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SUSTAINABILITY REPORT

Williamtown Special Activation Precinct

FINAL

February 2022

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Prepared by
Umwelt (Australia) Pty Limited
on behalf of
HATCH RobertsDay

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This report was prepared using Umwelt's ISO 9001 certified Quality Management System.

Acknowledgement of Country

Umwelt would like to acknowledge the traditional custodians of the country on which we work and pay respect to their cultural heritage, beliefs, and continuing relationship with the land. We pay our respect to the Elders – past, present, and future.

Document Status

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1.0 Introduction

The NSW Government has identified a number of Special Activation Precincts (SAP) across regional NSW. These sites are catalysts for renewal of regional economic activity, driving sustainable development that attracts investors and creates new employment opportunities now and for the future.

Each SAP has the potential for state or regional significant economic development.

Williamtown has been highlighted as a prime location for further developing local Defence and aerospace-related industries. Building on the established entities in the region such as the Royal Australian Air Force (RAAF) Base Williamtown as well as the Newcastle Airport, University of Newcastle and the Williamtown Defence and RAAF Airport Employment Zone (DAREZ), the Williamtown SAP is positioned to assist in the region's transition to a more diversified economic base as discussed in the State, regional and local strategic planning documents.

The Williamtown SAP planning process is a joint government agency initiative intended to catalyse the sustainable development of Defence, Aerospace, Advanced Manufacturing industries in the region. It highlights and integrates forward thinking environmental, social and economic processes, structures and plans within an innovative land use planning framework that facilitates streamlined development of business, industry and infrastructure, for the benefit of regional communities and ultimately to build the prosperity and well-being of the people of NSW.

It will enable the Hunter Region to grow as a national and international Defence Hub and a centre of excellence for Australia's aeronautics, aerospace and defence industries.

The five components of the Williamtown SAP are government-led studies, fast track planning, government-led development, infrastructure investment, and business concierge (refer to **Figure 1.1**).

Figure 1.1 Components of Williamtown SAP

The delivery and activation of the Williamtown SAP are underpinned by seven principles (see **Figure 1.2).**

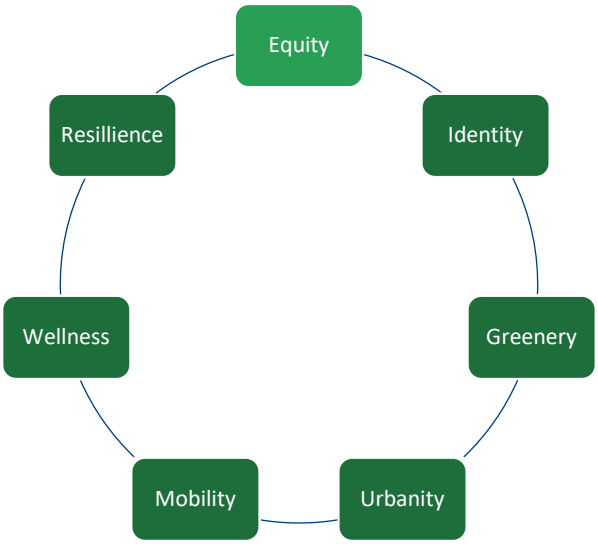


Figure 1.2 Williamtown SAP Principles

1.1 Purpose

The purpose of this report is to provide sustainability and circular economy recommendations for inclusion within the proposed Williamtown SAP Structure Plan, Masterplan and Delivery Plan. Specifically, these include:

- Recommendations and opportunities for the precinct (and catchments) based on the Structure Plan.
- Set clear precinct scale measures to address sustainability requirements and recommendations to achieve benefits realisation of the Williamtown SAP.
- Ideas for building design and performance measures that could be incorporated into the delivery plan.
- Circular Economy opportunities that should be harnessed across the Precinct and broader region based on the Structure Plan, including the efficient location of certain land-uses or the co-location of certain land uses and infrastructure.

The 'baseline' for sustainability measures is rising as willingness, external drivers and technology coincide. Many organisations, including organisations already located within the Precinct have adopted net zero carbon by 2050 in their environmental and sustainability policies and plans.

To achieve sustainability, development standards for the Precinct will need to be flexible, responsive and adaptive, so that they continue to accommodate changes to the regional, national and international context of sustainability. The staged approach to the development of the Precinct over its lifespan will enable the development to benefit from ongoing sustainability innovation and technology advances.

1.2 Scope of Sustainability

A key objective for the Williamtown SAP planning process is that the planning framework, design and operation of the site should showcase leading practice in the application of sustainability concepts in precincts for advanced manufacturing, aerospace and related land uses. The Brundtland Report 1987 (Our Common Future)[1] introduced the concept of sustainable development which would meet the needs of the current generation without compromising the ability of future generations to meet their needs.

Sustainable development implies integration of risk, technological capacity, social organisation, the state of the environment and the ability of the biosphere to absorb the cumulative effects of human activities. The report described the adaptive process needed to accommodate and respond to change.

There are diverse perspectives on the scope of sustainability. Some practitioners focus on resource utilisation; others on environmental systems; others on environmental and social resilience. For the purposes of planning for the Williamtown SAP, this sustainability report focuses on resource utilisation – energy, greenhouse gas generation and offsetting, water consumption and reuse/recycling of industrial resources through circular economy initiatives. The analysis and recommendations in this report address these aspects of sustainability, but also consider the interactions between sustainable resource management and environmental and social resilience, including resilience to climate change and sea level rise. The key sustainability themes for the Williamtown SAP are outlined in **Table 1.1** and **Figure 1.3.**

Table 1.1 Sustainable Development Themes

Sustainable Development Theme	Focus of theme
Resource Optimisation	Promotion of eliminating or minimising resource use and optimising materials for their prolonged operation and investing in technologies to reincorporate materials for future use.
Energy	Promotion of energy efficiency initiatives and harnessing of innovative, affordable and low carbon energy solutions for the community.
Greenhouse Gas Emissions	Promotion of carbon neutral activities and focus on offsetting emissions from carbon emitting activities.
Transport Connectivity	Enabling connectivity in support of a fully integrated transport network for all purposes.
Water	Promotion of water efficiency initiatives and integration of water cycle.
Green infrastructure and ecological services	Infrastructure developed with consideration of supporting the local environment, habitat and biodiversity.
Technology solutions and knowledge sharing	Promotion of fully integrated digital technology and communications infrastructure to support knowledge sharing and digital connectivity.

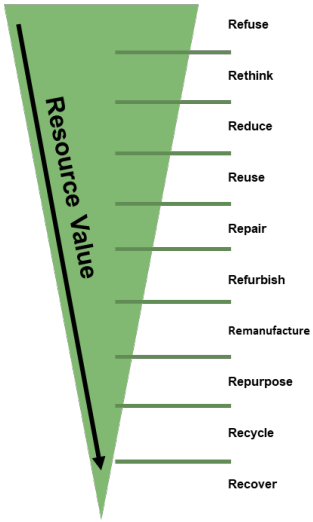


Figure 1.3 Resource Value Prioritisation

[1] Brundtland, G. (1987). Report of the World Commission on Environment and Development: Our Common Future. United Nations General Assembly document A/42/427.

1.3 Locality

The Williamtown SAP is located around 15 km north of Newcastle, NSW and within the Port Stephens Local Government Area (LGA) (refer to **Figure 1.4**), in the Hunter Region.

The Hunter Region has a large share of both regional population growth and regional employment in NSW and is part of the state's fastest-growing corridor (Sydney to Newcastle). Greater Newcastle is the demographic core of the Hunter Region with 95% of residents living within 30 minutes' travel of the strategic centre. Williamtown SAP is just within this 30-minute radius, located adjacent to Newcastle Airport and approximately 20 minutes from major shipping infrastructure in the Port of Newcastle.

The existing land uses and industries of the Williamtown area include the Royal Australian Air Force Base, Newcastle Airport, adjoining industries servicing Defence and Aerospace and a number of the tourism and grazing operations. Additional manufacturing and warehousing industries are also located across the wider locality in Tomago.

Newcastle Airport and the Port of Newcastle are recognised as global gateways targeted to enable the region and the state to satisfy the demand from growth in international economies (e.g. Asia) for products and services associated with education, health, agriculture, resources and tourism[2] (Hunter Regional Plan, 2036). In addition, Newcastle Airport recently received funding to upgrade its runway to a Code E status, meaning that once constructed, the Airport will be able to accommodate long-range, wide-bodied aircraft capable of international transit[3].

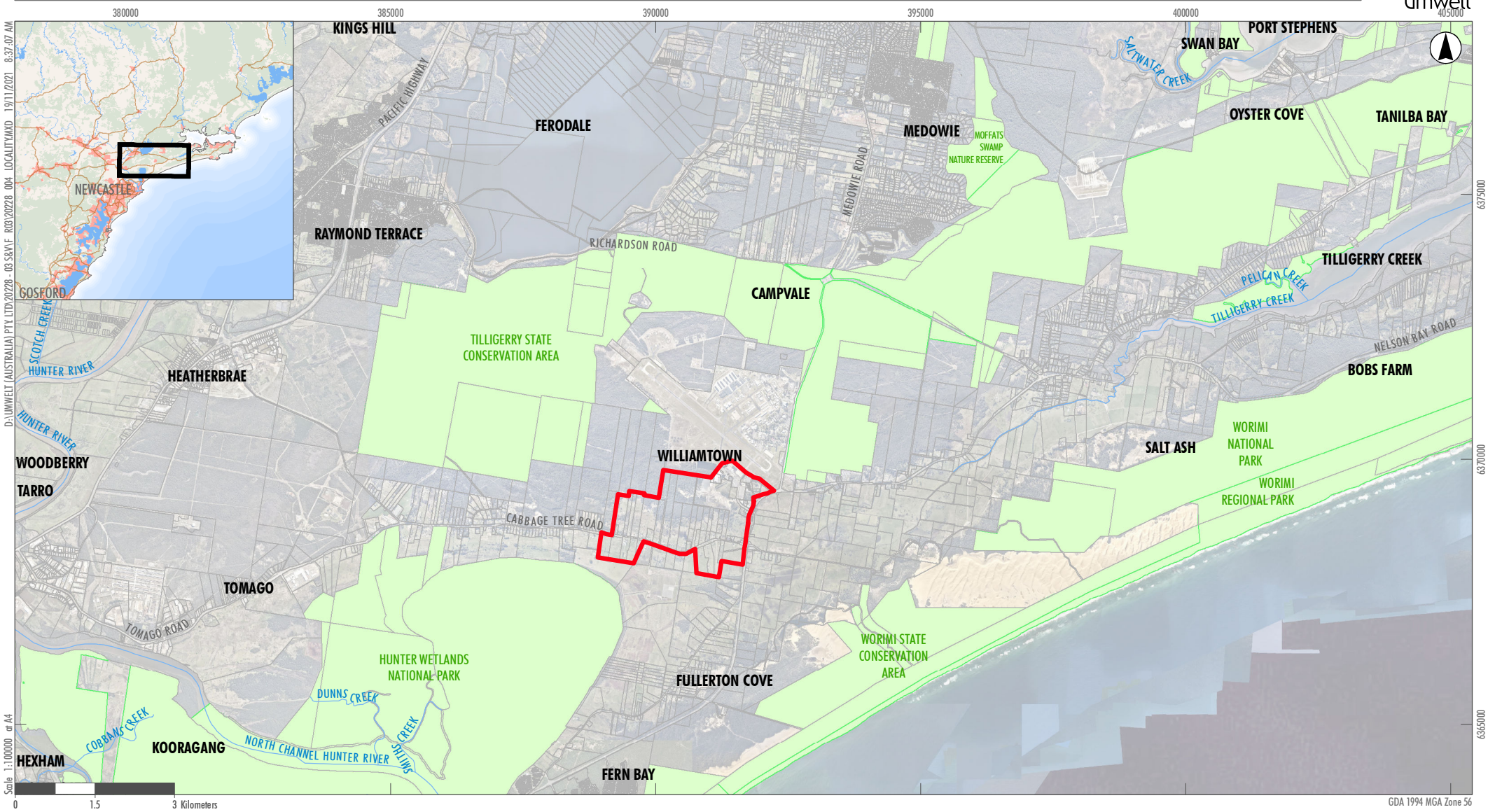
The locality also includes a wide range of environmentally sensitive lands managed for water resources and conservation of natural values, including but not limited to the Tilligerry State Conservation Area, Worimi Conservation Lands, RAMSAR Listed Hunter Wetland National Park and Hunter Water Corporation Drinking Water Catchment for Tomago Sandbeds.

1.4 Key Stakeholders

Key government stakeholders involved in the preparation and planning of the Williamtown SAP planning report include:

- Department of Planning & Environment (DPE), including strategic planning and Biodiversity Conservation Divisions
- Department of Regional NSW
- Port Stephens Council
- NSW Environment Protection Authority
- Transport for NSW
- Newcastle Airport
- Hunter Water Corporation
- Australia Defence Force (Williamtown RAAF).

[2] Hunter regional Plan 2036 (Department of Planning & Environment, 2016)
[3] https://www.newcastleairport.com.au/our-future/code-e-runway-upgrade



Legend

- Structure Plan Area
- NPWS Estate
- Watercourses

FIGURE 1.4

Project Locality

Image Source: Neamap Imagery (Dec 2020) Data source: DFSI (2021)

2.0 Strategic Alignment

A key objective for the Williamtown SAP planning process is that the design and operation of the site should showcase leading practice in the application of sustainability concepts in precincts for advanced manufacturing, aerospace and related land uses.

Sustainability is not a static condition and the concept of sustainable development has evolved since its introduction and will continue to evolve over time.

There are diverse scales of governance which influence the sustainability framework from within the Williamtown SAP from global to local and regional approaches and strategies (see **Figure 2.1**).

More recently, all levels of Australian government and many businesses have recognised that action to move towards sustainable development is not a remote concept, but an urgent priority. This has resulted in agreement about short, medium and long term goals and targets which direct innovation and investment in new ways of delivering products and services, managing resources, connecting systems and people. These targets and actions are a way of operationalising sustainability and linking it directly to business performance systems. The sustainability performance of the Williamtown SAP will depend on how government and private sector investors respond to goals and targets at all levels.

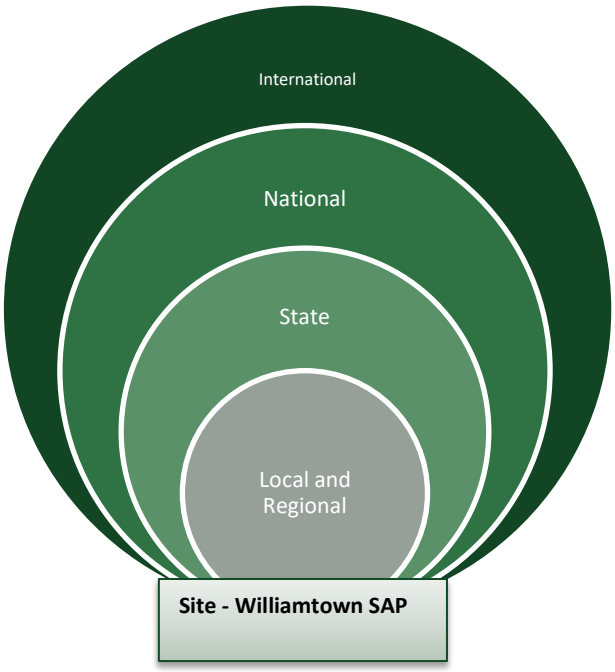


Figure 2.1 Framework Scales

2.1 International

2.1.1 United Nations Sustainable Development Goals

The United Nation's Sustainable Development Goals (SDGs) are a set of 17 holistically developed goals (**Figure 2.2**) and associated targets aimed to protect the global environment and enhance communities now and for future generations.

The goals are intended to drive better outcomes in terms of the health, dignity and equality of people; sustainable management of natural resources (linked to earlier definitions and principles of ecologically sustainable development); economic prosperity; peace and cross regional to global partnerships. These goals are linked to an ambitious, expansive and transformational vision. The SDGs also provide a shared framework for engagement with stakeholders across regions and governance scales.

The goals have been adopted across various levels of government in Australia. Several local industries and sectors have also adopted the SDGs in their environmental or sustainability policies, plans or projects including Newcastle Airport, Hunter Water, Transport for NSW and Ausgrid, which are all notable stakeholders for the Williamtown SAP.

It is expected that all levels of government and private industry will consider the goals relevant to their developments and understand their role in addressing these goals for the benefit of the global community.

Figure 2.2 United Nations Sustainable Development Goals

The SDGs and related targets highlight the scope of change and innovation to be considered for the Williamtown SAP, directly in the design and operation of the site and indirectly through interactions with the wider region. They highlight the role of new industry, infrastructure and technology to activate and enhance sustainability outcomes across a connected region and to drive environmental improvements off site e.g. through the wider supply chain.

SDGs directly linked to the development of the Williamtown SAP are shown below in **Figure 2.3**. Potential sustainability opportunities associated with SDG goals, targets and indicators directly linked to the precinct have influenced the final recommendations made in this document. A copy of the preliminary review is provided in **Appendix A**.

Goal 6 – Climate, Water and Sanitation

Goal 11 – Sustainable Cities and Communities

Goal 7 – Affordable and Clean Energy

Goal 12 – Responsible Consumption and Production

Goal 8 – Decent Work and Economic Growth

Goal 13 – Climate Action

Goal 9 – Industry, Innovation and Infrastructure

Figure 2.3 Directly linked Sustainable Development Goals

2.1.2 UNIDO Eco-Industrial Park

The United Nations Industrial Development Organisation (UNIDO) contributes to the SDGs through facilitating Eco-Industrial Parks (EIPs). While many of the parks that have been developed are in countries with emerging economies, the principles are applicable in Australian contexts.

An EIP is a community of businesses located on a common property in which businesses seek to achieve enhanced environmental, economic and social performance through collaboration in managing environmental and resource issues. The aim of EIPs is to promote resource efficiency and circular economy practices and better connect cities and industries. The promotion of circular economy objectives and climate change adaptation is a key principle of the UNIDO EIP Framework.

Performance requirements are linked to the 2030 SDGs for industry, innovation and infrastructure, as well as employment, economic growth and climate change. For instance, SDG 7 encourages doubling of the rate of energy efficiency improvement and significantly increasing the share of renewable energy by 2030.

The UNIDO EIP framework focuses on delivering beneficial outcomes across four themes:

1. Park management
2. Environment
3. Social
4. Economic

A preliminary review of how the Williamtown SAP can align with the principles of the framework is provided in **Appendix B**.

2.1.3 COP21 Paris Agreement

The Paris Agreement is an International agreement within the United Nations Framework on Climate Change (UNFCC) which aims to keep global temperature rise this century within 2 degrees Celsius (^{o}C) of pre-industrial levels and further pursue options to limit the temperature rise to less than 1.5 ^{o}C above pre-industrial levels[4]

During 2016, Australia was one of 196 countries to commit to the Paris Agreement. Australia committed to reducing national emissions to below 26 - 28% below 2005 levels by 2030. This agreement in turn set a benchmark for each state and territory to develop and set their own targets with an emphasis on meeting or exceeding this target.

All Australian states and territories have set commitments or aspirations to achieve this minimum benchmark by 2030 and have made additional commitments to further committing to net zero emissions by 2050 (or earlier).

There is no defined end period for the Paris Agreement however a 'ratchet mechanism' was introduced where every 5 years, member countries would review their nationally determined contributions and effectively, 'ratchet up' their contributions with more effective and ambitious commitments. This was one of the primary purposes of the recent COP 26 conference in Glasgow. A contemporary example of this mechanism is the NSW State government increasing their commitment to reduce greenhouse gas emissions by 50% before 2030[5].

2.1.4 International Standards Organisation

ISO 14001 (Environmental Management Systems) is an International Standard originally developed during 1996 to assist organisations, including small and medium sized enterprises in the development of a systematic environmental management framework. The standard seeks to establish, implement, maintain and continually improve a framework with the aim to manage an organisation's environmental responsibilities in a manner that contributes to the attainment of sustainable outcomes.

To meet the requirements of ISO 14001, organisations must be independently certified to confirm relevant requirements have been satisfied. Whilst ISO 14001 is a voluntary system for organisations, it has become increasingly common for ISO 14001 certification in tenders for partnerships across public and private industry.

Most recently ISO 14001:2019 released provisions for the implementation of a staged approach for organisations to take in effort improve their environmental performance at a structured and organic pace to ultimately satisfy the requirements of standards. This framework is particularly relevant for small -to-medium enterprises which wish to relocate within the Williamtown SAP however may not have sufficiently mature systems meet to criteria from commencement of operations.

[4] United Nations (2015) Paris Agreement to the United Nations Framework Convention on Climate Change
[5] https://www.environment.nsw.gov.au/topics/climate-change/net-zero-plan

In addition, ISO Guide 84: Guidelines for addressing climate change in standards (2020)[6] provides linkages between ISO 14001 and climate change. It aims to enable and encourage developers to include climate change adaptation and mitigation considerations into the planning and development framework.

Considerations related to climate change adaption focus on promoting organisational resilience to climate change. Considerations related to climate chance mitigation seek to avoid, reduce or limit the release of GHG emissions and/or increase GHG removals. **Figure 2.4** provides an example of how Climate Change risks can be integrated into an ISO 14001 Environmental Management System.

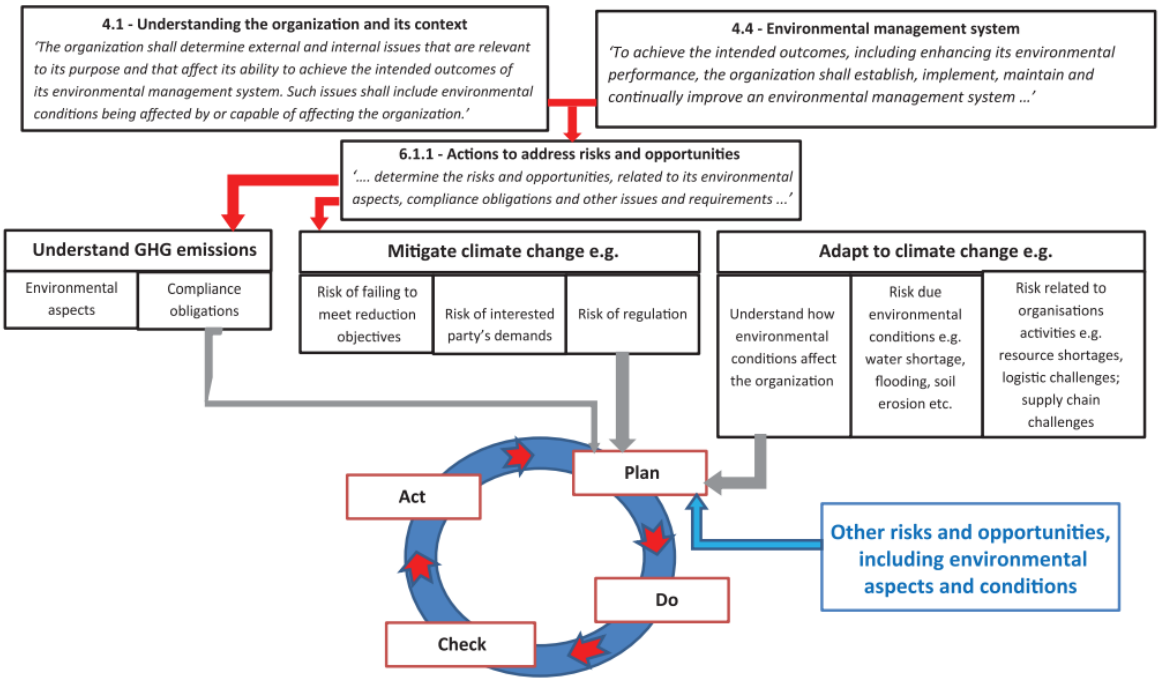


Figure 2.4 ISO 14001 and Climate Change

[6] https://www.bsigroup.com/contentassets/fb7f1499fa6f43c6b9084be8c2378bc9/iso_guide-84_2020e---guidelines-for-addressing-climate-change-in-standards.pdf

2.2 National

2.2.1 Long Term Emissions Reduction Plan

Australia's Long-term emissions reduction plan – a whole-of-economy Plan to achieve net zero emissions by 2050 was released during October 2021. The plan aims to achieve net zero emissions by 2050 across four areas through a number of priority low emissions technologies. At a high level, the plan identifies a number of stretch goals between 2030 and 2040 to guide and encourage development[7]. These are summarised in **Table 2.1**. Specifically, the plan outlines Australia's ambitions to produce ultra-low cost solar of $15/MWh before 2035 to drive energy transition. Reaching this goal will underpin the progress for other priority technologies including but not limited to green hydrogen production and low emissions materials.

The plan also outlines a number of additional strategies, plans and programs which include grants and funding options to encourage the uptake and transition to a net zero emissions landscape in regional Australian areas including the recycling modernisation fund, buildings better regions fund and modern manufacturing strategy.

Table 2.1 Summary of Australia Long-term emissions reduction plan

Action areas	Priority technologies	Stretch goal
1. Driving down technology costs	• Clean hydrogen	• Clean hydrogen production under $2 per kilogram by 2030
	• Ultra low-cost solar	• Solar electricity generation at $15 per MWh by 2035
2. Enabling deployment at scale	• Energy storage for firming	• Electricity from storage for firming under $100 per MWh by 2030
3. Seizing opportunities in new and traditional markets	• Low emissions materials	• Low emission steel and aluminium production under $700 and $2,200 per tonne, respectively by 2040
	• Carbon capture and storage	• CO_2 Carbon dioxide compression, hub transport and storage for under $20 per tonne of CO_2 by 2030
4. Fostering global collaboration	• Soil Carbon	• Soil organic carbon measurement under $3 per hectare per year by 2030

2.2.2 Climate Active Carbon Neutral Standard

Climate Active (formerly the National Carbon Offset Standard) is an Australian Government program designed to encourage voluntary climate action.

[7] https://www.industry.gov.au/sites/default/files/October%202021/document/australias-long-term-emissions-reduction-plan.pdf

Climate Active certifies carbon neutrality, and can be awarded to buildings, events, organisations, precincts, products and services. The Climate Active Carbon Neutral Standard – Precincts outlines the requirements for Climate Active certification[8].

Climate Active would be the determining authority for net zero certification across the Precinct.

2.2.3 National Waste Policy Action Plan

The primary policy driver for resource recovery at a national level is the National Waste Policy Action Plan[9], which sets out targets responsibilities and timelines regarding key waste streams. National targets or actions relevant to the Williamtown SAP and are identified below:

- Export of waste plastic, paper, glass and tyres, commencing in the second half of 2020.
- Reduce total waste generated in Australia by 10% per person by 2030.
- 80% average resource recovery rate from all waste streams following the waste hierarchy by 2030.
- Significantly increase the use of recycled content by governments and industry.
- Phase out problematic and unnecessary plastics by 2025.
- Halve the amount of organic waste sent to landfill by 2030.
- Make comprehensive, economy-wide and timely data publicly available to support better consumer, investment and policy decisions.
- Recommendation: Addressing these targets can be achieved through the adoption of circular economy principles at a precinct level and through integration with and support of regional initiatives.

[8] https://www.industry.gov.au/sites/default/files/2020-07/climate-active-carbon-neutral-standard-precincts.pdf
[9] Department of Agricultural, Water and the Environment (2019), National Waste Policy Action Plan 2019

2.3 State

2.3.1 Climate Change Policy Framework

The NSW Climate Change Policy Framework seeks to achieve net zero emissions by 2050 and for NSW to be more resilient to a changing climate. The policy framework was released during 2016 and has driven the development of a number of plans and strategies to address the aspirational long-term objectives. The NSW Climate Change Policy Framework identifies the critical risks faced by physical infrastructure and communities across the state as a result of climate change. Climate Change and adaptation is further discussed in **Section 4.0**.

The framework sets out seven key policy directions to achieve net zero emissions by 2050 whilst also ensuring the state is more resilient to climate change. These policy directions include:

1. Create a certain investment environment by working with the Commonwealth to manage transition.
2. Boost energy productivity, put downward pressure on household and business energy bills.
3. Capture co-benefits and manage unintended impacts of external policies.
4. Take advantage of opportunities to grow new industries in NSW.
5. Reduce risks and damage to public and private assets in NSW arising from climate change.
6. Reduce climate change impacts on health and wellbeing.
7. Manage impacts on natural resources, ecosystems and communities.

The objectives of the Williamtown SAP are aligned to the Climate Change Policy Framework and associated strategies and plans in place supporting the implementation of the framework. This includes attaining net zero certification across the precinct. It is anticipated this could be achieved across the precinct sooner than 2050.

2.3.2 NSW Net Zero plan

The NSW Net Zero Plan is a staged plan released by the NSW Department of Planning, Industry and Environment which has an ultimate goal of reaching net zero emissions by 2050. The plan supports a wide range of initiatives targeting electricity and energy efficiency, electric vehicles, hydrogen, primary industries, coal innovation, organic waste and carbon financing.

The NSW Net Zero Plan is currently within Stage 1 (2020-2030) and focuses on fast-tracking emissions reduction to provide a foundation for further reductions in the coming decades. At a minimum, the primary goal of the Stage 1 is to deliver a 50% emissions reduction in NSW by 2030. The priorities of the Net Zero Plan include:

- Drive update of proven emissions reduction technologies.
- Empower consumers and business to make sustainable choices.
- Invest in the next wave of emissions reduction innovation.
- Ensure the NSW government leads by example.
- The fundamental objectives of the Net Zero Plan will be achieved across the precinct through attaining net zero certification.

2.3.3 Circular Economy Policy Statement

The NSW government has committed to embed circular economy in their decision making and to plan for the transition to the circular economy at a state level[10]. A key pathway to promoting circular economy principles across the state will be driven by the implementation of state legislation to incentivise circular economy uptake through pricing on products and the waste levy[11].

The principles set out in the Circular Economy Policy Statement (CEPS), which will apply to the Williamtown SAP project are shown in **Table 2.2**. Planning and operations across the precinct should take the 20-year strategy into account.

[10] Environment Protection Authority (2019). NSW Circular Economy Policy Statement
[11] https://climatechange.environment.nsw.gov.au/Adapting-to-climate-change/Regional-vulnerability-and-assessment/Hunter-Central-Coast

2.3.4 NSW Waste and Sustainable Materials Strategy 2041

The NSW Waste and Sustainable Materials Strategy 2041: Stage 1 – 2021-2027 (WSMS) focuses on the environmental benefits and economic opportunities in how we manage our waste[12]. The strategy provides a roadmap for NSW to support the transition to a circular economy over the next 20 years. It includes measures to reduce waste, increase recycling, plan for and attract investment in the infrastructure needed to process future waste streams and volumes, and develop new markets for recycled products.

The strategy includes clear targets to:

- reduce total waste generated by 10% per person by 2030
- have an 80% average recovery rate from all waste streams by 2030
- significantly increase the use of recycled content by governments and industry
- phase out problematic and unnecessary plastics by 2025
- halve the amount of organic waste sent to landfill by 2030.

Table 2.2 identifies the relevance and applicability of the principles set out in the NSW CEPS and the NSW WSMS for the Williamtown SAP.

Table 2.2 NSW CEPS and WSNS – Application to Precinct

NSW Circular Economy Policy Principles	NSW WSMS (Principles)
Sustainable management of all resources • Replace raw materials with recycled products in order to reduce demand for virgin materials	**Transitioning to a circular economy** • Increase the productivity of current resources and use them efficiently
Valuing resource productivity • Identification and capture of resources which have value throughout multiple cycles of use and re-use	**Designing out materials that end up in landfill** • A key principle to achieving a circular economy through effective upfront design
Design out waste and pollution • Product, packaging and service design for longevity and reusability, including through contemporary business models	**Adequate and sufficient infrastructure** • Ensure services and infrastructure are put in place to deal with waste safely and to maximise value retention from waste streams
Maintain the value of products and materials • Upkeep materials and products in such ways that retain their highest value for as long as possible, for example through regular maintenance, repair, and recycling and energy recovery as a last resort	
Innovate new solutions for resource efficiency • Research and development to explore more efficient and effective processes to recover value from products and materials once they're reached their end of life	

[12] NSW Waste and Sustainable Materials Strategy 2041

NSW Circular Economy Policy Principles	NSW WSMS (Principles)
Foster behaviour through education and engagement • Ongoing engagement with stakeholders across the precinct to encourage uptake of circular economy initiatives	

2.3.5 Waste Avoidance and Resource Recovery Act

The NSW *Waste Avoidance and Resource Recovery Act 2011* (WARR Act) promotes waste avoidance, efficient use of resources, and recovering resources at their end of life to achieve a continual reduction in waste generation and ecologically harm. The WARR Act aims to ensure resources are managed in line with the waste hierarchy, covering waste avoidance at the top of the hierarchy, followed by resource recovery, energy recovery, and disposal. The Williamtown SAP would also be required to meet the requirements of relevant resource recovery orders and exemptions, should relevant materials be proposed for use.

2.4 Independent and Industry Standard

The Infrastructure Sustainability Council of Australia's (ISCA) Infrastructure Sustainability Rating Scheme (ISRS) and Green Building Council Australia's (GBCA) Green Star Rating System (GSRS) facilitate best practice sustainability measures. Both the ISCA ISRS and GBCA GSRS initiatives aim to provide a framework to support the development of best practice sustainable design, build and operations of infrastructure, assets and buildings.

The ISCA ISRS initiative focuses on driving and maximising sustainability outcomes across the construction and ongoing operation of infrastructure projects and assets whereas the GBCA GSRS focuses on the sustainable design, construction and operation of buildings, fit-outs and communities. In addition, the GBCA GSRS provides a framework for the retrofitting of existing assets and buildings to meet these standards.

Modern precincts such as the Barangaroo Precinct, have integrated designs and boundaries between different infrastructure, assets and buildings, maximising the efficiency of land, material and resources uses and efficiencies.

As a consequence, it is becoming increasingly common for the projects which have integrated designs and boundaries to receive dual accreditation.[13]

Uptake of both of these initiatives across the Precinct for both infrastructure projects and new commercial building constructs, will incorporate best practice sustainability measures relevant to the scale, size and type of project. Each of the abovementioned rating systems are further discussed below.

[13] https://www.isca.org.au/getmedia/b381eb3c-a694-4cfc-a728-078635a99d30/G0197_Brochure_ISCA-and-GBCA-Crosswalk-Report_v8-3.aspx

2.4.1 Infrastructure Sustainability Council of Australia

The Infrastructure Sustainability Council of Australia (ISCA) is a peak industry body which promotes the enabling of best practice sustainability outcomes across a diverse range of infrastructure developments (refer to **Figure 2.5**). ISCA does this through several mechanisms, including:

- Operating an industry-led Infrastructure Sustainability Rating Scheme (ISRS) for planning, design, construction and operations of infrastructure assets.
- Delivering a wide range of training and capacity-building programs specifically to enhance sustainability outcomes in infrastructure.
- Connecting infrastructure projects to suppliers of sustainable products and services through its ISupply program.
- Bringing together sustainability practitioners and infrastructure professionals to share knowledge and lift the community of practice.

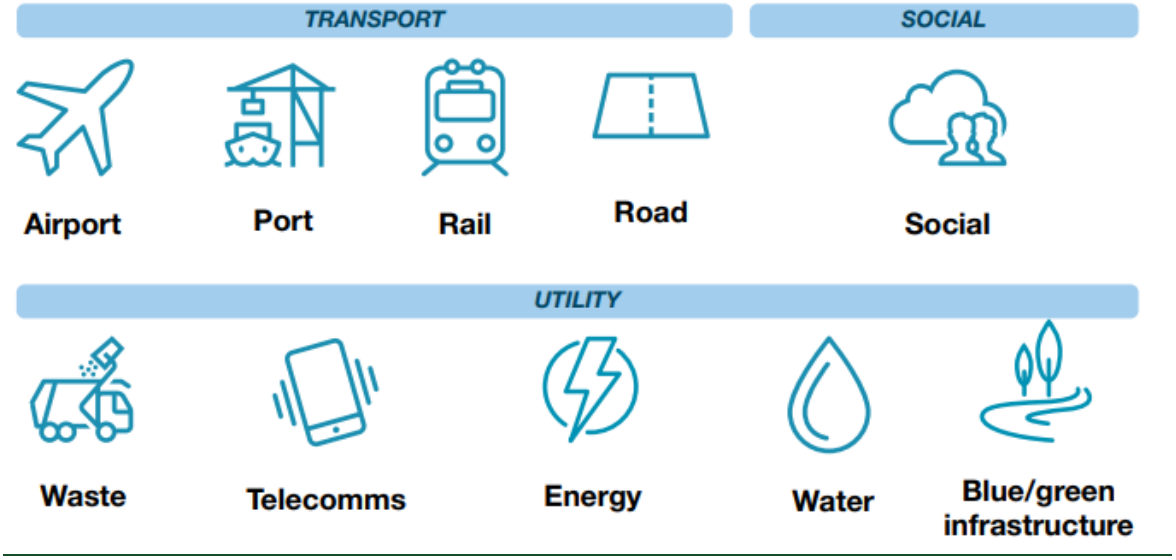


Figure 2.5 ISCA ISRS Applications

Estimates indicate that the construction and operation of physical infrastructure assets for transport, energy, water, waste and communications directly contribute to approximately 15% of Australia's annual emissions whilst indirectly attributing to approximately 55% of emissions through the operation or undertaking of activities enabled by infrastructure[14].

To date over 40 Projects across NSW have been certified contributing to significant decreases in construction and operational emissions, energy and water use and materials used across asset's lifecycle.[15]. The ISRS is already embedded within several Australia public infrastructure frameworks, including Sydney Metro and Melbourne Metro which require all project packages to achieve an IS and/or Green Star rating while all Queensland and Western Australia road authorities require an IS rating on all projects over $100 million.

NSW government has also noted its responsibility to drive sustainability in government policies and procurement, though influencing whole of government policies which impact sustainability, and whole of government sustainable procurement and supply chains for goods and services. Examples include but are not limited to Transport for NSW Sustainability Targets and NSW Procurement Policy Framework.

The IS Rating Tools is based on a rating scale out of 100 and much meet certain criteria to attain credit points. ISv2.1 and ISv2.0 Rating Tools have five award categories: Diamond (95-100), Platinum (80-94.9), Gold (60-79.9), Silver (40-59.9) and Bronze (20-39.9). Best practice sustainability outcomes for the Williamtown SAP would likely include incorporating ISCA ratings, or similar into design and development requirements for relevant Williamtown SAP projects. Utilisation of the iSupply program would also promote circular economy initiatives across the Precinct during the various construction stages.

Incorporating these standards into the Williamtown SAP would likely occur during the construction and develop of each catchment.

2.4.2 Green Building Council Australia

The Green Star rating system was established by the Green Building Council Australia (GBCA) and is Australia's largest voluntary sustainability rating system promoting the sustainable transformation of buildings, cities and communities. The rating system primarily focuses on commercial applications however GBCA are investigating opportunities to align industrial building applications within their system[16].

The GBCA Carbon Positive Roadmap[17] for the built environment sets out a roadmap for the certification of commercial, institutional and government buildings from 2020 onwards. As noted within Appendix J of the roadmap, the rating system will respond dynamically as sustainable technologies become more affordable and accessible to industries and policy amendments.

This roadmap sets a target that all new commercial, institutional and government buildings constructed will operate at net zero emissions carbon by 2030 and all existing constructed buildings operate at net zero emission by 2050.

[14] Climate Works Australia (2020) Issues paper: Reshaping Infrastructure for a net zero emissions future https://www.climateworksaustralia.org/resource/issues-paper-reshaping-infrastructure-for-a-net-zero-emissions-future/
[15] Infrastructure Sustainability Council of Australia (2021) Impacts Report
[16] https://gbca-web.s3.amazonaws.com/media/documents/green-star-in-focus-the-case-for-sustainable-industrial-buildings.pdf
[17] Green Building Council of Australia (2019), Carbon Positive Roadmap for the built environment

3.0 Existing Industry and Assets

3.1 Existing and Adjacent Industries

Newcastle Airport & Astra Aerolab

Newcastle Airport is jointly owned by Port Stephens Council and Newcastle City Council. The land is owned by the Commonwealth and under lease from the Department of Defence. Newcastle Airport sees over 1 million passenger transits annually. Passenger numbers and airside activity are expected to significantly grow following the completion of the runway upgrade at the airport to cater for international passenger and freight flights[18]. Newcastle Airport is a participating member in NSW Sustainability Advantage program.

Astra Aerolab is a local technology precinct owned by Newcastle Airport and located within the Precinct, promoting aviation, Defence, advanced manufacturing, maintenance, research and education investment. Stage 1 of the Astra Aerolab is now complete with planning underway for Stages 2 - 6.

Recommendation: Partnership, investment and sustainability opportunities, including sustainable transportation options with the existing stage and future stages of the Aerolab will be embedded together across the Precinct.

Royal Australia Air Force Base

The Williamtown RAAF Base is located adjacent to the precinct and is a key stakeholder in the planning process. The environmental framework for the RAAF base largely is managed via Australian Defence Force (ADF). A key sustainability measure enacted across the Defence estate is the implementation of a 'Whole of Life' cost approach when considering the selection of materials and resources.

- Recommendation: *Williamtown SAP stakeholders working within or adjacent Defence based industries should stay abreast of opportunities for collaboration with local partners with sustainability ambitions that are aligned with the SAP's (such as the adjacent ADF).*

[18] https://www.newcastleairport.com.au/our-future/code-e-runway-upgrade

3.2 Infrastructure Providers in or adjacent to the Williamtown SAP

This section provides an introduction to sustainability policies and frameworks of existing infrastructure and service providers operating within or adjacent to the precinct; they are considered key stakeholders for development across the precinct to achieve respective sustainability goals. An initial review of these policies and frameworks identifies a capacity for these stakeholders to actively participate and embed sustainability practices across the precinct during its development.

Transport for NSW

Transport for NSW (TfNSW) has developed the TfNSW Sustainable Design Guidelines incorporating various state sustainability policies as they relate to the transport sector. These guidelines are broadly focused on sustainability themes such as energy and greenhouse gases, climate resilience, materials and waste and water.

Each theme has a number of compulsory and discretionary initiatives, and outcomes which must be satisfied across the duration of a Project. TfNSW also encourages projects to be rated under external mechanisms e.g. ISCA which takes a wide range of sustainability factors into account.

TfNSW Sustainability initiatives for projects within the Precinct would likely focus on:

- construction and demolition wastes being diverted from landfill
- satisfaction of sustainable procurement requirements
- consideration of embodied emissions in material used.

Recommendation: Public infrastructure works supported by the Precinct should aim to be rated under external sustainability rating mechanisms e.g. ISCA.

Hunter Water

Hunter Water Corporation (HWC) is a State-owned corporation which provides drinking, wastewater, and recycled water services across the Lower Hunter and Greater Newcastle region. HWC is currently a stakeholder for the Williamtown SAP and is responsible for the supply and management of drinking and wastewater resources for a number of existing land uses.

HWC has a commitment to minimise and mitigate emissions and support opportunities for the development to alternate energy sources. Specific HWC commitments include:

- reducing greenhouse gas emissions and reach net zero carbon emissions by 2030
- integrating sustainability principles into planning and operations business decisions
- implementing recycling and reuse initiatives.

Sustainability initiatives for the Williamtown SAP would focus around maximising the reuse water onsite, reducing potable demands, environmental discharges and emissions.

3.3 Natural Assets and Ecosystem Services

Natural assets, green or natural infrastructure, natural capital and ecosystem services concepts highlight the economic and social value contributed by natural systems (see **Table 3.1**).

Regulating and cultural ecosystem services offered by natural systems are important to:

- water and carbon budgets
- social and community systems, including place keeping, amenity and liveability.

Investing in protection of the natural ecosystem services available on the site and encouraging the provision of green infrastructure across the Williamtown SAP can provide benefits including:

- stormwater management, flood mitigation and water quality improvements
- localised air quality management
- habitat connectivity for biodiversity
- urban heat island mitigation and improved amenity
- carbon sinks via blue and green infrastructure investment, including development man-made wetlands
- active and passive recreation through landscape design.

This also forms part of a key principle of the 2021 draft Place and Design SEPP to deliver sustainable and greener places to ensure the wellbeing of people and the environment which has been a consideration in the development of the Williamtown SAP structure plan.

Table 3.1 Value of Natural Systems

Concept definitions	Description
Natural assets	Ecosystem assets are the character and condition of diverse ecosystems and the ecosystem services they generate.
Natural infrastructure	Natural infrastructure comprises areas or systems that are either naturally occurring or naturalised and then actively managed to provide multiple benefits for the environment and human well-being. Examples include naturally occurring and constructed wetlands, riparian buffers, urban forests, meadows and pastures, community gardens, green roofs, treatment lagoons and even stormwater drains (if designed and managed appropriately). These benefits can include climate resilience, clean drinking water, stormwater management, floodwater detention, cooling and biodiversity (i.e. the ecosystems services- as defined below).

Concept definitions	Description
Natural capital	The 'capitals' approach includes five types of capital, of which natural capital is one. Natural capital refers to the renewable and renewable physical stock of nature such as trees, minerals, soil, ecosystems, atmosphere, which yield a flow of benefits to people (Schumacher 1973). This connection to human well-being is a key component of sustainability. The goods and services that are supported by natural capital include clean water, fertile soil, genetic resources. Natural Capital accounting and ecosystem accounting attempt to provide a systematic framework to measure and report on how the flows of natural capital are balanced by the values of natural ecosystems and how the condition and integrity of ecosystems can be maintained while they provide natural capital benefits. UN notes a key question is 'what are the trade-offs among different land uses that benefit from ecosystem services, e.g. for agriculture, mining, housing, development, recreation or conservation, to achieve long term sustainability and equity?
Ecosystem services	UN and SEEA define ecosystem services as the contributions of ecosystems to benefits used in economic and other human activity. These can be considered in three broad categories: Provisioning services – material and energy contributions generated by an ecosystem. Regulating services – the capacity of ecosystems to regulate climate, hydrologic and biochemical cycles, earth surface processes and a variety of biological processes, including considering their spatial distribution. Cultural services – intellectual and symbolic benefits to people.

4.0 Climate Change

4.1 Observations and Projections

The 2020 State of the Climate report was released by CSIRO and Bureau of Meteorology (BoM) in November 2020[19]. The report presents clear evidence that the climate is changing across all scales of the environment. The report provides a list of meteorological and climate change observations recorded through 2019/2020. Observations of the 2020 State of the Climate report are summarised in **Table 4.1**.

The rate of change identified in the report provides incentives for regional planning processes to incorporate both climate adaptation measures (for instance to be resilient to sea level rise, drought, increased frequency of high heat days or more intense storms over the asset life of the development) and climate change mitigation measures. This report has utilised climate change projections from the NSW and ACT Regional Climate project (NARClim) and more broadly from AdaptNSW. **Table 4.1** provides a summary of relevant climate projections for the Hunter region and a summary of implications to health, natural and built environmental across the Williamtown SAP.

4.2 Precinct Vulnerability and Risk

AECOM has prepared a discussion paper on natural hazard vulnerability in the lower Hunter[20] focused on community vulnerability and resilience to the changing risk profile of natural hazards that are driven by meteorological events and related processes. The hazard profile of the Lower Hunter includes inundation due to sea level rise and catchment flooding, coastal recession, storm damage (from cyclones and East Coast Lows), drought, extreme heat and bushfire. With the exception of open coast recession, all of these apply to the Precinct. CSIRO and BoM estimates indicate sea level rise of greater than 100 mm per decade in the local coastal area[21][22] over the coming decades. This means that impacts associated with flooding and poor drainage within the local area would be experienced in greater severity.

Hunter Joint Organisation of Councils (formerly HCCREMS) prepared a risk assessment for the Lower Hunter region for climate exacerbated natural hazards[23]. The assessment was informed by risk assessments undertaken by each coastal council member of HCCREMS, including PSC. The project identified 50 priority risks (i.e. high or extreme risks) across the region based on the consequences of natural hazards. Risks identified relevant to the Precinct locality, in broad terms, are summarised in **Table 4.2.**

A key goal is to embed climate change adaption into precinct planning and this has commenced as part of the wider study packages, which included the facilitation of a climate change risk assessment (CCRA) and preparation of a Climate Change Adaptation Plan[24]. The CCRA should be reviewed periodically during the term of the Williamtown SAP to promote greater resilience and adaptation to changing climate conditions and status of precinct operations at the time.

[19] State of the Climate 2020 https://www.csiro.au/en/Showcase/state-of-the-climate
[20] AECOM (2013) Resilience to natural Hazards in the Lower Hunter
[21] State of the Climate 2020 https://www.csiro.au/en/Showcase/state-of-the-climate
[22] https://www.csiro.au/en/Research/OandA/Areas/Assessing-our-climate/State-of-the-Climate-2020/Oceans-and-cryosphere
[23] Hunter and Central Coast Regional Environmental Management Strategy (2010) Coastal Councils Climate Change Adaptation Plan
[24] dSquared (2022) Williamtown Special Activation Precinct Climate Change Adaptation Plan

Future iterations of the CCRA should be expanded to cover aspects such as transitional risk, including those recommended by the Task Force for Climate Related Disclosures focusing on Policy and Legal, Technology, Market and Reputational risks associated with the precinct.

Table 4.1 Climate Project and Observation Summary

Aspect	Projections	Observations	Implication to Williamtown SAP
Temperature	• Increase in all temperature variables, with maximum temperatures increasing by 0.7 °C in the near future (to 2030) and 2.0 °C in the far future (2070) • Greater increases are projected to occur in spring and summer (up to 2.3 °C higher maximum temperatures). • Minimum temperatures will increase • Increase in the number of very hot days by approximately 5 - 10 per year in coastal regions	• Nationally, on average, the climate as warmed 1.44 +/- 0.24 degrees Celsius since nation records began in 1910 • 2019 experienced 43 extreme heat days, more than triple the number in any year prior to 2000	Shifts in extreme temperatures has implications for health, ecosystems and infrastructure including but not limited to: • Heat stress on human and ecosystem communities • Increased demand for utility services and power • Increased water consumption • Risks to building integrity (e.g. cracking)
Rainfall	• Rainfall in Autumn to increase • Rainfall in Spring to decrease • Rainfall in Winter to decrease	• 12% decline in rainfall experienced between April & October since the late 1990s • Notable increase in short term high intensity rainfall	• More variable rainfall patterns resulting in potential of more sporadic rainfall capture • Flash flooding in urban and built environments
Extreme Weather Events	• Increase in severe fire weather is projected for spring and summer • Less frequent and more intense storm events	• Increase in extreme fire weather and length of fire seasons since 1950 • Heavy rainfall becoming more intense • Extended drought	• Greater risk of bushfire and threat to built environment • More intense storm events leading to greater flooding and tidal inundation • Water security of alternative water sources; impact on water dependent surface vegetation

Aspect	Projections	Observations	Implication to Williamtown SAP
Warming and Rising Oceans	• Increase in global mean sea level rise • Thermal expansion of ocean	• Ocean temperatures warmed by about 1 degree Celsius • Highest rates of sea level rise have been measured off the central east coast – including off the Hunter region	• Greater risk of inundation by increasing the frequency and duration of extreme high-water levels • Loss of marine and terrestrial ecosystems • More variable tidal patterns • Potential groundwater PFAS implications • Permanent inundation and salinisation of nearby intermittent wetlands, changes to stormwater drainage opportunities and effectiveness

Table 4.2 HCCREMS Climate Change Risk Assessment (2010) – High or Extreme Risks

High or Extreme Risk Priorities in SAP	Sustainability and Adaptation Connections
Impacts to built structures due to extreme weather events and changing climate	• Incorporation of climate change adaptation technologies in design criteria for new structures, including building envelopes on land parcels • Program to retrofit existing structures to incorporate climate change adaptation technologies • Use of climate resilient materials and building designs (in accordance with the relevant ISO and other sustainable building rating system) • Management of waste materials from any damaged structures • Self-sufficient energy systems with lower reliance on external or regional networks
Stormwater and drainage system overtopping/failure in intense rainfall events	• Design and install appropriate flood mitigation measures and structures • Management of waste materials from any damaged structures
Transport infrastructure - damage and maintenance requirements	• Rising water table impacting design life of underground infrastructure and assets and of road pavement of connecting roads • Emergency access and egress options for when flash flooding occurs • Consideration of climate modelling in design to prevent future flooding and inundation
Wastewater treatment – failures of pump stations, treatment plants and associated infrastructure	• Increased resource optimisation and efficiencies • Incorporation of climate change adaptation technologies in design criteria for new structures
Water supply security	• Minimum Williamtown SAP specific water efficiency measures to be implemented in design criteria • Program to retrofit existing industries to meet minimum Williamtown SAP specific water efficiency measures • Resource optimisation of potable and non-potable water
Land use planning in coastal and flood prone areas (e.g. loss of development potential)	• Consideration of climate modelling in design to prevent future flooding and inundation • Minimum ground and floor level requirements and material and footing procurement standards in flood prone areas
Greater health and well-being risks to community	• Incorporation of green infrastructure • Reduced precinct emissions
Decline in stream and or Increased pollution of waterways, affecting the health and productivity of aquatic ecosystems	• Natural and bio-filtration systems incorporated into design

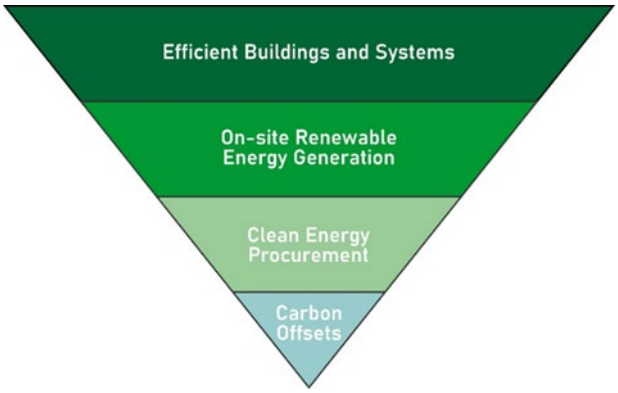
5.0 Energy and Emissions – a Pathway to Net Zero

5.1 Renewable Energy Adoption Strategy

A fundamental goal of the Williamtown SAP masterplan process is to provide a pathway to maximise the efficiency, use and generation of decarbonised energy across precinct operations and ultimately reducing emissions to contribute to a net zero emissions landscape.

The long-term energy adoption and decarbonisation strategy for the Precinct is outlined in **Table 5.1**. It focuses on reducing energy consumption through building design and system efficiencies, utilising energy from renewable resources and finally, offsetting unavoidable emissions from fossil-fuel energy sources.

Table 5.1 Renewable Energy Adoption Strategy

Energy Hierarchy Strategy	
	**Energy Efficient Buildings and Systems** • New infrastructure developments maximise energy efficiency outcomes • Existing infrastructure retrofitted to maximise energy efficiency
	On-site Renewable Energy Generation • New infrastructure developments to install onsite electricity generation capabilities • Existing infrastructure to be retrofitted with onsite electricity generation capacity (if not already)
	Clean Energy Procurement • Organisations develop purchase agreements with renewable energy organisations across the region (preferably local)
	Carbon Offsets • Offset unavoidable emissions

5.1.1 Energy Efficient Buildings and Systems

Efficiency measures can be simple initiatives such as efficient fixtures and fittings within buildings, through to more innovative technology solutions to achieve the more significant energy savings. Efficiency measures can also be embedded into the design process to maximise long term sustainable outcomes, including but not limited to reduced incoming heat through shading, heat pumps, insultation, glazing of windows, building orientation and colour and installation of smart monitoring technologies.

Whilst minimum government standards have been set through applications such as BASIX, industry partnerships such as GBCA and NABERS rating schemes provide best practice benchmarks across a number of key sustainability attributes for the built environment, including prioritising energy efficiency measures, the elimination of carbon emissions, water and materials. Additional actions may also include investigating options to switch from gas or other fossil fuel based processes to renewable-sourced, electricity based processes.

5.1.2 On-site Renewable Energy Generation

A number of renewable energy sources were reviewed and assessed as part of the Renewable Energy Report for the Williamtown SAP[25]. Due to land use and space constraints the preferred approach for on-site renewable energy generation would be via small scale solar PV (or rooftop solar).

The utilisation of small scale solar would be an adoptable option on the majority of buildings and other assets in the Williamtown SAP.

Benefits of small scale solar across the Williamtown SAP include:

- Peak generating capacity generally aligns with day time business operations (9 am - 5 pm).
- Opportunity to cover early part of 'peak' demand periods (2 pm – 5 pm).
- Opportunity to sell or transfer residual electricity back to market or to other Williamtown SAP land uses.
- Minimises energy transmissions losses from offsite sources.

Maximising the benefits of small scale solar could be realised through:

- Include base requirements within delivery plan that rooftop solar is installed on all built assets in the precinct.
- Consideration of constructing roofs capable of supporting solar panel generation above carparks and other impervious land (also provides additional rainwater collection and reuse opportunities).
- Installation of battery storage systems at precinct and catchment levels.
- Connection to a precinct based microgrid.
- Development of behind the meter metering options, such as Virtual Power Plant.

Requirements for the installation of small scale solar systems within the Williamtown SAP could be included within the Delivery Plan, where practicable or unconstrained due to land use or spatial requirements.

[25] Aurecon (2021) Williamtown SAP Draft Renewable Energy Report

5.1.3 Clean Energy Procurement

Based on conceptual calculations from the Renewable Energy Report for the Williamtown SAP[26], externally sourced renewable energy will be required for the operation of the Precinct. The most preferable option to source energy from outside the Williamtown SAP would be undertaken via precinct based Power Purchase Agreement (PPA).

A number of organisations and precincts such as Newcastle City Council[27] and the Barangaroo Precinct operate under existing PPAs. Sourcing additional offsite electricity at a precinct level, could create a competitive advantage over other direct market consumers and enticing new business within the Williamtown SAP.

Uptake of a PPA has the potential to drive and further influence sustainable development in NSW, particularly in areas of Regional NSW where Renewable Energy Zones or Hubs are being constructed. Ongoing consideration of locally (I.e. Port Stephens and Hunter region) based renewable energy generators should also be considered during procurement. It would be the responsibility of the Williamtown SAP concierge or other suitable project facilitator to manage this process.

5.1.4 Carbon Neutral Precinct

A central goal for the Precinct will be to achieve an ISO 14001 certified carbon neutral status. Emissions generated as a result of Precinct operations will include a combination of Scope 1, 2 and 3 emissions that are generated from the day-to-day running of the Precinct.

Scope 1 emissions are classified as direct emissions, these are emissions generated from within the nominated boundary of the precinct. Scope 2 emissions are classified as indirect emissions, these are emissions generation of purchased electricity, heat and cooling etc that are generated from outside the boundary of the Precinct. Scope 3 emissions are emissions as a consequence of a responsible entity's activities but emitted outside the responsible entity's control (or geographic boundary), this includes emissions from either upstream or downstream from their supply chain. This may include the development of suitable procurement standards at either a precinct or organisation level as minimum practice or consideration of an organisation's sustainability commitments, objectives and actions, such as those outlined in **Section 3.2.**

Achieving net zero emissions accreditation can be completed through either a centralised precinct approach or through a more decentralised approach where individual business and organisations are required to attain certification independently. If a centralised approach is preferred, options may also become available for a hybrid approach where individual organisations and businesses would opt to attain accreditation themselves independently of the precinct.

The Climate Active Carbon Neutral (CACN) Standard for Precincts[28] provides a voluntary and accredited federal framework for managing emissions and achieving carbon neutrality across the precinct, measure test and if required, offset remaining emissions to allow certification of carbon neutrality.

[26] Aurecon (2021) Williamtown SAP Draft Renewable Energy Report
[27] https://newcastle.nsw.gov.au/council/news/latest-news/city-awards-100-per-cent-renewable-contract
[28] https://www.industry.gov.au/sites/default/files/2020-07/climate-active-carbon-neutral-standard-precincts.pdf

The CACN Standard for Precincts (i.e. centralised approach) is a compatible framework for adoption across the Precinct. Precinct emissions could be managed through the same Park Management entity as required by the UNIDO EIP framework (likely the Williamtown SAP concierge). Identification of the appropriate geographic boundary is a key element of the CACN Standard for Precincts. The geographic boundary set for the Precinct should be consistent with the boundary of the precinct in planning documents and should also align with community expectations of the precinct's border. For new precincts developed in stages, the geographic boundary should include the whole extent of the planned precinct where practical. This will allow for the incorporation of new parts of the precinct into the carbon neutral claim as they achieve construction completion and become occupied.

CACN Standards for Buildings and Organisations (i.e. decentralised approach) are also compatible mechanisms to certify carbon neutrality for respective buildings and organisations across the Precinct on a smaller scale. CACN Standards for Buildings and Organisations also provide a flexible option for the Businesses and Organisations that may already have their commitments to net zero carbon outside the scope of the Precinct (i.e. a hybrid approach).

Certification under the CACN Standards require renewal every three years. All CACN Standards offer a practicable approach to measure, reduce, offset, report and audit emissions across the nominated scale (boundary). Greenhouse gas emissions can be offset by surrendering recognised carbon offsets. Every offset surrendered offsets one tonne of carbon dioxide (equivalent). Carbon offsets can be purchased or generated.

A strategy for offsetting all carbon emissions produced by industries or enterprises across the Precinct will likely be based on the purchase and surrender of offset credits generated from outside the Precinct. Given total area/size of the Precinct, it is considered unlikely that offset credits will be generated within the precinct.

Carbon offset units can be created or sourced from a range of certification programs and units eligible under the CACN Standard are listed in **Table 5.2**[29].The management of carbon offsets within the Precinct could be managed centrally via the Williamtown SAP concierge on behalf of tenants or individually where businesses located within the Williamtown SAP could purchase credits as part of their wider organisational framework and net zero commitments.

Table 5.2 Eligible Offset units

Offset Unit`	Description
Australian Carbon Credit Units (ACCUs)	• ACCUs are generated by Australian offset projects and issued by the Clean Energy Regulator.
Certified Emissions Reductions (CERs)	• CERs are generated by offset projects in developing countries, and are issued by mechanisms associated with the Kyoto Protocol.
Removal Units (RMUs)	• RMUs are generated by land use, land use change and forestry projects (LULUCF), and are issued by mechanisms associated with the Kyoto Protocol. • RMUs are not eligible to be created in Australia.

[29] https://www.industry.gov.au/sites/default/files/2020-07/climate-active-carbon-neutral-standard-precincts.pdf

Offset Unit`	Description
Verified Emissions Reductions (VERs)	• VERs are generated by offset projects, and are issued by the Gold Standard. The Gold Standard is an NGO, led by WWF, which manages offset projects in over 60 countries. • Gold Standard projects aim to generate offsets and drive sustainable development.
Verified Carbon Units (VCUs)	• VCUs are generated by offset projects, and are issued by Verra. Verra is an NGO, which manages a large suite of international offset projects.

5.2 Gas

Renewable energy and electricity is only one part of efforts to decarbonise both the energy and industrial/manufacturing sectors. The utilisation of gas will continue to have functionality in a number of industrial and manufacturing processes. Unlike natural gas, hydrogen gas as an energy resource can be considered a clean fuel when manufactured from 100% renewable resources i.e. life-cycle emissions of zero. The application of hydrogen has the potential to increase industrial productivity while also decarbonising industrial and manufacturing processes that cannot be efficiently electrified however, as noted by the NSW Chief Scientist during 2020[30], the cost of producing and using hydrogen from renewable resources (i.e. green hydrogen) is currently cost prohibitive in a number of current industrial applications. Both the National Hydrogen Strategy and the NSW Hydrogen Strategy aim to develop Hydrogen produced via renewable electrolysis into a cost competitive resource (i.e. $2/kg) by as soon as 2028[31].

Whilst there will likely be some short-to medium term functionality through the blending of hydrogen into the existing gas network as the technology becomes increasingly more feasible, there are technical limitations on injecting or blending more than 15% hydrogen within the existing gas network[32].

There are a number of possible methods for future utilisation of hydrogen in the Williamtown SAP, including:

- Injection or blending of hydrogen (up to 15% by volume) into an existing gas pipeline.
- Installation of a dedicated hydrogen network.

Recommendation: Dedicated easements for future technology advancements (e.g. hydrogen pipeline) are considered and planned for during the early stages of the Precinct planning.

5.3 Transport

The Precinct is currently serviced by two public bus services which run multiple services on a daily basis. The services connect the Precinct to Newcastle, Nelson Bay, Raymond Terrace and other suburbs in proximity to the Precinct.

[30] https://www.chiefscientist.nsw.gov.au/__data/assets/pdf_file/0004/321466/Final-Report-Decarbonisation-Innovation-Study.pdf
[31] COAG Energy Council (2019) Australia's National Hydrogen Strategy
[32] Aurecon (2021) Williamtown SAP Draft Utilities Infrastructure Report

From a wider transport perspective, sustainability options driven by the Precinct will generally be limited until the wider freight and transport sector is able to utilise electric powertrains[33] or alternate energy fuelled freight vehicles[34]. However day to day operations of mobile plant within the freight and logistics, manufacturing and light industrial hub will have the potential to be fully electrified and sourced from renewable energy sources.

Research from the Greater Newcastle Future Transport Plan indicates that up to 80% of residents utilise personal vehicular transport as part of their daily commuting habits[35]. The ongoing uptake of electrified or alternately fuelled personal transportation vehicles will also support the state's overarching objective to achieve net zero emissions by 2050. Infrastructure additions such as charging stations will also be required to be developed across the Precinct to support uptake of electrified or alternatively fuelled personal transportation vehicles across the life of the Precinct. Additional measures to encourage the uptake of electric or hybrid vehicles may also include requirements for organisations within the Precinct to utilise a minimum percentage of hybrid or electric vehicles across their overall fleet. This is consistent with NSW government initiatives for their own fleet vehicles[36]. Measures such as these, including the provision of charging stations across the Williamtown SAP should be periodically reviewed or when detailed design for the eastern and western catchments is undertaken.

Participation of active transport options such as walking and cycling are generally highest when the commute distance is less than or around 5 km[37]. Once within the Precinct, active transport should be encouraged through the Precinct landscape design including dedicated off-road walking and cycling pathways. Opportunities for shared cycling schemes could also promote uptake of active transport options within the Precinct. Other sustainable intra-precinct transport options that could be implemented across longer term planning horizon includes an electrified autonomous on-demand shuttle service[38] that which would provide additional accessibility options however, the timing of such mobility measures would likely rely on the timing of expansion of the precinct into the eastern and western catchments of the Williamtown SAP.

[33] https://cleantechnica.com/2021/01/30/scania-ditches-fuel-cell-trucks-to-focus-on-full-electric/
[34] https://arena.gov.au/assets/2019/11/biofuels-and-transport-an-australian-opportunity.pdf
[35] Aurecon (2021) Williamtown SAP Draft Traffic and Transport Scenario Report
[36] https://future.transport.nsw.gov.au/sites/default/files/media/documents/2019/Future%20Transport%20NSW%20Electric%20%26%20Hybrid%20vehicle%20plan.pdf
[37] Aurecon (2021) Williamtown SAP Draft Traffic and Transport Scenario Report
[38] https://www.transport.nsw.gov.au/projects/programs/smart-innovation-centre/projects

6.0 Water

The goal for sustainable water management across the Precinct is to develop a precinct wide, coordinated approach to flooding, drainage and water cycle management which also preserves, enhances and protects the natural environment.

A key constraint to water cycle management across the Precinct is the PFAS mobilisation risk, linked to offsite impacts on natural systems (RAMSAR values and other wetlands) and the suitability of surface and groundwater for domestic and agricultural uses. The precinct is located within the Hunter Water Drinking Water Catchment. This introduces specific requirements for the management of surface and ground water quality and connectivity.

6.1 Sustainable Water Management Components

Components of sustainable water management such as Water Efficiency and Water Sensitive Urban Design are shown in **Figure 6.1.** The two management categories are connected through a number of measures including stormwater capture and reuse for non-potable water uses. Water inputs across the Williamtown SAP can be broadly categorised into the following groups (see **Table 6.1**)

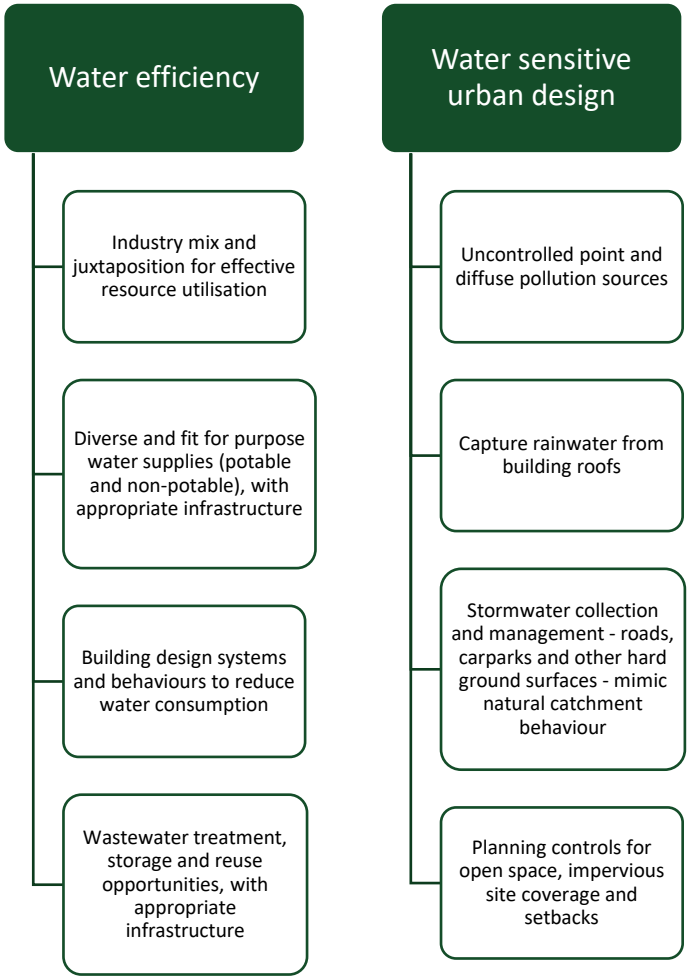


Figure 6.1 Water Management Components

Table 6.1 Water Inputs

Category	Description
Potable	• Potable water will be supplied through the Hunter Water Corporation's mains supply. The mains supply is sourced from Grahamstown Dam with alternate sources of water coming from Tomago Sand Beds when necessary (e.g. during severe drought).
Rainwater	• Water captured across roofing structures
Stormwater	• Water captured from run-off, including impervious surfaces such as roads, car parks and pedestrian access areas
Groundwater	• Groundwater levels across the Precinct are naturally high due to the low lying nature of the landscape however the use of groundwater across the Precinct for operational purposes is not proposed
Wastewater	• Water that has been used and would otherwise be disposed e.g. greywater (water from sinks, basins and some industrial processes) and blackwater (water from sewage and some

6.2 Proposed Sustainability Measures

Water cycle management supported by water sensitive urban design principles and best practice efficiency measures will be a key strategy to ensure adequate water resources are available to preserve, enhance and protect the environment.

To minimise demand on potable water supplies, access to alternative water supplies for non-potable water uses will be encouraged across the Precinct. This will be achieved through recommendations in the delivery plan including water efficiency and re-use measures.

It is proposed that rainwater capture from roofing will be maximised across the Precinct. It is anticipated that rainwater storage tanks will be located across the Precinct for non-potable uses. The minimum storage capacity of rainwater tanks will likely depend on demand requirements. The Flooding and Water Cycle Management Report assumed a minimum tank capacity of 40 to 200 kL/ha depending on proposed land uses.

Stormwater harvesting facilities across the precinct would reduce the volume of runoff that would need to be treated downstream. A key principle for the preservation and protection of the natural environment is the Neutral or Beneficial Effect test, requiring that the development must have a Neutral or Beneficial Effect on the receiving waters. Noting the Precinct is located within the HWC Drinking Catchment zone, implementation of this principle through planning controls will be key to meeting the water based goals and to protecting or restoring the receiving environment.

Reducing stormwater runoff volumes and subsequent treatment requirements could also be minimised across precinct through:

- Planning controls to minimise impervious development areas.

- Where impervious areas are unavoidable, such as car parks, consider installation of roofing structures to act as rainwater capture devices. Installation of roofing across these areas may also provide additional supply of solar generated electricity for the precinct.

There is an opportunity to implement a three-pipe system in the Precinct to re-use grey water across different applications. Re-use of grey water across the precinct should continue to be considered during the planning process. Part of the precinct (e.g. Newcastle Airport and Astra Aerolab) is currently connected to the wider Hunter Water Corporation sewage network. The remaining undeveloped parcels of the Precinct would require connection to the existing Hunter Water wastewater treatment network and it is likely the network would require upgrades to service to the proposed growth across the area.

Opportunities exist for the installation and operation of a decentralised wastewater treatment facility at either catchment or precinct scales and the implementation of small-scale packaged treatment plants would alleviate the need for the construction of a wastewater network at a minimally serviced existing site. The flat topography and existing ground contamination issues across the Williamtown SAP area indicate that a pressure sewer reticulation system is likely to be a preferable option to service new developments, as opposed to traditional gravity mains that can become deep with flat topography.

If a decentralised wastewater treatment facility is progressed, following treatment, water could be used across a number of applications in the precinct including but not limited to toilet flushing and irrigation purposes. Further investigation at the time of construction of each catchment would be required to assess the functionality and potential constraints of these measures.

7.0 Circular Economy and Resource Optimisation

7.1 Scope and Scale of Circular Economy

Incorporating circular economy practices is a clear ambition for the Williamtown SAP. Circular economy provides a framework to account for the full lifecycle cost of materials, retain the value of materials in the economy for as long as possible, and reduce the unsustainable depletion of natural resources and impacts on the environment. To achieve this, the circular economy framework provides the following three guiding principles:[39]

- Eliminate waste and pollution.
- Keep materials in use.
- Regenerate natural systems.

Two explanations for circular economy design for the built environment and facilities that enable the cycling of materials within a circular economy are provided below to help to contextualise the application of circular economy for the Williamtown SAP:

- Circular economy design is a set of principles that can be applied to elements of the built environment such as buildings, infrastructure, and public spaces to maximise the efficiency and value of materials used across the lifecycle of an asset, from construction, through operation, and beyond decommissioning. This includes designing structures with sustainable materials that can be:
    - easily identified and disassembled for future reuse, or
    - demolished in a way that will maximise the value of the recovered materials
    - designed for flexibility and adaptability to accommodate an array of users
    - designed to allow for the separation of operational waste materials to maximise their value. The European Commission provides additional detail on these circular economy design principles within their paper 'Circular Economy Principles for Buildings Design'.[40]
- There are a variety of facilities that enable the cycling of materials to retain their value. This encompasses facilities that store, transfer, sort, reprocess or repurpose materials and products. Examples of facilities that could be developed within the Williamtown SAP or used by tenants include logistics facilities, repair facilities, retailers of used products, transfer stations for material aggregation, storage facilities, material recovery facilities, material remanufacturing, recycling, and reprocessing facilities.

[39] Ellen Macarthur Foundation, What is circular economy?
[40] European Commission, 2020, Circular Economy Principles for Building Design

Lifecycle thinking is the practice of considering the impact on sustainability issues across the full lifecycle (pictured in **Figure 7.1**) when designing products or processes to minimise the whole-of-life impact.[41]

Life Cycle Assessment (LCA) is the standardised method for quantifying impact across a range of sustainability issues across the lifecycle of a product or process, for example the following environmental impact categories: global warming, depletion of abiotic resources (elements and fossil fuels), ozone depletion, water pollution and air pollution.

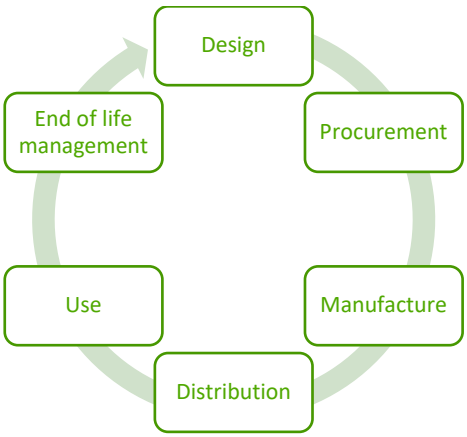


Figure 7.1 Typical Product Lifecycle

Lifecycle thinking should be applied to the Williamtown SAP throughout its development, operations and decommissioning lifecycle (shown in **Figure 7.2**) and from the nano scale to the meso scale (shown in **Figure 7.3**) to ensure truly sustainable solutions. Lifecycle thinking at the design stage is particularly important as it can pre-determine much of the impact realised later in the lifecycle.

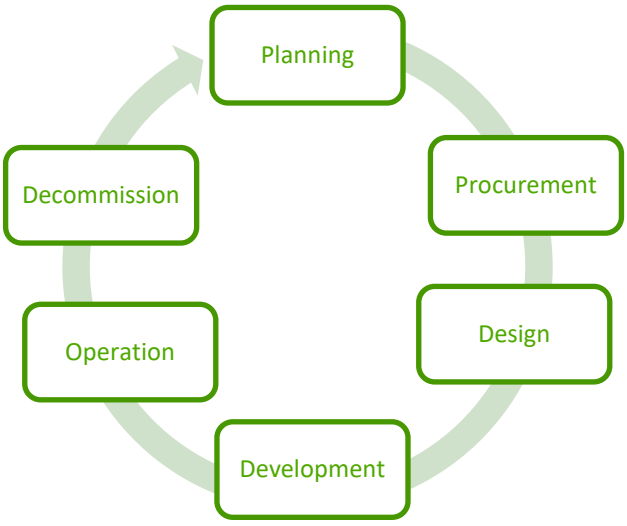


Figure 7.2 Lifecycle for the Williamtown SAP

[41] Circular Economy Practitioner Guide, Life cycle thinking

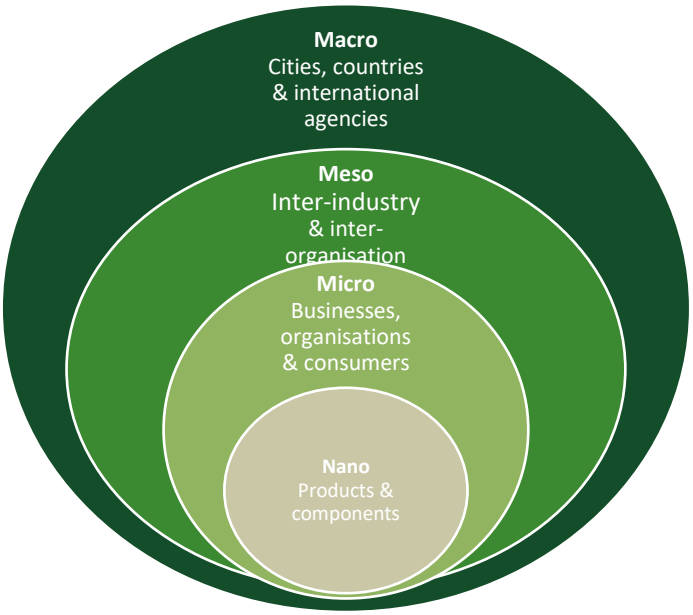


Figure 7.3 Scales of Measurement[42]

7.1.1 What Could Circular Economy Look Like in Practice for the Williamtown SAP?

In the context of the Williamtown SAP, circular economy can be applied in a variety of ways across the lifecycle and at multiple scales. Concepts provided as part of **Figures 7.1-3** have been consolidated to present the scope and scale of circular economy across the Precinct in **Figure 7.4**.

[42] WBCSD (2018), Circular Metrics – Landscape Analysis

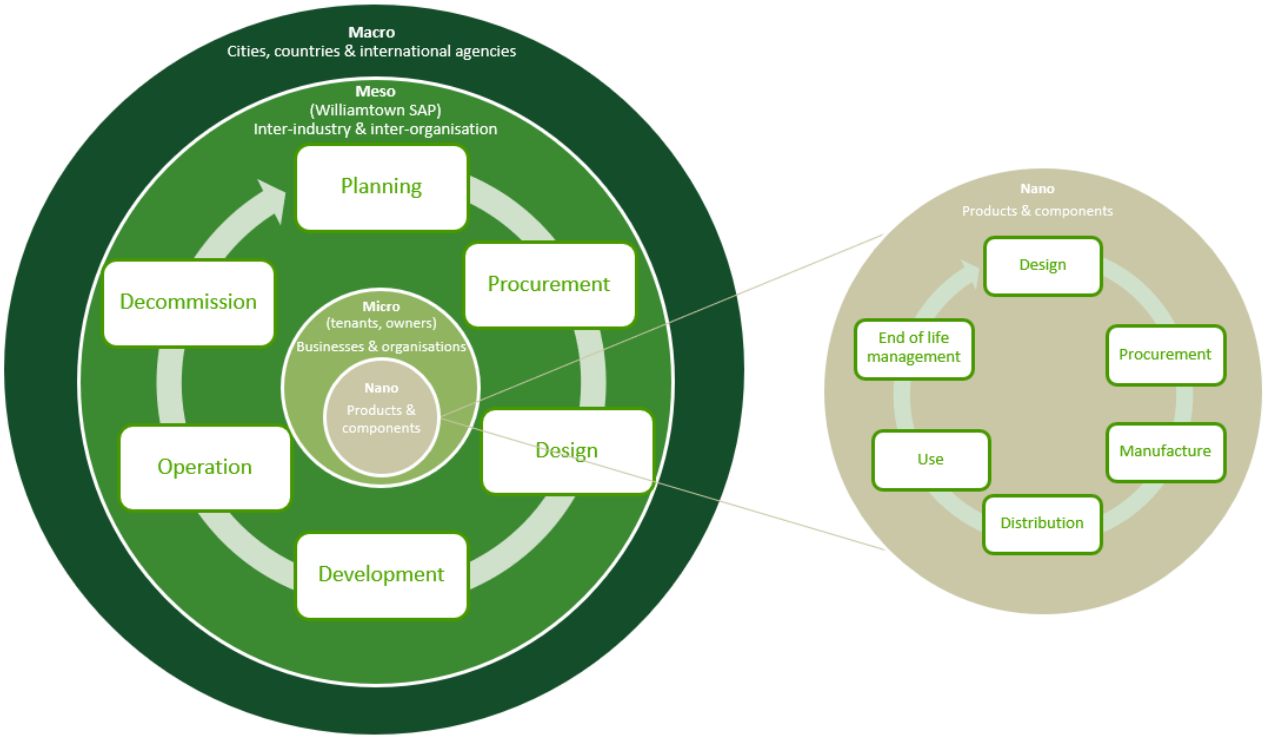


Figure 7.4 Scope and Scale of Circular Economy in the Williamtown SAP

To further illustrate the variety of ambitions the Williamtown SAP could take on in becoming a leading circular precinct, the following presents several circular precinct archetypes:

- Zero waste, emissions and water precinct – zero development waste, zero operational waste through advanced waste management and procurement of resource recovery services, on-site renewable energy or renewable Power Purchase Agreement, and 100% water recirculation.
- Circular economy innovation hub – public-private research partnerships, start-ups, business think tanks trialling and commercialising innovative new products that could displace linear products in domestic and potentially international markets.
- Resource efficient UNIDO EIP – central precinct governance, advanced data collection and management of material flows, realise a range of industrial synergies, including industrial symbiosis on the exchange of by-products, and sharing of goods or services such as equipment or utilities.
- Zero carbon, circular design – infrastructure and buildings designed for low whole-of-life impact (emissions and other environmental impacts, determined through evidence based LCA assessments). This could be through substitution of virgin materials with recycled materials; design for maximum use through flexibility and adaptability; active mobility, ridesharing and EVs; energy efficiency through urban greening, maximising natural light, use of on-site generated renewable energy; and reuse of building components at end-of-life through modularity and design for disassembly.
- Green precinct – sensitive ecological design, building vegetation into the precinct wherever possible.

Regional circular economy initiatives are also summarised below to highlight potential connections with the broader ecosystem to collaborate to develop local circular value chains, increase knowledge sharing, learn from each other's hurdles, reach critical mass adoption for initiatives based on network economies, leverage other's efforts, and avoid redundancy in efforts or investment.

7.2 Opportunities for Circular Economy Across the Williamtown SAP Lifecycle

The following sections present relevant opportunities to enable, implement and measure circular solutions across the lifecycle of the Williamtown SAP and across different scales based on the existing tenants and indicative land-uses. The success of realising a circular Williamtown SAP depends on the participation of stakeholders responsible for designing, delivering and using the precinct. The Williamtown SAP sits within a broader ecosystem.

7.2.1 Planning Stage

7.2.1.1 UNIDO EIP Framework

The UNIDO EIP framework[43] is designed for businesses to co-locate and achieve enhanced environmental, social, and economic outcomes through industrial synergies such as:

- Supply synergies and co-location of suppliers and clients in the value chain.
- Sharing utility infrastructure, such as water, energy, and materials management infrastructure.
- Sharing services, such as waste collection, maintenance, or staff training.
- Industrial symbiosis – the exchange of by-products (solid, liquid or gas) between businesses or facilities.

There are various options for management models to govern EIPs-industrial parks, including:[44]

- Associative management model – businesses within the park organise themselves with no distinct leadership and minimal government intervention.
- Government management model – government manages the park with a dedicated team. This model is often seen in EIPs where there is high government investment. Government may also subcontract management to one/several private contractors.
- Mixed public-private management model – park management is delivered through a combination of government and private sector resources on a temporary basis (e.g., a private contractor builds capacity until government takes over functions itself) or a permanent basis.
- Private company or individual management model – a private operator or agent manages the park.

Aligning with a government or mixed public-private management model would be considered the most likely approach for the Precinct.

[43] https://www.unido.org/our-focus-safeguarding-environment-resource-efficient-and-low-carbon-industrial-production/eco-industrial-parks
[44] United Nations Industrial Development Organization, 2017, Implementation Handbook for Eco-Industrial Parks

Circular economy concierge

Many enabling factors of an EIP and circular economy adoption more generally could be delivered through a circular economy concierge service. The concierge service could be undertaken as part of Park Management responsibilities (see **Appendix B**) and would provide:

- Data collection and analysis – precinct scale data collection systems, for example, for types of materials flowing through the Williamtown SAP, material flow weights, controlling entities; and centralised analysis of material flows. This will help actively identify industrial symbiosis, resource recovery, and other circular economy opportunities.
- Strong park leadership to implement industrial synergy initiatives across multi-stakeholders; and promote and sustain cooperation, ownership, and action.
- Adoption of performance monitoring and benchmarking with suitable indicators.
- Oversight and assistance in attracting investment, co-locating entities to align complementary resource flows and environmental requirements and maximise the use of the Williamtown SAP's buildings and infrastructure.
- Recognition and effective marketing of the broad benefits (environmental, social, and economic).
- Develop and provide access to training material and operating manuals on how to meet circular economy and sustainability requirements. Connect stakeholders with external education and inspiration for how to embed circular economy and lifecycle thinking into goods and service design and tenant operations.
- Develop and maintain a stakeholder map for the precinct, including for example precinct management, developers, owners, tenants, and employees. The stakeholder map should also include what their role is in the Williamtown SAP, what their role is for delivering circular economy in the Williamtown SAP, and what training, resources or documents they need to access to deliver their role.

7.2.1.2 Regional initiatives

The Hunter Joint Organisation of Councils and Central Coast Council are currently developing a Circular Economy Roadmap for the region. An emerging idea is to develop a circular economy concierge for the region. Should this initiative be implemented, it may be possible for tenants within the Williamtown SAP to leverage this service. However, the scope and ambitions for the Hunter and Central Coast circular economy concierge may differ from those required to maximise resource optimisation and lifecycle design in the Williamtown SAP.

Further, there are a variety of regional, state, Australian, and international organisations that could support a Williamtown SAP circular economy concierge in some of their specific functions. A not-for-profit organisation based in Newcastle, Go Circular, builds awareness among the local business community on circular economy and how to develop circular economy opportunities, connects businesses to facilitate innovation and collaboration, and shares educational resources on sustainability and circular economy.[45]

[45] Go Circular

NSW Circular is a NSW government funded body focused on building open evidence, catalysing new circular supply chains and collaborating to scale circular solutions.[46] The open evidence may be useful to the Williamtown SAP in identifying opportunities. The Australian Circular Economy (ACE) Hub, from Planet Ark, an Australian not-for-profit organisation, aims to facilitate the transition of Australia to a circular economy. The ACE Hub provides information, case studies of circular solutions, facilitates networking and collaboration, and hosts working groups on circular economy metrics and circular procurement.[47] ASPIRE provides an online marketplace and matchmaking tool for businesses to exchange waste materials.[48]

Internationally, organisations such as the Ellen Macarthur Foundation, the European Commission, and several Green Building Councils offer free toolkits and virtual knowledge hubs to educate and assist in the implementation of circular solutions.

7.2.2 Procurement Stage

The procurement process is an important tool to achieve sustainable outcomes. Circular procurement (or procuring for circular economy outcomes) should be overlayed across the Williamtown SAP lifecycle as goods and services are procured at many stages. ISO20400 is the international standard describing what is required to implement sustainability into the procurement function of an organisation. It is structured in four sections shown in **Figure 7.5.**

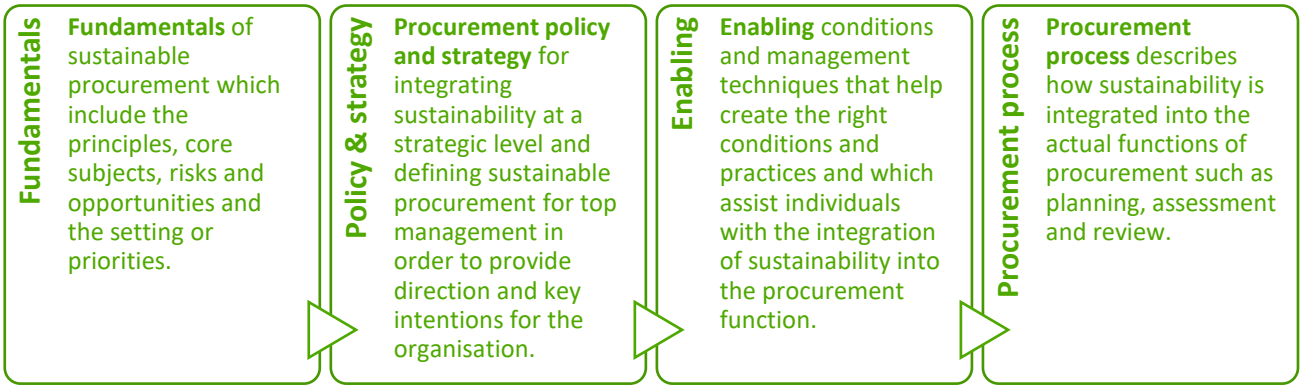


Figure 7.5 Four sections of ISO 20400

To integrate sustainability into procurement, all participants in the process should use a combination of strategy, policy, communicated targets and goals, as set out in *Sustainable Procurement Guidance AS ISO20400:2018* to set objectives and track ongoing progress. By embedding this leading approach to sustainable procurement, the Williamtown SAP can generate environmental, social, and economic benefits.

7.2.2.1 Establishing key sustainability priorities for each procurement

It is not practical to ask suppliers about every aspect of sustainability; instead, at the start of each procurement, it is important to identify the areas of high environmental risk or priority issues.

[46] NSW Circular, Strategic Plan 2020-2023
[47] Planet Ark, Australian Circular Economy Hub
[48] ASPIRE

Sustainability issues can occur as hotspots throughout the lifecycle of a product or service, including in the supply chain, in the product itself, in the operations of a business or at a product's end-of-life. For example, some key issues for procurement of new infrastructure and buildings in the Williamtown SAP include:

- Materials with embodied carbon.
- Transportation emissions.
- Scope 1 and 2 emissions.
- Natural resource usage (water, raw materials).
- Product long term maintenance, repairability and replacement of parts.
- Construction waste.

Once priorities are identified, the procurer needs to establish the criteria and specifications for suppliers to meet (keeping in mind the procurement need and market capability). **Figure 7.6** below is an example of cornerstone circular procurer priorities and strategies by which to achieve them.

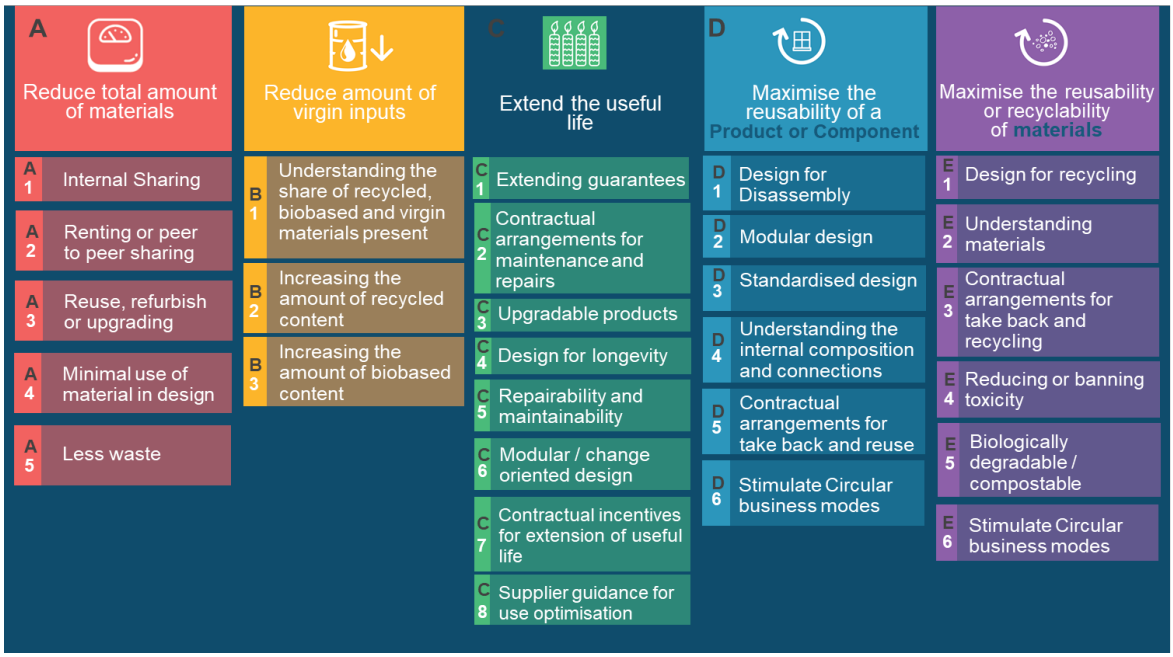


Figure 7.6 Circular Ambition Chart

(Adapted from "Getting Started" by Circular Flanders, a website of the Flemish Government: 2021 Aankopen Vlaanderen Circular)

7.2.2.2 Regional initiatives

A proactive procurement project[49] run by Hunter Joint Organisation will seek to embed circular economy considerations in Council procurement. The project is currently in design and development phase. Hunter Joint Organisation is developing a circular economy procurement guide, starting with government but intended to provide guidance to the private sector as well.

[49] https://www.hccrems.com.au/wp-content/uploads/2019/06/hjoc-ed-operational-report-may-2019_final.pdf

Lake Macquarie City Council commissioned a life cycle assessment tool to evaluate the environmental impact of using different recycled materials in roads. This tool is intended to guide procurement decisions for council and could be extended to building material and products. It might be possible to access and utilise this tool to guide procurement decisions for road realignment and development as part of the Williamtown SAP.

7.2.3 Design and Development Stages

The Williamtown SAP includes some areas of existing developed land, it should make use of the existing infrastructure and buildings as much as possible, or where necessary, deconstruct in a manner that retains the resources for future use. For new buildings and infrastructure in the Williamtown SAP, circular design principles and alignment with best practice rating schemes (ISCA and Green Star) should guide the design for minimal whole-of-life impact.

In practice, this includes but not limited to using low embodied carbon, renewable and recycled materials developing with zero construction waste; designing in effective operational waste management systems; designing adaptive and flexible spaces to maximise utilisation; enabling active and shared mobility and including infrastructure for electric vehicles; using product-as-a-service systems to incentivise high quality products and accountability for end-of-use management; and designing for disassembly of components and reuse at end-of-use.

7.2.3.1 Circular design principles

Designing buildings, products or processes for a circular economy involves lifecycle thinking – designing not only for the user but for the whole system within which the design exists. There are several design principles that can assist in designing for circularity and reduced whole of life impact, including:[50]

- Design for the multiple uses at the highest value– such as reuse, sharing, remanufacturing and refurbishment as preference to recycling.
- Moving from products to services – shifting from ownership to access. This allows higher utilisation of products across multiple users and can be facilitated through short-term rental, subscription, sharing or leasing rather than sale forever. It allows manufacturers to provide higher quality products and maximise the use of the resources in a cost-effective manner.
- Product life extension – design products that are both physically and emotionally durable or adaptive to a user's changing needs over time. Such products can be reused by a single user for a long-time or can be reused by many different users.
- Safe and circular material choices – avoid materials that are harmful to humans or the environment, including materials with high-embodied carbon which contributed to global warming. See Section 7.2.3.2 for low carbon materials for the built environment.
- Dematerialisation – minimise the resource requirements required to deliver utility, for example through digitisation.
- Modularity and design for disassembly – to make buildings and products easy to disassemble, repair, remanufacture and upgrade. Modular systems are also easy to customise, adapting to a variety of users' needs and allowing for extended use.

[50] Ellen Macarthur Foundation, Circular design

The above circular design principles should be considered in designing across the scales and lifecycle stages of the Williamtown SAP. As the built environment is a key component of the Williamtown SAP, case studies of applied circular design presented below are focused on this sector.

7.2.3.2 Circular design through alignment with building rating schemes

The current iteration of the Green Building Council of Australia's tool, Green Star – Buildings, includes several criteria that encourage circular economy across the lifecycle of an asset, including:

- Diversion of construction waste from landfill.
- Design for effective operational waste management.
- Responsible procurement of products and services for best practice environmental and social principles in building structure, envelope, systems, and finishes.
- Use of low or non-toxic materials.
- Emissions – reduced upfront carbon emissions and other emissions (refrigerants and others), low energy consumption and energy sourced from renewables.
- Low water use.
- Low environmental impacts from resource use over the building's lifespan shown through comparative lifecycle assessment.
- Movement and place – encouraging active, low carbon, and mass transport options.
- Impacts to nature – ecological value of the site is conserved, biodiversity is restored and enhanced within and beyond the site, wildlife is encouraged to move through site, and waterways are protected.

7.2.3.3 Low embodied carbon materials for the built environment

The embodied carbon in materials can make up a significant portion of a built asset's overall carbon footprint. Newly constructed buildings and infrastructure in the Williamtown SAP should select low embodied carbon materials as much as possible. Some examples include:

- Reused components such as bricks, beams, staircases, etc.
- Third-party verified carbon neutral or carbon negative materials.
- Concrete using mixtures that reduce Portland cement content.
- Steel manufactured with renewable energy or green hydrogen.
- Replacing steel with sustainably sourced structural timber.
- Aluminium manufactured with renewable energy.
- Asphalt avoiding the use of lime.
- Aggregates sourced onsite, locally or from construction and demolition waste, for application as reclaimed asphalt pavement in roads or gravel in concrete.

7.2.3.4 Targets and objectives for precinct application certificates

Targets and objectives could be incorporated within precinct application certificates to assess the circularity of individual proposals and set minimum standards. The following list of questions should be considered for applicants:

- Is the proposal aiming for a minimum of a 5-or 6 star Green Star rating or equivalent (aiming for as high as practicable)?
- Will the proposal optimise the use of existing structures and resources on the site?
- Does the proposal include circular economy design principles to maximise the value gained from materials used to construct the built element, such as through adaptive and flexible spaces to accommodate a variety of users overtime; facilitating active and shared mobility for example through secure bike racks, showers, electric vehicle charging stations; using product-as-a-service systems; and designing for disassembly of components and reuse at the assets' decommissioning phase.
- Will the proposal estimate the embodied carbon in their design and select for low embodied carbon materials and products wherever possible, such as those made from renewable and recycled materials?
- Will the project meet a 95-100% diversion of development and construction waste?
- Will the proposed design provide an effective operational waste management system to enable 100% diversion of waste from landfill, and maximise the value of waste materials?

7.2.4 Operation Stage

7.2.4.1 Embedding circular economy with tenants

The realisation of circular economy in the operation of the Williamtown SAP will depend on the participation of tenants. One of the proposed functions of the Williamtown SAP circular economy concierge is to support organisations to embed circular economy and lifecycle thinking, connect and facilitate trading of by-products between businesses, and provide education and resources for individual business to design their products and services for circularity. Such resources could include circular design principles toolkits, implementation guidelines.

Each circular solution should be evaluated based on their whole-of-life environmental, social, and economic impacts; and technical feasibility.

Several circular economy opportunities and case studies which connect with the Structure Plan land-uses are presented below as food for thought.

7.2.4.2 Operational waste management

Retaining value from discarded resources is a key component of a circular economy. Existing businesses in the Williamtown SAP generate operational waste, and all Williamtown SAP masterplan scenarios developed to date include new land-uses and business activities that almost certainly will generate operational waste. The planning approvals process requires new developments to provide minimum waste storage, access, and safety for operational waste management. However, more can be done to achieve good practice.

Better Buildings Partnership provides 10 steps to good practice operational waste management, including:[51]

- Specifying and communicating objectives and roles across stakeholders (building management, contractors, cleaners, tenants, etc).
- Develop a Waste Management Plan in collaboration with contractors and stakeholders to foster collaboration.
- Incorporate best practice ratings such as NABERS Waste and GECA Waste Management into operations.
- Agree on fees and rebates and nominated treatment facilities for each waste stream to create shared incentives for resource recovery.
- Know and comply with the acceptance criteria for each treatment facility to improve their recovery rates.
- Ensure waste management systems from in-tenancy through to collection docks support the correct segregation of waste streams and easy identification of contamination.
- Preference onsite weighing over bin lifts or volume.
- Require periodic auditing and reporting on the building's resource recovery performance.
- Rate and improve data quality where possible.
- Meet with stakeholders (contractors, cleaners, occupants, etc) regularly to address challenges and improve the system through for example, education, training, and signage.

A detailed assessment of the waste profile of existing waste streams and forecasting the waste profile of streams from future businesses in the Williamtown SAP will highlight where key opportunities for resource recovery lie (this assessment should also be undertaken to identify industrial symbiosis opportunities, discussed in **Section 7.2.1**). Where the same waste materials are generated by multiple tenants or buildings, shared provision of waste services could achieve cost efficiencies, increase uptake of niche recycling services, and gain greater bargaining power over waste service contractors to drive best practice resource recovery outcomes or innovative processing at waste facilities.

It is not expected that PSC would play a role in waste collections for the Williamtown SAP's commercial and industrial tenants. However, there could be an opportunity for the private waste collection and processing contractors to utilise the same waste treatment facilities (existing or future facilities) as PSC and other local councils in the Hunter. This would support the achievement of necessary scales of materials to make commercially viable innovative processing facilities that achieve best practice is resource recovery and value retention of materials.

[51] Better Buildings Partnership, July 2018, Operational Waste Guidelines: procurement, management and reporting

7.2.4.3 Regional initiatives

The following NSW EPA funded programs should be leveraged by Williamtown SAP tenants to gain assistance in eliminating waste and aligning with best practice recycling:

- Sustainability Advantage.
- BinTrim.
- Circulate, NSW EPA Industrial Ecology Program.

There is a growing local ecosystem enabling the recirculation of products at their end-of-use, including a network of charitable recyclers for reusable products and recyclers to process materials that cannot be reused. An ecosystem map with existing stakeholders is listed on the Hunter Circular platform.[52] There are several additional regional material processing initiatives in the strategic planning stage, including:

- Hunter Biovalley – an initiative aiming to develop a bioeconomy in the Hunter region and connect regenerative farming, food valorisation, anaerobic digestion, and plastics recycling.
- Sorting and processing of kerbside commingled material – Gateshead Material Recovery Facility (MRFs) sorts commingled kerbside material for several councils in the Hunter. The future use of Gateshead MRF is uncertain, and there is a possibility that councils will look to commission a new MRF, potentially with additional processing of materials into marketable commodities, such as PET or HDPE flakes or granules suitable for remanufacturing.

[52] https://www.huntercircular.com.au/

7.2.4.4 Measuring operational circularity

There are several tools emerging to track the operational circularity of organisations which could be used by tenants of the Williamtown SAP (micro scale) or measured for the Williamtown SAP as a whole (an overview of all tenants, at the meso scale). Current circular economy measurement tools include qualitative factors, such as strategic planning, people and skills, innovation, and supply chain engagement; and quantitative measures of material, energy and water use and productivity, and revenue associated with circular products or services. The themes addressed in two circularity measurement tools are provided in **Figure 7.7**.

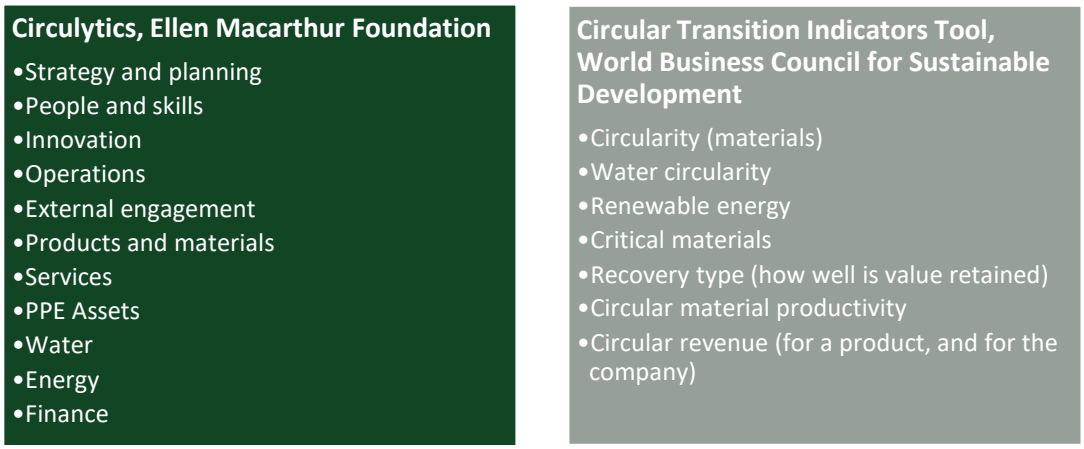


Figure 7.7 Themes Covered in Two Circularity Measurement Tools, Circulytics and the Circular Transition Indicators Tool

Selecting suitable circularity metrics for the Williamtown SAP should be undertaken in conjunction with designing a precinct wide data collection and management system. It may be unfeasible to measure across several metrics as tenants may be unwilling to share certain data, for example revenue associated with circular products or services. While data on material, water and energy use may be more available if suitable data collection and governance systems are in place.

The indicator for circularity of materials used in the Circular Transition Indicators could be suitable for performance monitoring the operations of the Williamtown SAP as a whole, tenants within the Williamtown SAP, and tenant's products or services (i.e., at the meso, micro and nano scale). The calculation method for circularity of materials considers both circular inflows (the proportion of material with non-virgin content and renewable content from sustainable grown bio-based sources) and circular outflows (the proportion of material with recovery potential and actual recovery).[53]

[53] WBCSD (2021), Circular Transition Indicators V2.0 – Metrics for business, by business

7.2.4.5 Regional initiatives

The Australian Circular Economy Hub hosts a Circular Economy Metrics Working Group. The role of the Working Group is to provide strategic direction, assessment of tools and systems, and advice on research and data requirements for circular economy metrics to government, industry, and other relevant organisations, with the aim of developing a co-ordinated best practice system for circular economy metrics across Australia. The Williamtown SAP Circular Economy Concierge should leverage the advice from this Working Group as it emerges.[54]

7.2.5 Decommission Stage

As the Williamtown SAP matures, the needs of its users will likely change. The design of buildings in the Williamtown SAP should anticipate and accommodate the changing needs of users and through flexible and adaptive solutions that extend the life of buildings In some cases however, decommissioning of buildings and assets will be necessary.

The decommissioning of any building should look to retain the value of resources as much as possible through disassembling building components for future reuse and maximising the recycling of the remaining materials.

For building interiors, the Better Building Partnership provides guidelines on current best practice management of strip out waste[55]. Whilst the principles and objectives of circular economy will remain, it is expected that circular economy outcomes will evolve up to and during the timing of decommission. Review of best practice circular economy measures at the time of asset and building decommission is recommended.

[54] Australian Circular Economy Hub (2021), Metrics Working Group
[55] Better Buildings Partnership, July 2018, Stripout waste guidelines

8.0 Performance Measures

8.1 Performance Measures

The following performance monitoring criteria (see **Table 8.1**) are intended to incorporate sustainability and lifecycle thinking and design into all elements of the Williamtown SAP to align with circular economy principles and deliver sustainability objectives.

Table 8.1 Proposed Sustainability and Circular Economy Performance Measures

Performance criterion	Rationale	Lifecycle stage(s)	Scale(s)	Responsible stakeholder(s)
ISO 14001	Integrated environmental management system for precinct and organisations	Planning, design, development, operations	Meso, micro	Williamtown SAP concierge (or Precinct management), Tenants
ISCA certification	Embeds sustainability and circular economy design across several aspects.	Planning, design, development, operations	Meso	Government agencies (e.g., Transport for NSW)
GBCA certification	Embeds sustainability and circular economy design and performance measures across several aspects.	Design, development, operations	Micro	Owners, developers, government agencies
NABERS Waste, Energy and Water Ratings	Encourages towards zero operational waste, zero emissions, and water recycling.	Operations	Micro	Tenants, owners
ISO 20400	Embeds circular economy and lifecycle thinking across the procurement of goods and services.	Design, development, operations	Meso, micro, nano	Tenants, owners, developers, precinct management, government agencies
Life Cycle Assessment	Informs product and process design for low whole-of-life impact.	Design, operations	Meso, micro, nano	Tenants, owners, developers, precinct management
Material circularity and waste	Encourages circular design and operations by considering cycling in material inflows and outflows, including zero construction and operational waste targets.	Planning, design, operations, decommissioning	Meso, micro, nano	Tenants, owners, developers, precinct management
KPIs determined for the Williamtown SAP Concierge	Enables and monitors sustainability and circularity across the Williamtown SAP's lifecycle and at different scales.	Planning, design, development, operations, decommissioning	Micro	Williamtown SAP Concierge

8.2 Recommendations and Indicators

Systems focused

- Integrate UN SDGs into decision making framework for the precinct. This may also require organisations to undertake, or to commit to undertake their own UN SDG mapping exercise as part of the lodgement of the precinct application.
- Precinct and prospective tenants adopt ISO 14001 (including ISO Guide 84 principles) EMS requirements. This may also require organisations to undertake, or to commit to attaining a certified ISO 14001 EMS (See **Section 2.1.4**).
- Align with the UNIDO Eco-Industrial Park framework principles to capitalise on industrial synergies across co-location of organisations within the same value chain, sharing utility infrastructure and services, and exchanging resources among tenants including materials, liquids, gases, or heat.
- Stay abreast of opportunities for collaboration with local partners with sustainability ambitions that are aligned with the SAP's (such as the adjacent ADF).

Built Assets

- Align with ISCA and Green Star rating schemes to ensure infrastructure and building embeds a range of sustainability and circular economy across the lifecycle of assets.
    - Best practice sustainability outcomes for the Williamtown SAP would likely desire a 5-6 star GSBA rating or equivalent (aiming for as high as practicable) for commercial, institutional and government building developments pending land use constraints. Potential industrial sustainability rating applications should also be considered (once matured) across the Precinct.
- Procure products and services for circular outcomes across all lifecycle stages and scales of the Williamtown SAP, leveraging ISO 20400 for best practice.

Carbon

- Precinct and prospective tenants commit to achieve net zero carbon certification. Certification could be undertaken via CACN standards, or applicable certification process at the time. At a minimum this would be achieved by 2050 however ongoing revision of this goal should be undertaken regularly e.g. every 5 years to strengthen short term goals. Measurement and monitoring of emissions from all relevant sources should be undertaken from the outset. Data collection, management and reporting would be the responsibility of each tenant, SAP concierge or relevant park manager.

Circular Economy and Resource Optimisation

- Provide a Circular Economy Concierge as part of Park Management Responsibilities to coordinate and mature opportunities for industrial synergies, to be administered through the Regional Growth Development Corporation's role in the delivery of the SAP.
- As the Williamtown SAP contains some pre-existing development, it should leverage the built assets that are already on site as much as possible, and work with existing tenants to embed circular economy and lifecycle thinking into their product and service design and operations.

- Incorporate circular design strategies across all lifecycle stages (planning, design, development, operations, and decommissioning) and scales (meso, micro, and nano) of the Williamtown SAP to achieve world-leadership in circular precincts.
- Conduct LCAs on critical processes and products to enable evidence-based decision making at relevant scales and stages of the Williamtown SAP lifecycle.

Climate Change and Adaptation

- A precinct specific CCRA should be undertaken to consider climate change and adaptation risks. Future risk assessments may also include status update of risk treatment plans, implementation of scenarios which focus on decarbonisation and inclusion of transitional risks[56].
- Embed CCRA processes into Williamtown SAP EMS for tenants, including the requirement for tenants to undertake their own CCRA periodically.

Energy

- Precinct sources 100% of electricity from renewable generation sources.
- Precinct optimises small scale solar capacity.
- Precinct design considers Microgrids and VPP concepts as additional catchments are developed.
- SMART Technology systems installed across all catchment to track and monitor energy requirements.
- Dedicated easements for future technology advancements (e.g. hydrogen pipeline) are considered and planned for during the early stages of the Precinct planning.

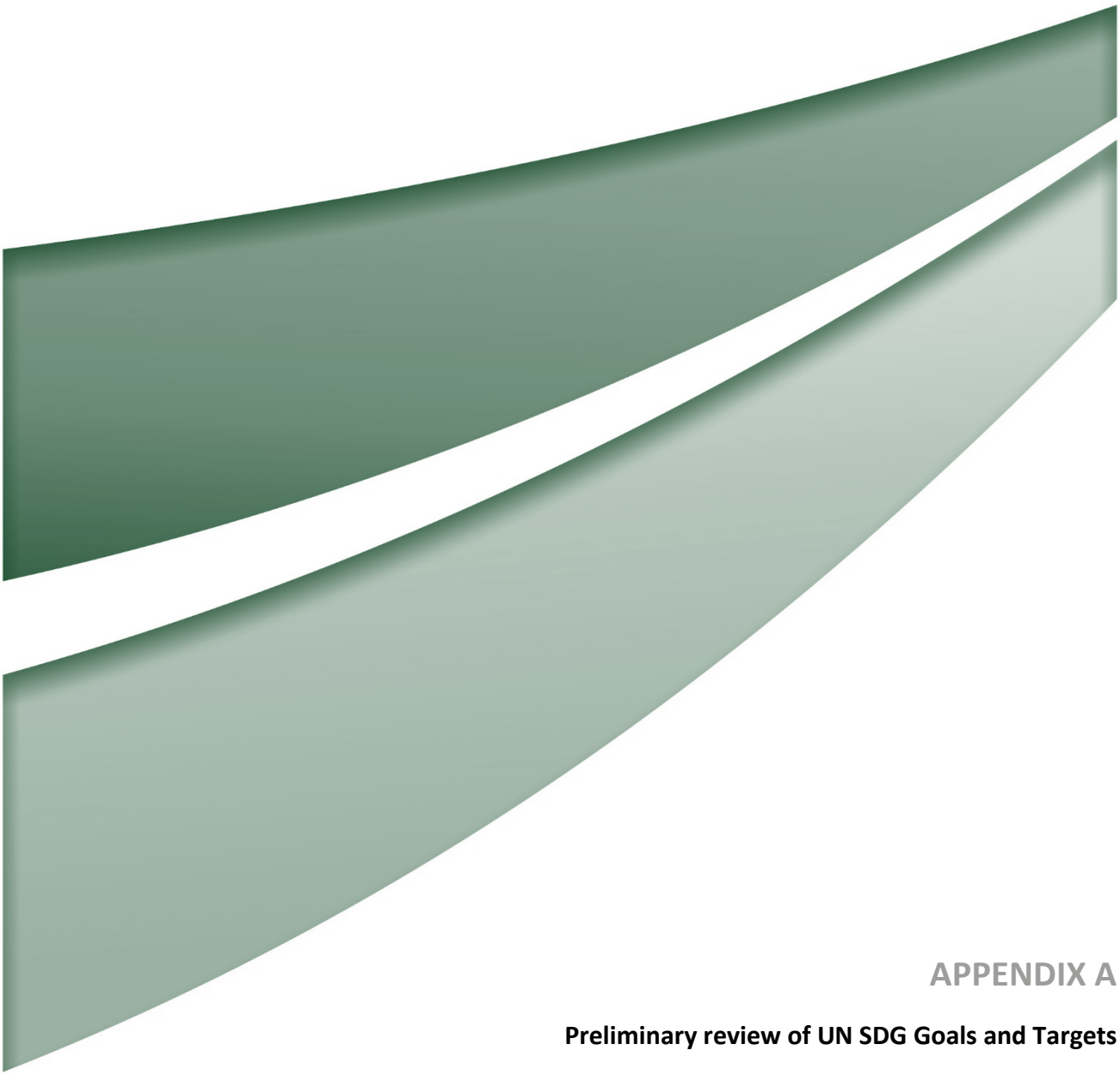
Mobility

- Maximise active transport participation across the Precinct through landscape and asset design (e.g. active transport corridors) and cycle sharing schemes.
- Consider implementation of electrified (or other renewable energy source) autonomous shuttle service or other accessibility options across the Precinct.
- Consider minimum electric or hybrid fleet procurement standards for organisations within the Precinct. At a minimum, this could reflect existing NSW Government procurement commitments.

Water

- Implement planning controls to minimise impervious development areas.
- Where impervious areas are unavoidable, such as car parks, consider installation of roofing structures to act as rainwater capture devices. Installation of roofing across these areas may also provide additional supply of solar generated electricity for the precinct.

[56] https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Implementing_Guidance.pdf



APPENDIX A

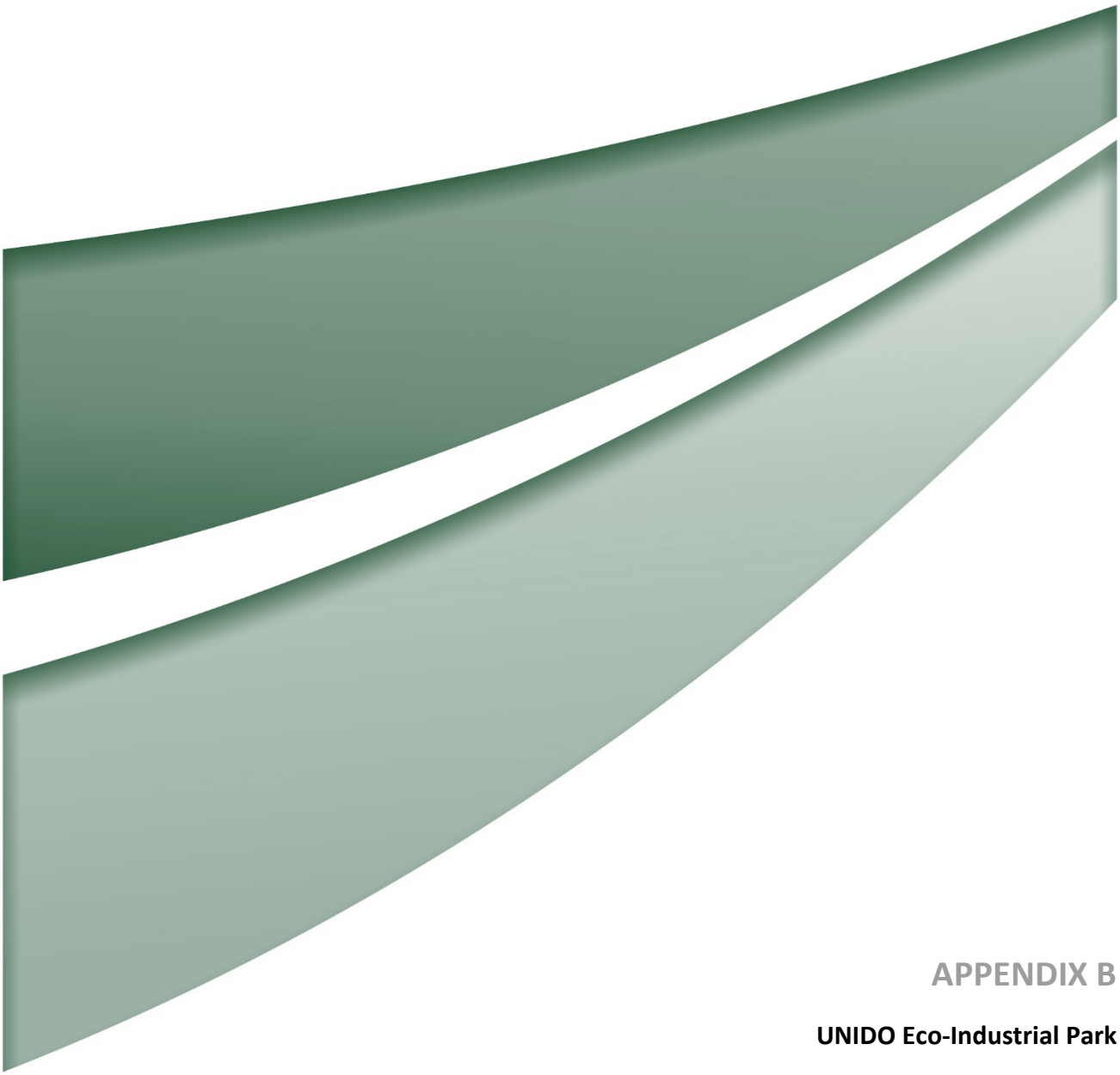
Preliminary review of UN SDG Goals and Targets

Sustainable Development Goal	Relevant UN Targets linked to this goal	Potential opportunities to achieve this in Williamtown SAP
Goal 6 Ensure availability and sustainable management of water and sanitation for all	6.3 By 2030 improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally 6.4 By 2030 substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of fresh water to address scarcity and substantially reduce the number of people suffering from water scarcity 6.5 By 2030 implement integrated water resources management at all levels, including through transboundary cooperation as appropriate 6.6 By 2020, protect and restore water related ecosystems including mountains, forests, wetlands, rivers, aquifers and lakes	• Instigation of Neutral or Beneficial Effect (NorBE) for pollutants entering the aquatic environment • Reuse and recycling of process water • Connect the Williamtown SAP to other recycled water options such as Hunter Water Corporation Wastewater Treatment Facilities • Link development approvals to aquatic biodiversity (including wetlands) offsets and rehabilitation as part of integrated water resource management and climate adaptation, as well as supporting resilient natural landscapes
Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all	7.2 By 2030 increase substantially the share of renewable energy in the global energy mix 7.3 By 2030 enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced cleaner fossil fuel technology, and promote investment in energy infrastructure and clean energy technology	• Precinct operations powered by 100% renewable sources. • Innovative, energy efficient transport technologies to access the site and to move materials around the site (e.g. electric vehicles, autonomous precinct vehicles as technologies progress) • Lead, enable and facilitate adoption of modern renewable energy and transmission technologies across the Hunter region

Sustainable Development Goal	Relevant UN Targets linked to this goal	Potential opportunities to achieve this in Williamtown SAP
Goal 8 Promote sustained inclusive and sustainable economic growth, full and productive employment and decent work for all	8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors 8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services 8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead	• Industries and technologies which drive and demonstrate resource efficiency (i.e. adoption of circular economy principles within their operational framework) • New industries are supported by regional education and training opportunities which enable regional employees to transition successfully from 'old' (e.g. traditional and energy intensive manufacturing) industry to 'new industries and technologies (e.g. advanced manufacturing) • Workforce develops and promotes restoration and enhancement of natural systems
Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure to support economic development and human well being 9.2 Promote inclusive and sustainable industrialisation, and by 2030 significantly raise industry's share of employment and gross domestic product (with specific reference to least developed countries) 9.4 By 2030 upgrade infrastructure and retrofit industries to make them sustainable, with increased resource efficiency and greater adoption of clean and environmentally sound technologies and industrial processes 9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, including by 2030 increasing the number of research and development workers per million people and public and private research and development spending 9.6 significantly increase access to information and communications technology	• Introduce new advanced technology and low energy (or circular energy/economy) industries • Promote regional transition away from old energy and industrial processes such as energy intensive manufacturing (i.e. Precinct can be seen as an enabling example of successful transition) • Link to research and development, and education opportunities at Newcastle University and other educational institutions and in technical education • Innovative communication and system control technologies

Sustainable Development Goal	Relevant UN Targets linked to this goal	Potential opportunities to achieve this in Williamtown SAP
Goal 11 Sustainable Cities and Communities	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management 11.8 Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning	• Promote waste reduction and avoidance actions across precinct utilising circular economy and resource optimisation principles • Promote clean energy technology for transportation and other industries in precinct. • Promote utilisation of public transport wherever practicable
Goal 12 Ensure sustainable consumption and production patterns	12.2 By 2030 achieve the sustainable management and efficient use of natural resources 12.4 By 2030 achieve the environmentally sound management of chemicals and all wastes throughout their lifecycle, in accordance with agreed international frameworks and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment 12.5 By 2030 substantially reduce waste generation through prevention, reduction, recycling and reuse 12.6 Encourage companies to integrate sustainability reporting into their reporting cycle 12.9 Rationalise inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions in accordance with national circumstances	• Apply life cycle analysis to all materials used in construction and operation of industries/businesses on the site, to minimise use of 'virgin' materials. This could apply to input materials including but not limited to concrete, steel, plastics and timber. This could be supported by a precinct concierge during operations. • Focus on protection of local/regional natural resources such as sand and gravel, water, replacing them with recycled or reused material options. • Strengthen opportunities to link development of the Precinct to land and waterway rehabilitation, which will protect, restore and enhance high value (high ecosystem services or conservation value) natural systems and support sustainable natural systems with climate change • Organisations within the precinct prepare climate mitigation and adaptation reports across their supply chains

Sustainable Development Goal	Relevant UN Targets linked to this goal	Potential opportunities to achieve this in Williamtown SAP
Goal 13 Take urgent action to combat climate change and its impacts	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries 13.2 Integrate climate change measures into national policies, strategies and planning 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	• Consider options for power transmission and communications that reduce climate change and natural hazard risks • As above, combine mitigation opportunities (net zero carbon, 100% renewables) with adaptation and natural system management opportunities in relation to climate change and sea level rise. Sea level rise and associated flooding issues are a particular challenge and opportunity for this site.



APPENDIX B

UNIDO Eco-Industrial Park

Topic	Sub-topic	Requirement	Indicator	Application to Precinct
Environment				
Management and monitoring	Environmental/Energy Management Systems (EMS and EnMS, respectively)	The park has an appropriate, functioning EMS and EnEMS systems (for example, ISO 14001 Environmental Management Standard and ISO 50001 Energy Management Standard) in place to set and achieve targets, and covering key issues (for example, energy waste and material use; water; point-source emissions; and the natural environment).	• Precinct or individual organisations operate under EMS or EnMS	Yes – A precinct wide EMS or EnMS could be implemented across the Williamtown SAP. Additional opportunity to use systems to encourage operators within the Williamtown SAP to meet or exceed targets Consideration of EMS adoption could be included in the Delivery Plan. This would require ongoing management by Williamtown SAP concierge or other management provider.
Energy	Energy efficiency	Energy efficiency strategies are in place for the park management infrastructure and major energy-consuming resident firms.	• Minimum Energy efficiency measures for tenants and organisations • Precinct wide energy metering and monitoring program in place	Yes – Energy efficiency measures, including objectives and targets could be implemented. This would include a long term target to source energy from renewable sources and offset unavoidable emissions At a high level, consideration of energy efficiency options and energy sources could be included in the Delivery Plan
	Exchange of waste heat energy	A program/mechanism is in place to identify opportunities for common energy and heat exchange networks to be established, including support programs to assist resident firms with implementation.	• Tenants have ability to Co-locate or co-share resources • Service corridors available for share or exchange of energy or resources	Yes –Opportunities for coshare and exchange of energy and heat exist within catchments i.e. landuses within the same precinct. Intra-precinct sharing opportunities may need further review and research due to geographical placement of catchment land uses.

Topic	Sub-topic	Requirement	Indicator	Application to Precinct
				Design requirements for co-sharing and locating resources could be included in the Delivery Plan
Water	Water efficiency, reuse and recycling	Water-saving and re-use plans are important to reducing total water consumption. The park and businesses should have systems in place to increase water savings and reuse.	• Water optimisation measures, including reuse (including industrial waste water, if applicable), rain and storm water harvesting are adopted	Yes – Opportunities to maximise use, re-use, efficiency of resources across the Williamtown SAP is a key theme of promoting a circular economy, a central theme of the Williamtown SAP. This is also considered as part of the Water-Sensitive Urban Design considerations. Water design and optimisation requirements could be included in the Delivery Plan
Climate change and the natural environment	Air, GHG emissions and pollution prevention	The park seeks to limit and mitigate all point-source pollution and GHG emissions, including air, waterway, and ground pollution. A set of measures at the park level is introduced (for instance, low-carbon technologies, energy efficiency measures, waste heat) to reduce GHG emissions.	• Precinct wide program is adopted to monitor, manage and report emissions. This includes providing demonstrable pathway to meet net zero emissions	Yes – Precinct could adopt this to drive net zero emissions
	Environmental assessment and ecosystem services	Protection of the sensitive natural environment is key to environmental and community well-being. The industrial park demonstrates an understanding of the potential impact of park activities on priority ecosystem services in and around the vicinity of the park.	• Technical assessments undertaken to identify impacts • Precinct and/or tenants have strategy in place to prevent pollution to environment • Organisations have risk management framework in place which identifies aspects which have potential to impact environment	Yes- Precinct aims to retain natural systems function, including the retention of the centre environment corridor and other environmental drainage structures Option – Precinct can develop pollution control strategy during construction and operational phases (this would also form part of the precinct EMS).

Topic	Sub-topic	Requirement	Indicator	Application to Precinct
			• Ecological areas are reserved from development	
Park Management				
Park Management Services	Park management entity	A park management entity (or alternative agency, where applicable) exists to handle park planning, operations and management, and monitoring.	• Precinct wide program is put in place to monitor, manage and report emissions, including demonstrable pathway to meet net zero emissions	Yes – this could be provided by the Williamtown SAP concierge or other management facilitator
	Park property, common infrastructure and services	The park management entity provides and facilitates common services and infrastructure to resident firms to ensure smooth operations.	• Tenants have ability to Co-locate or co-share resources • Service corridors available for share or exchange of energy or resources	Yes – Masterplan process including respective technical studies for development of the Williamtown SAP. Ongoing management via Williamtown SAP concierge. Shared services and resources corridor provisions could be included in Delivery Plan.
Monitoring and risk management	Monitoring performance and risks	The park management entity has established and maintains a system for monitoring achievement of threshold EIP performance targets and management of critical risk factors within the park.	• EMS or EnMS and Risk management systems adopted across precinct or tenants	Yes – this could be provided by the Williamtown SAP concierge or other management facilitator. Provisions to monitor and understand energy and resource use across precinct and organisation level could be included in Delivery Plan.
		The park management establishes measures to deal with climate change adaptation and disaster preparedness.	• Climate change risk assessment is undertaken, actions tracked and updated to reflect previously unidentified risks on a periodic basis	Yes – this could be provided by the Williamtown SAP concierge or other management facilitator

Topic	Sub-topic	Requirement	Indicator	Application to Precinct
	Information on applicable regulations and standards	Park management has a good understanding of regulations and international standards applicable to industrial park compliance.	• Adoption of precinct wide EMS or EnMS which incorporates requirements	Yes – this could be provided by the Williamtown SAP concierge or other management facilitator
Planning and zoning	Masterplan	A masterplan for the EIP should be developed by relevant authorities (for example by governments, land owners, and planning agencies); it should be applicable for both planning and operations.	• Masterplan is developed taking into account technical studies and stakeholder feedback.	Yes – Masterplan process including respective technical studies for development of the Williamtown SAP. Ongoing management via Williamtown SAP concierge.
Social				
Social management systems	Management team	Functioning system(s) are in place for ensuring social infrastructure provisioning, operations and performance, as well as collecting, monitoring, and managing key social information and impacts relevant to the industrial park.	• Adoption of ESG reporting standards for precinct or tenants	Yes – this could be managed and driven by Williamtown SAP concierge or other management facilitator
Social infrastructure	Primary social infrastructure	Provision of fundamental social infrastructure in the industrial park or its proximity also facilitate and encourage women's employment, for example, lavatories and public toilets (for men and women), drinking water fountains, provision of cafeterias within reach of the employees, recreational areas, and childcare programs. This infrastructure needs to be fully operational to encourage women's employment.	• Adoption of ESG and performance reporting requirements for precinct or tenants • Adoption of employment diversity targets • Adoption of Blue/Green infrastructure spaces • Adopted of precinct wide safety management system	Yes – this could be managed and driven by Williamtown SAP concierge or other management facilitator
Economic				
Employment generation	Type of employment	An EIP has employment generation plans in place to provide opportunities for long-term employment.	• Adoption of employment diversity targets	Yes – this could be provided by the Williamtown SAP concierge or other management facilitator

Topic	Sub-topic	Requirement	Indicator	Application to Precinct
Local business and SME promotion	SME development	An EIP provides opportunities for local, regional, and national SMEs, enabling them to benefit from EIP activities	• Park management promotes the establishment of SME's that provide services and add value to precinct as a whole • Local suppliers (where practicable) are preferred procurement options	Yes – this could be managed by the Williamtown SAP concierge or other management facilitator
Economic value creation	Market demand for EIP services and infrastructure	The development of an EIP, including green infrastructure and services, must be based on realistic market and industry demands to ensure economic feasibility.	• Identify suitable locations for green infrastructure • Identify service corridors and transportation nodes to allow for material and/or energy movements	Yes – Masterplan process including respective technical studies for development of the Williamtown SAP. Ongoing management via Williamtown SAP concierge.
	EIP meets economic interests of the government	The site is economically efficient in terms of achieving government targets, including investment, foreign direct investment, and tax revenue targets.	• Target Williamtown SAP organisations and land uses	Yes – Masterplan process including respective technical studies for development of the Williamtown SAP. Ongoing management via Williamtown SAP concierge.

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