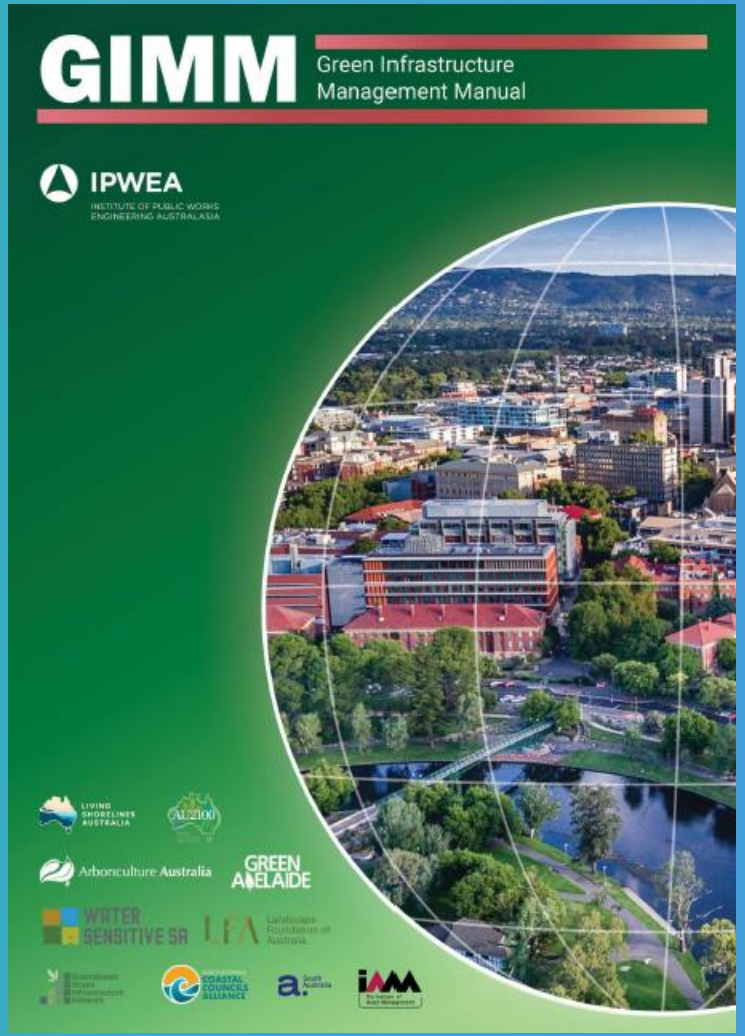
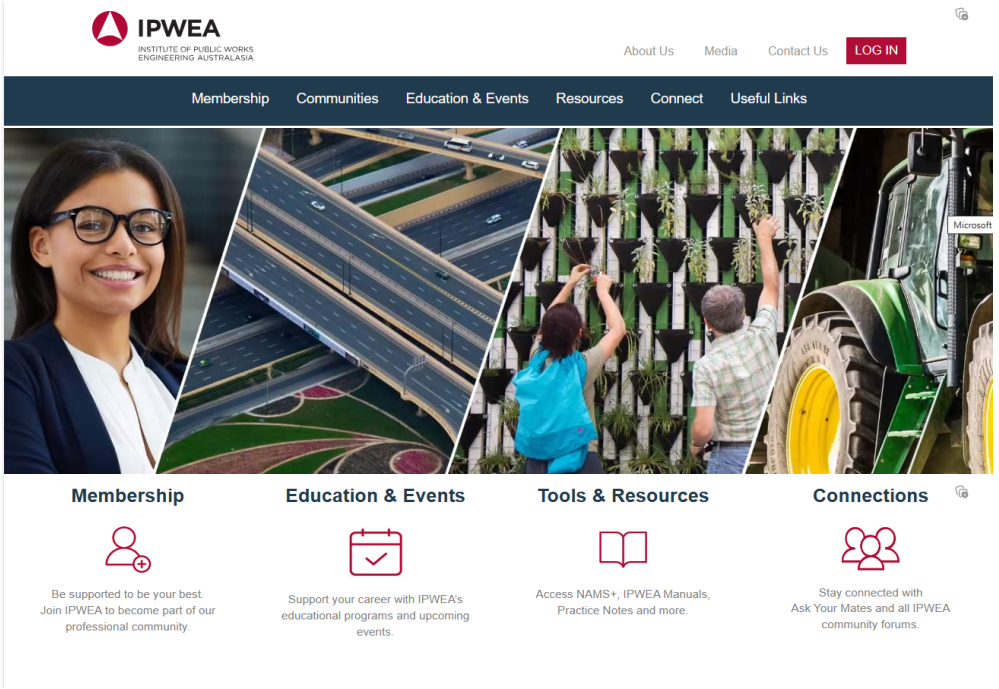


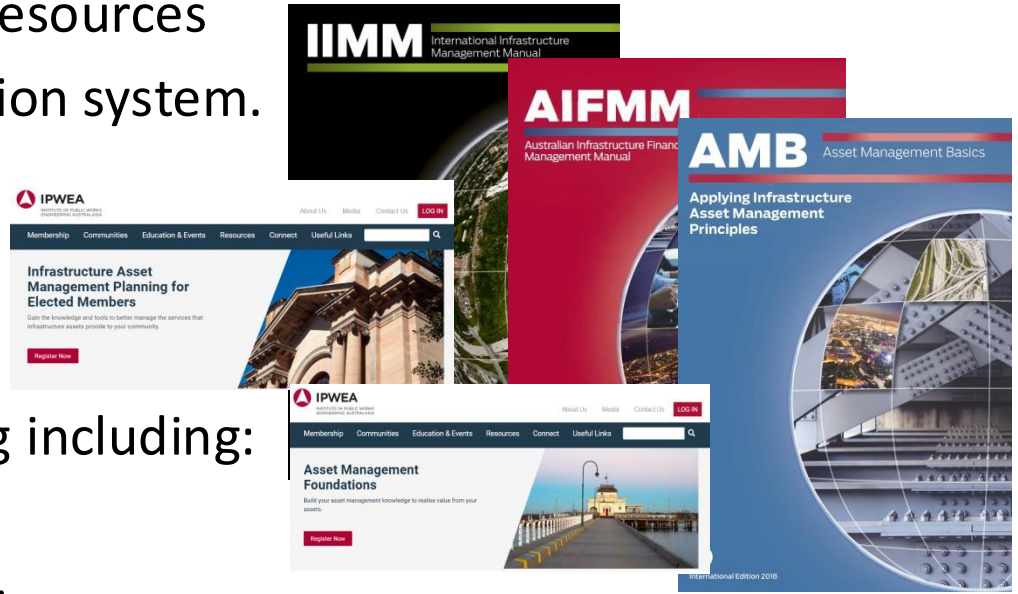
Institute of Public Works Engineering Australasia

- Peak association for public works professionals and asset managers
- Educational programs and courses, technical publications, tools, advocacy, networking, conferences
- 30,000+ stakeholders worldwide



IPWEA – Key resources

- The International Infrastructure Manual (IIMM).
- Australian Infrastructure Financial Management Manual (AIFMM).
- NAMS+ Asset Management resources
- AUS-SPEC National specification system.
- Over 20 Practice Notes.
- Print and e-books.
- Educational pathways.
- In person and on-line training including:
  - Foundational program
  - - Elected Member course.



The Green Infrastructure Management Manual

- Enables integration of GI into AM Planning
- Provides detailed glossary and definitions
- Identifies GI for land, water, coasts
- Identifies services, benefits and values
- Details costs, risks and financial reporting
- Uses an asset life cycle approach
- Provides a simple framework and instructions on how to write a GI AMP

Manual is FREE via the IPWEA and LGA SA websites

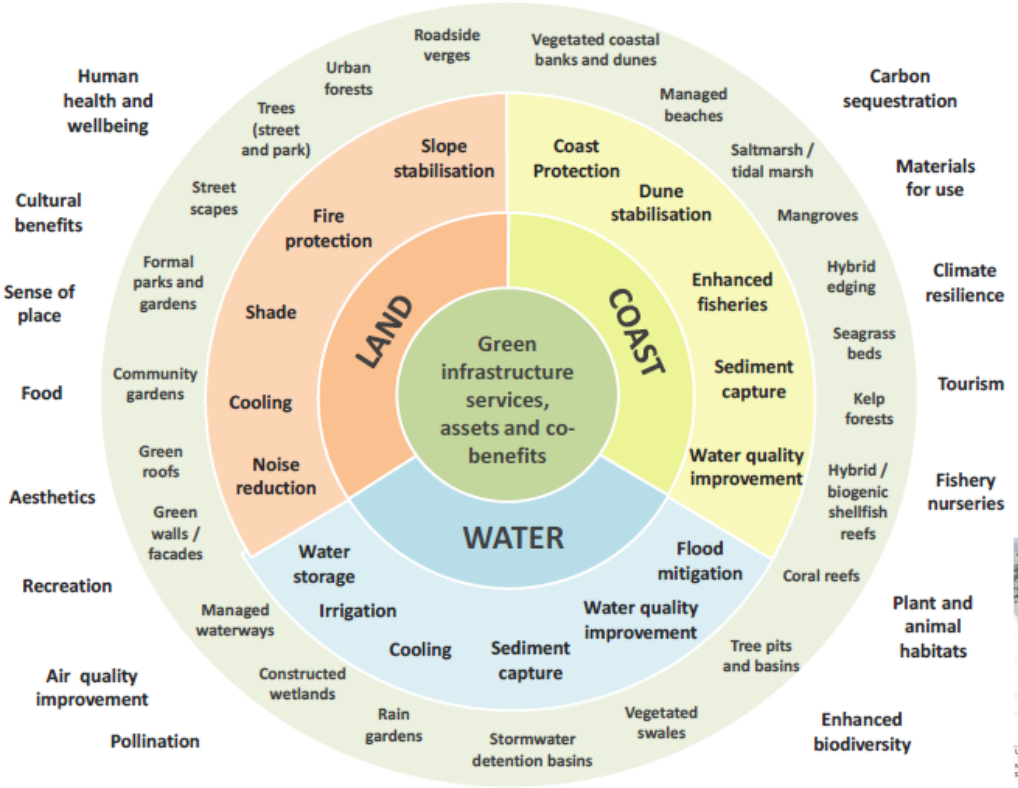
Defining Green Infrastructure

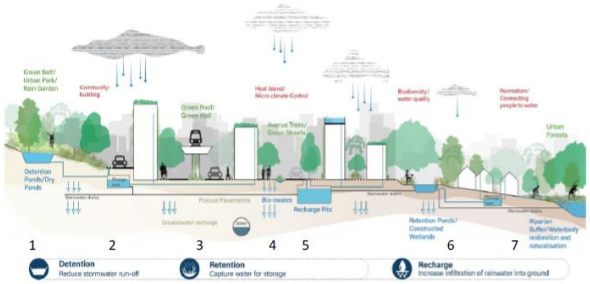
A "*managed and interconnected nature-based network for the provision of services*"

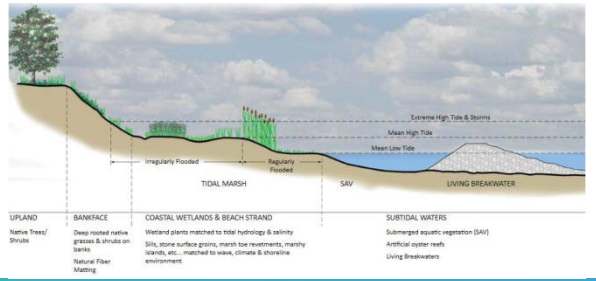
Green Infrastructure (GI)					Grey Infrastructure
Natural and Nature-based assets				Engineered GI assets that support nature-based assets	
Unmanaged	Managed				
Naturally established	Naturally established	Planted, modified or restored	Hybrid or enhanced		
Woodlands and forests	Old growth forestry, managed natural forests	Plantation forestry, urban forest, street and park trees	Street trees with pits	Permeable paving	Buildings, footpaths and cycle-ways
Unmanaged remnant vegetation	Managed remnant vegetation	Formal parks and gardens, green wind / fire breaks	Green roofs and walls	Kerb inlet	Roads – sealed and unsealed
Unmanaged waterways	Managed natural waterways	Managed modified waterways	Rain gardens, bio-swales	Irrigation systems	Storm-water assets
Lakes, ponds and wetlands	Managed natural lakes	Recreational lakes	Constructed wetlands, Infiltration ponds	Gravel infiltration trenches	Water and wastewater assets
Grasslands	Managed natural grasslands, road verges	Managed modified grasslands, rain-fed lawns	Irrigated lawns and open spaces	Water tanks	Carparks
Coasts and estuaries	Managed natural beaches	Nourished beaches, restored / rehabilitated mangroves	Living shorelines, mangroves with concrete planters, hybrid sills	Fencing and structural wind breaks	Seawalls and riprap
Marine ecosystems	Fisheries	Restored / remediated oyster reefs, seagrasses	Mangroves with concrete planters, hybrid oyster reefs	Seawalls with bio-niches	Jetties

Scope of the Green Infrastructure Management Manual

GI assets, ecosystem services and co-benefits







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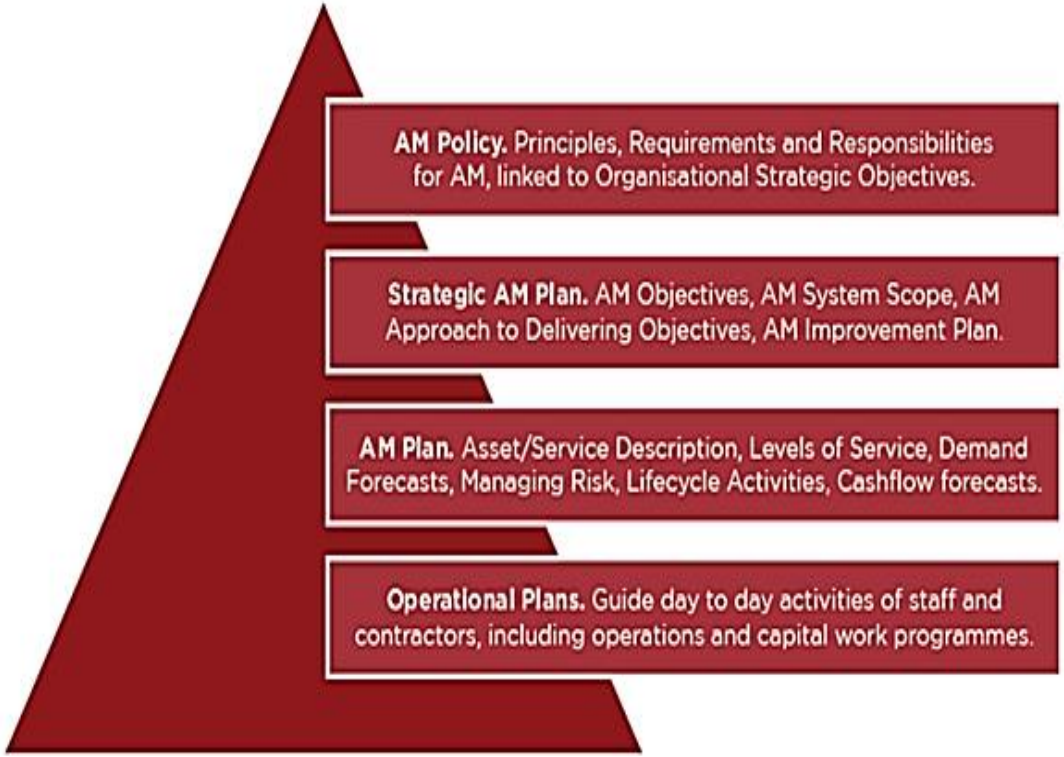
Asset Management for Green Infrastructure

1. Providing Levels of Service
2. Future Demand Management
3. Lifecycle Approach:
    - Acquisition
    - Operation
    - Maintenance
    - Renewal
    - Recycling / Disposal
4. Managing Risks
5. Long-term Financial Planning

Integrating GI into AM Planning



Objective	Performance Measure Example
The organisation is committed to good asset management practice for its green infrastructure assets	The AM Policy adopted by the elected officials includes references to green infrastructure assets and is reviewed every three years. The AM plans include green infrastructure and is approved by senior management. The AM Plans provide the basis for inputting the costs associated with managing green infrastructure into the long-term financial plan
Stakeholders are effectively engaged in how green infrastructure is managed	Stakeholder communication is carried out in accordance with the organisation's communication plan. The communications plan is reviewed every three years.
Decision making is based on reliable information	The organisation has a reliable asset register for its green infrastructure assets, with the required condition and performance data to support informed decision making.
Green infrastructure is resilient and risks are mitigated to appropriate levels	A risk register is in place and monitored in accordance with the Risk Policy.
Green infrastructure is man... financially sustainable and ... manner	The AM plans describe required long term expenditures and funding is
A continual improvement a... taken	

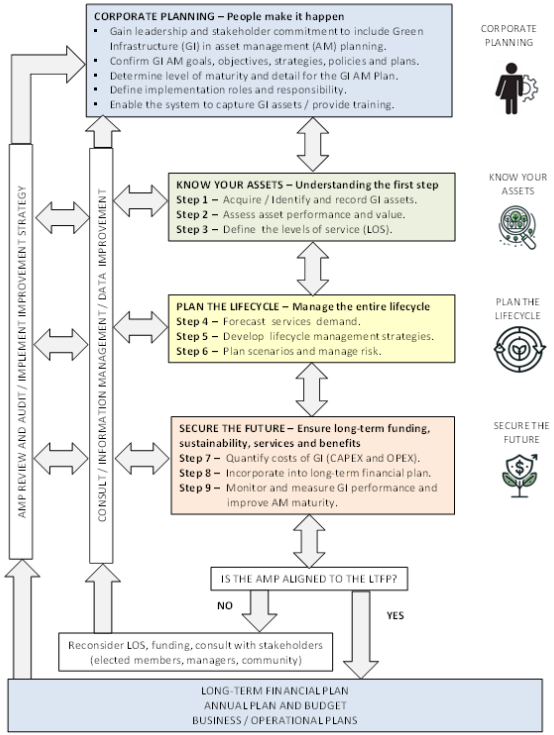
Case Study: ***City of Ballarat Yarrowee River and Tributaries River Corridor Masterplan (2020)***
This masterplan supports existing City of Ballarat and greater catchment strategic documents to propose the new strategic foundation to improve, develop, manage and maintain the Yarrowee River and tributaries. The plan covers 38 km of the Yarrowee River – from the Gong Gong Reservoir to the City of Ballarat's southern boundary (near Garibaldi) – and over 35 km of tributary creeks that flow into the Yarrowee. The plan provides detailed drawings and recommendations for both the waterways and adjacent reserve land.
https://www.ballarat.vic.gov.au/about-us/vision-plans-and-strategies/plans-strategies-and-frameworks

Tool: ***AUS-SPEC Urban and open spaces***
AUS-SPEC is the Australian National Specification System for the design, construction, maintenance and operation of local government assets. AUS-SPEC Urban and Open Spaces guidance covers planning and design, tendering and contract preliminaries, construction, maintenance and operations of urban and open spaces. It also includes the NATSPEC Building Landscape package.
https://www.aus-spec.com.au/aus-spec-urban-and-open-spaces/

To learn more about how IPWEA and NATSPEC work together to support end-to-end asset management planning download the joint pamphlet:
https://www.aus-spec.com.au/wp-content/uploads/2022/07/AUS-SPEC-and-IPWEA-Joint-Brochure.pdf

Writing a Green Infrastructure AM Plan

Framework for including Green Infrastructure in an Asset Management Plan



Corporate Planning

Ensure support and ownership so that people will make it happen

Know your assets

Identify & Know your Green Infrastructure Assets

Plan the lifecycle

Apply a Lifecycle Approach to your Green Assets

Secure the future

Manage risks & finances for Long-Term success

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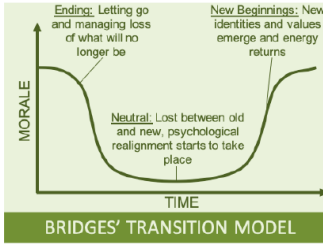
Writing an Asset Management Plan for GI

Corporate Planning - *People make it happen*

- Gain commitment
- Confirm policies, plans
- Determine AMP maturity
- Define roles and responsibilities
- Enable systems and
- Provide training

Before Municipal Natural Asset Management	After Municipal Natural Asset Management
Services provided by natural assets were not fully recognized or understood.	Strategic, policy, financial and operational decisions increasingly reflect the importance of natural assets.
Inventories did not include natural assets.	Town is beginning to include natural assets in inventories.
Town had a very incomplete view of which assets provided vital services.	Town under… natural ones
Bylaws did not reflect the role of natural assets.	Several bylaw… assets.
Development permitting focussed on clearing land and then designing and building new engineered assets.	Developmen… making bett… priority, and… enhanced a…
Departments worked in silos according to their specific mandate.	Departmen… service level…
External funding was not received (or applied for) for the municipal service function that natural assets perform.	External fun… assets for th… perform.
Financial reporting made no mention of natural assets.	Natural asse… the Notes t…
Development changes were applied only to engineered assets.	Developmen… natural asse…

Dimension	Drivers for change	Obstacles to change	Options to reduce obstacles
Understanding of purpose and process for including GI in AMP	Alignment with organisational and staff values Easy to understand process for a wide range of stakeholders, including engineers, policy makers, and the public.	Requires extensive training and guidance for some specialized areas.	IPWEA offers online training.
Stakeholder Involvement	The vision brings together a range of stakeholders including government, service providers, community and traditional owners.	Complexity increases with many involved stakeholders. Potential for conflicts in decision-making	Leadership and Management challenge Requires champion – Appendix 3 provides guidance using Kotter change model and application of communication strategy.
Training & Guidance	Organisational training increases expectation for the inclusion of GI in AMP. Establishes rigorous and referenced guidance, improving asset appreciation and lifecycle costing.	Developing comprehensive training requires significant resources and time.	IPWEA offers online training and is available internationally.
Understanding the benefits of including GI in AMP	Increased awareness, budget for lifecycle management, better information & decision-making, improved ecosystem services, community support, potential increased real estate and rates valuation, physical & mental health all provide incentive for continued change.	Challenges lie in quantifying benefits, research needed to determine financial values. Funding difficulties, political barriers, delayed benefits, and difficulty integrating into asset management.	Case studies and research provide useful data. References available through the Manual. Research still needed to continue to refine and integrate indicators.
Tools & Resources	Framework for integrating GI into AMP is consistent with normal asset management planning. Easy to use GIS mapping, carbon accounting, data bases AI-based assessment, case studies, and writing templates improve usability.	Requires investment in technology and expertise to implement effectively.	Asset owners arrange access to IPWEA tools and other resources, communities of practice and case studies.



	Stakeholders/ Audience	Key Focus of Communication. Link to performance measures (cf IIMM 4.1.5)	Frequency	Communication Channel
Internal governance	Council Members	**Inform** **Motivate** - Meet residents' expectations.	Quarterly	Quarterly report at Council Update to constituents
	CEO Senior Management	**Motivate** - Meet strategic objectives, align with state and federal government sustainability goals, reporting requirements. **Solve problem** - Biodiversity and climate change objectives.	Monthly	Guiding Team Leader meeting Regular reports
	Guiding Team	**Coordinating activities** **Seek data** **Solve problem** **Motivate** maintain passion for managing green infrastructure planning.	Weekly	Project plan, community of practice (IPWEA Ask your Mates) Regular meeting, email as project requires it
	Government Departments	**Inform** e.g. Building a sustainable State – one plant at a time Reports to EPA and other national / international bodies e.g. COP	Annually	Annual reports of planting Asset development indicators
tments including viders	Asset managers	**Inform** **Motivate** **Seek data** **Solve problem**	Weekly	Report Monitoring Project Plan
	Engineers/ Planners	**Motivate** **Seek data** **Solve problem**	As required	Critical stage reporting

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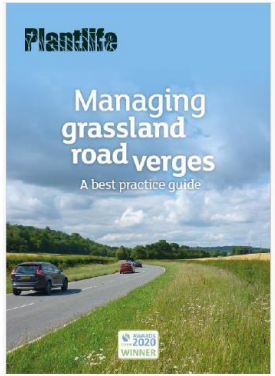
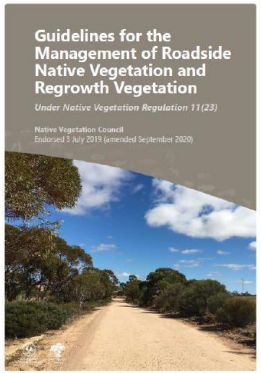
Writing an Asset Management Plan for GI

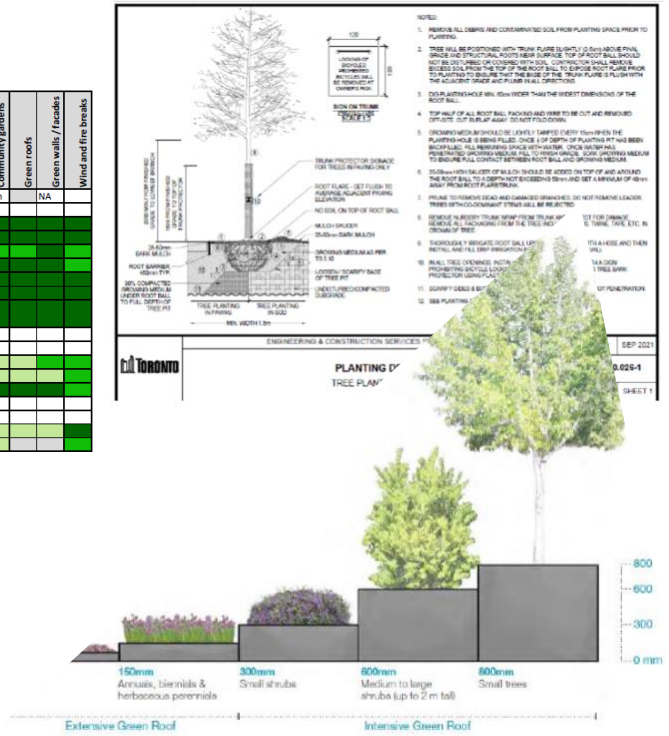
Know your assets – *Understanding is the key*

- Identify, record assets
- Define levels of service
- Assess asset performance

Green Infrastructure for the Land / Example measures of performance	Urban forests	Trees (street & park)	Streetscapes	Roadside verges	Parks and gardens	Community gardens	Green roofs	Green walls / facades	Wind and fire breaks
Key: Measures of performance - relevance		Low		Med		High		NA	
Condition:									
Plant health									
Plant condition									
Amenity measures									
Measures of biodiversity									
Plants establish, remain healthy and complete life cycles									
Assets are maintained to achieve performance targets									
Renewal of assets undertaken at the optimal time in life cycle									
Function:									







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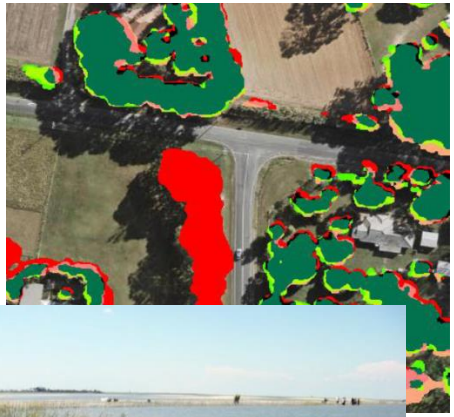
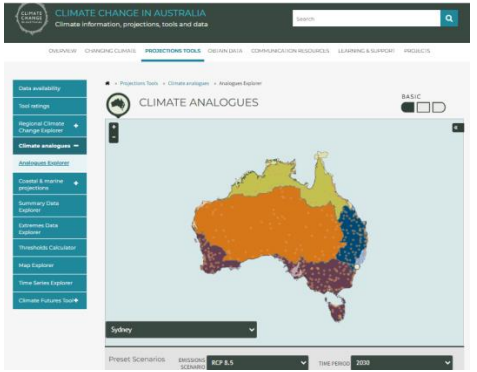
Writing an Asset Management Plan for GI

Plan the lifecycle – *Manage the entire lifecycle*

- Forecast service demand
- Develop lifecycle management strategies
- Plan scenarios and manage risk





Writing an Asset Management Plan for GI

Secure the future – *secure long term funding*

- Quantify financial value and costs
- Incorporate into LTFP
- Improve asset maturity

Tool: ***The Australian Natural Capital Accounts – Environmenal Economic Accounting***
Data in the Natural Capital Accounts can be accessed via the searchable Environmental E
Accounting (EEA) Dashboard. Currently the dashboard allows the user to explore, visualis
customise content from the current Australian Bureau of Statistics National Land Accoun
Land Cover Account and National Ocean Account release. Content is presented in multip
including account tables, charts, customisable stories and underlying maps of spatial dat
https://www.eeadashboard.dcceew.gov.au/

Case Study: ***City of Melbourne Tree Valuation Method (2013)***
The City of Melbourne Tree Valuation method calculates the value of tre
factors: removal costs; amenity value (derived from the Maurer-Hoffmar
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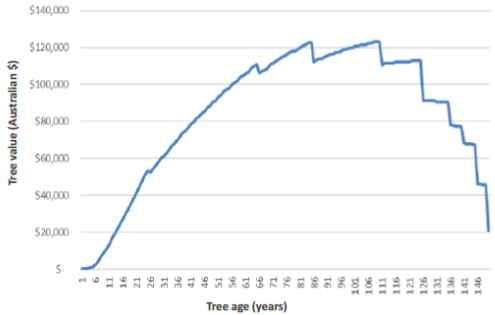

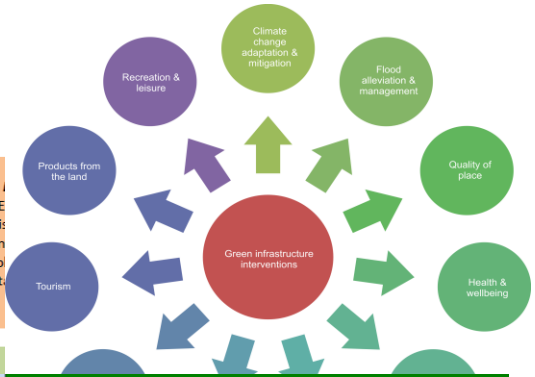

Financial value reporting options	Green Infrastructure (GI)				
	Nature-based assets / components				Engineered GI assets that support nature-based assets
	Unmanaged	Managed			
	Naturally established	Naturally established	Planted, modified or restored	Hybrid or enhanced	
Asset register #	Can include	Can include	Include	Include	Include
Risk register #	Can include	Include	Include	Include	Include
Internal decision making / damage compensation #	Can include	Can include	Include	Include	Include
Asset management plan #	N/A	Can include	Can include	Include	Include
Operational plans #	N/A	Can include	Can include	Include	Include
IAS General Purpose Financial Statements	N/A	N/A	Can include * ^	Can include* ^	Include * ^
IAS Special Purpose Financial Statements	Can include #	Can include #	Can include #	Can include #	Can include #
Long-term financial plan #	N/A	Can include	Can include	Include	Include

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Supporting Resources

- Detailed appendices on 24 GI assets classes
- Summary tables
- Lengthy case studies from around the world
- Images and charts
- Live links to further information and references
- Stand alone online training module

APPENDIX 8 – Checklist for including green infrastructure into asset management planning

This checklist aligns with the Framework for including green infrastructure in an asset m plan (Figure 1).

Corporate Planning – People make it happen

- ☐ Gain leadership and stakeholder commitment
- ☐ Confirm GI Am policies, objectives, strategies and plans
- ☐ Determine levels of maturity and detail for the GI AMP
- ☐ Define implementation roles and responsibilities
- ☐ Enable the AM system to capture GI assets and provide training

Know your assets – Understanding is the key

Identify and record GI assets

- ☐ Compile an inventory of all existing green assets in an asset register
- ☐ Describe the types, locations, sizes, functions of the assets

Define the levels of service (LOS)

- ☐ Establish technical and community LOS measures and targets and align with org objectives and regulatory requirements
- ☐ Use experts to provide metrics for the measurement of technical LOS
- ☐ Undertake stakeholder consultation to determine community LOS
- ☐ Use LOS to guide decisions
- ☐ Refer to when determining lifecycle management requirements

Assess asset performance against LOS

- ☐ Identify key criteria to assess asset performance
- ☐ Evaluate the performance (condition, health, functionality and capacity) of the GI assets
- ☐ Provide references to tools and templates

Plan the lifecycle – Take a whole of life approach

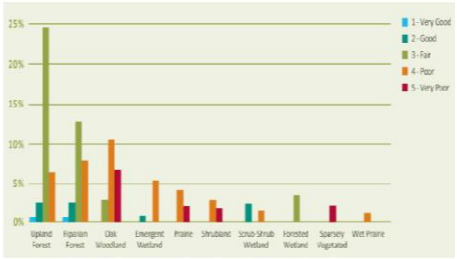

Figure 1: Assessment unit scores by asset class as a percentage of total acres assessed (Source: Portland Oregon extract from written report of assessment results).

Figure 1: From left - Panmure Green Roof eco pillows; Diorella Drive roof with solar panels (Images courtesy of Auckland Transport); and Sempergreen Click'n go trays (Image courtesy of Greenroofs Ltd).

The use of CAPEX funds for early tree planting and establishment opened up alternate funding sources, and made the approach and the related savings potentially realisable.

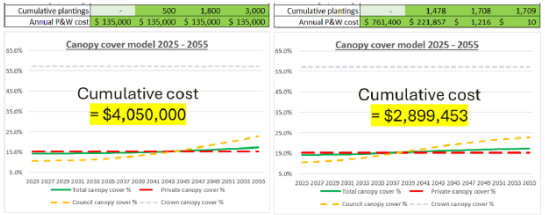

Figure 1: A 30 year modelled canopy projection for a SA LGA showing a tree canopy increase from ~14.5% in 2025 to ~17% in 2055, with cumulative tree numbers and costs for (Left) constant annual planting rates; (Right) high early-year planting rates (Source: S. Strauss)

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GIMM Project Partners

- Landscape Foundation of Australia
- Arboriculture Australia
- Water Sensitive SA
- SA Coastal Councils
- Living Shorelines Australia
- Green Adelaide
- Australian GI Network (AGIN)
- Water Sensitive Cities Australia
- AU 2100
- City of Adelaide
- City of Marion
- Yorke Peninsula Council
- Institute of Asset Management UK (IAM)
- Kingston District Council
- City of Mitcham
- City of Geelong
- Adelaide Plains Council
- Alexandrina Council
- City of Charles Sturt
- District Council of Grant
- District Council of Elliston
- District Council of Streaky Bay
- District Council of Tumby Bay
- City of Victor Harbour

Download your free copy now!

The project has been funded by IPWEA, project partners and the Local Government Research and Development Scheme administered by LGA South Australia.

…or search “Green Infrastructure” on the IPWEA or LGA of SA websites