Department of Climate Change, Energy, the Environment and Water

NSW Integrated Water Cycle Management Framework

Best practice guide

March 2025

NSW GOVERNMENT

Acknowledgement of Country

Department of Climate Change, Energy, the Environment and Water acknowledges the traditional custodians of the land and pays respect to Elders past, present and future.

We recognise Australian Aboriginal and Torres Strait Islander peoples' unique cultural and spiritual relationships to place and their rich contribution to society.

Artist and designer Nikita Ridgeway from Aboriginal design agency – Boss Lady Creative Designs, created the People and Community symbol.

NSW Integrated Water Cycle Management Framework

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Image front cover: Family enjoying the picturesque wetlands located in the award-winning Sydney Park, St Peters. Credit: Anna Kucera / Destination NSW

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Overview of the NSW Integrated Water Cycle Management Framework

The structure of the IWCM Framework

> The NSW Integrated Water Cycle Management (IWCM) Framework is a best-practice guide to developing and delivering IWCM projects. It provides clear steps for organisations seeking to adopt an IWCM approach to the design, delivery and review of new projects, programs and strategic planning processes. The IWCM Framework is specifically designed to be generic so that it can be applied in a range of circumstances and at a range of spatial levels.
>
> Government, land use planners, water utilities, councils, developers, businesses and the community can use the Framework to work together to better plan, manage and deliver water-resilient cities and towns across NSW.

The IWCM Framework consists of 5 stages (refer to Figure 1):

1. Understand context and set a strategic direction
2. Create a supportive, enabling environment
3. Build skills, knowledge and capability
4. Explore and deliver integrated solutions
5. Monitor, evaluate and learn.

Each stage consists of 2 to 4 key steps which in turn include a number of tasks and relate to distinct themes.

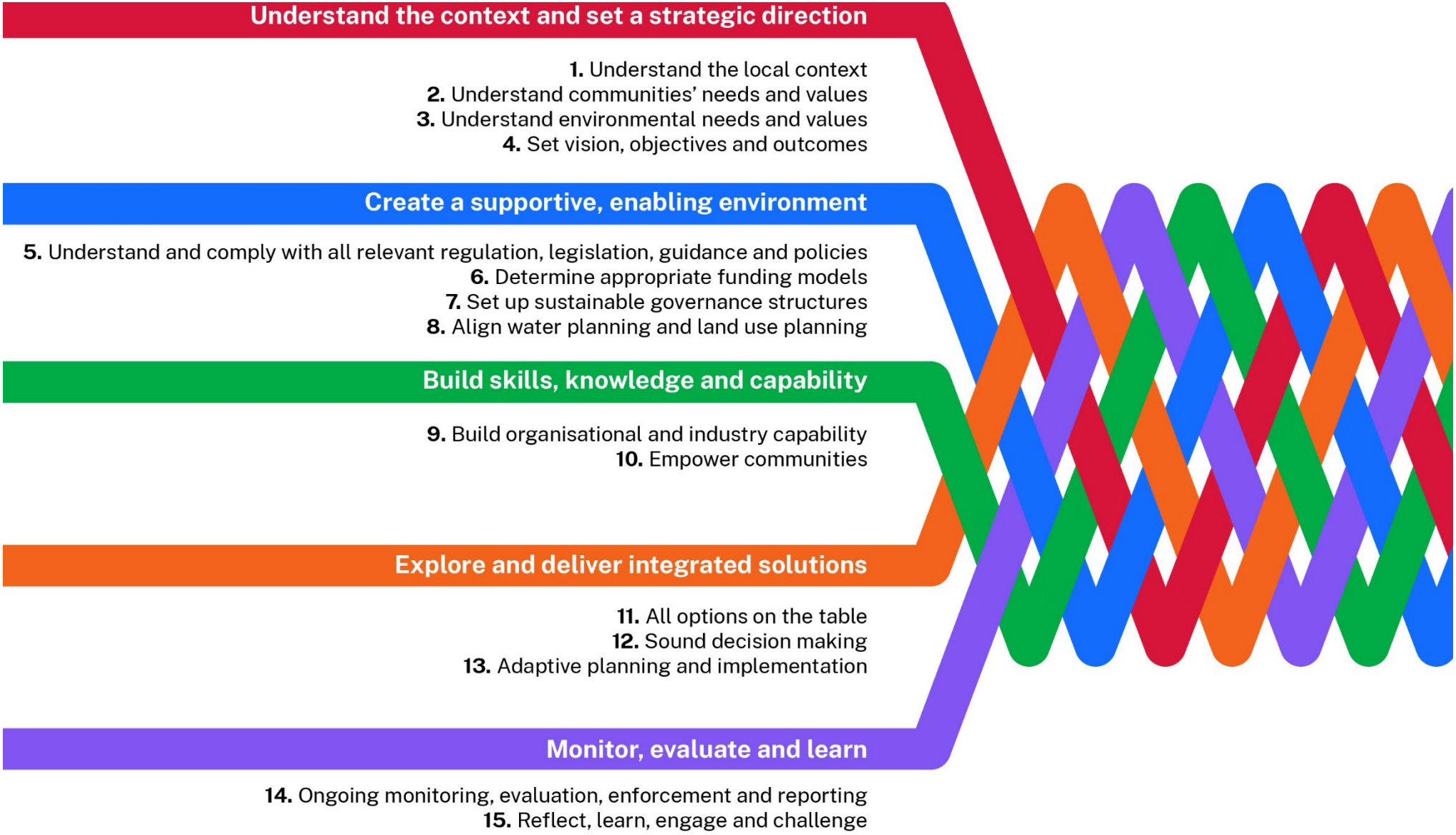
IWCM promotes the coordinated development and management of water with land, other infrastructure and related resources to facilitate protection of the water resource and vital ecosystems, and deliver place-based, community-centred outcomes that maximise the resilience and liveability of cities and towns.

This Framework identifies the common features of IWCM.

By drawing on this guidance, organisations will be better placed to:

- improve the design and establishment of new urban communities, urban infill and urban redevelopment.
- achieve greater community value from water infrastructure investment and land development.

Figure 1 - The 5 stages of the IWCM Framework



Using the IWCM Framework

The IWCM Framework covers all potential steps involved in completing an IWCM project. 'IWCM project' is used as an all-inclusive term and can include anything from strategic planning at a catchment scale to designing individual projects at a lot scale.

When starting out, an organisation doesn't need to attempt everything covered in the Framework. Having an idea of the 'full picture' of activities should, however, be useful for a project at any stage of maturity. This allows organisations to decide which actions to take on now and which ones they might leave for the future.

The Framework can be applied in an iterative and adaptive manner so organisations should apply the stages and actions that are applicable to each planning or project stage.

Many of the 15 steps are interrelated and apply throughout a conceptual IWCM process which would start with planning through to implementation, monitoring, evaluation and compliance.

The Framework can be applied across different scales and circumstances and shall be used to guide IWCM projects in the following contexts:

- to inform IWCM projects and programs being prepared by NSW Government agencies
- as a resource for NSW water utilities for strategic planning incorporating an IWCM approach
- to guide developers applicants undertaking IWCM projects at a precinct, site, or development scale
- to guide development assessment planners within state and local government to plan for and assess IWCM projects.

How will you know if you are achieving best practice?

For each of the steps in the IWCM Framework, we have developed key tasks and listed key IWCM themes. Supporting guidance material is provided below the table to assist proponents in completing key tasks. A separate self-evaluation tool is available for download that translates the key tasks into a set of evaluation criteria. The key tasks and guidance and their evaluation have multiple purposes.

At an individual utility or organisational level, these help to identify:

- progress towards achieving IWCM outcomes
- where more support or resources may be required.

At a statewide level, these help to:

- identify best-practice examples for organisations to share and improve capability across the state
- identify specific regions where centralised support or additional resources would help broader progress towards achieving IWCM outcomes
- assess statewide performance against the IWCM Framework to help develop statewide IWCM or support programs.

Organisations can self-rate the criteria on a 5-point scale based on these descriptors:

- Current best practice: The way the organisation/ project achieves the criterion represents best practice in the sector. It is comprehensive and innovative.
- Good practice: The organisation/ project addresses the criterion fully based on good practice in the sector.

- **Business as usual (BAU):** The organisation/ project addresses some aspects of this criterion but the way it is implemented does not reflect an IWCM approach and would be undertaken under BAU project implementation. .
- **Not done:** Step not currently addressed.
- **Not applicable:** Step not required for the particular context.

Figure 2 - Wetlands at Wangal Park, Croydon, Sydney. Credit: Salty Dingo / DPHI

IWCM Framework

Stage 1 - Understand the context and set a strategic direction

Understand the local context and community needs and values; and set the vision, objectives and outcomes for the IWCM project

Step	Key tasks	Key IWCM themes
1. Understand the local context What are the unique risks and challenges in the local geographic and operating context?	• Identify the geographic area of interest to the project, map the project boundary, and assess the hydrological and other natural resource impacts within, and in and out of, that boundary. • Consider the full range of IWCM-related issues evident in the project area and in its broader context. • Consider the unique challenges and risks relevant to the local context. • Consider the pressures and drivers of the IWCM-related issues. • Collect data and collate other information that establishes an evidence-based understanding across all these issues and risks i.e. place-based knowledge. • Summarise the problems and critical risks that the IWCM project needs to address.	Whole-of-urban water cycle Secure water systems Water quality Environmental health Public health Water efficiency Stormwater integration Drought planning Flood planning Emergency planning Risks and future trends considered/ Resilience Urban amenity/ Liveability Evidence-based
2. Understand communities' needs and values What are the communities' needs and values for the place/ area of interest?	• Identify the communities relevant to the IWCM project area. • Seek representation from these communities that involves a broad, diverse and representative cross-section. • Engage with these communities to understand their needs and values • Develop a community engagement plan. • Build authentic relationships with community representatives. • Partner with Aboriginal peoples (Regional Aboriginal Water Committees, NSW Aboriginal peaks and community controlled organisations, other Aboriginal water-interest groups, and/or Aboriginal communities) to build understanding of the communities' needs, and values and uses of water. • Ensure that the IWCM project outcomes are linked to the historical and social context of the area, including Aboriginal histories and culture. • Consult early with communities, at all key milestones, and to evaluate the IWCM project.	Understand communities' needs and values for all items listed in Step 1. above All values of water considered Public participation Aboriginal partnerships Community preparedness Social equity Inclusiveness Equitable access to environmental services

Step	Key tasks	Key IWCM themes
3. Understand environmental needs and values What are the needs of the environment and what environment are you seeking to protect?	• Consider the natural resources and ecosystems that exist in the IWCM project area. • Identify the services these natural resources and ecosystems provide. • Partner with Aboriginal peoples (Regional Aboriginal Water Committees, NSW Aboriginal peaks and community controlled organisations, other Aboriginal water-interest groups, and/or Aboriginal communities) to build environmental understanding. Use culturally safe mechanisms to allow knowledge sharing to take place, so that the exchange respects Aboriginal peoples' Indigenous Cultural and Intellectual Property (ICIP), while adhering to data sovereignty principles. • Seek to understand the value of the services provided by nature. • Identify dependencies between natural resources and nature-related risks. • Analyse the impacts the IWCM project may have on the environment i.e. how might water use and land use changes impact local ecosystems? • Determine whether the impacts of the IWCM project are acceptable to the community and to the environment i.e. do they allow for the ongoing healthy functioning of ecosystems?	Environmental health Sustainable ecological functioning Aboriginal partnerships Equitable access to environmental services
4. Set vision, objectives and outcomes What is the place-based vision and the objectives and outcomes the IWCM project will seek to achieve? Will targets be developed to support the vision?	• Frame the problems and risks that the IWCM project is seeking to address. • Establish a process to co-design the vision, objectives and outcomes with project stakeholders and communities, including with Traditional Owners. • Identify the full range of urban water cycle outcomes that can be achieved by the IWCM project. • Consult across multiple stakeholders, communities, government and industry to set the vision, objectives and outcomes. • Verify that the vision, objectives and outcomes are based on a strong and deep understanding of community and environmental needs and values. • Identify the outcomes that key stakeholders regard as critical to delivery. • Determine the levels of service/ targets that the IWCM project will need to meet for all critical outcomes. • Develop and agree indicators and measures for each of the targets/ level of service. • Establish a clear and community endorsed commitment to the vision, objectives and outcomes, across stakeholders, leaders and organisations.	Shared vision Inclusive and co-owned Place-based approach Public participation Social equity Aboriginal partnerships Agreed levels of service Equitable access to services

Stage 2 - Create a supportive, enabling environment

Understand, utilise, and where necessary extend the enabling environment to support the IWCM project

Step	Key tasks	Key IWCM themes
5. Understand and comply with all relevant regulation, legislation, guidance and policies Is the regulatory, legislative and policy environment well-established, understood and able to be complied with? If not, what are the gaps and/ or barriers and what might need to be done to address them?	• Identify all existing regulation, legislation, guidance and policies that relate to the IWCM project • Identify how the IWCM project aligns with this regulation, legislation, guidance and policy, and identify any gaps and barriers. • Engage with regulators to seek advice on how to deliver the IWCM project in the existing regulatory environment, given any gaps and barriers, and collaborate to extend the enabling environment, where appropriate. • Link the IWCM project to relevant NSW Government and council policies, where possible. • Advocate to improve the enabling environment to better enable current and future IWCM projects, where appropriate.	Enabling authorising environment Shared vision Public accountability
6. Determine appropriate funding models Are there ongoing funding mechanisms available to support the IWCM project? If not, what are the funding gaps and how might they be addressed?	• Identify the impactors and beneficiaries of the IWCM project and those entities that can support it. • Identify costs and allocate them to impactors as a first priority, then to beneficiaries if this is not possible. • Identify social equity and affordability issues. • Identify and develop mechanisms to recover project costs (such as developer charges and revenue from water bills) over the project lifecycle. • Determine an agreed cost and risk sharing arrangement at the start of the planning process that enables funding of multiple project impacts and benefits in the short and long term.	Cost recovery Impactor pays/ Polluter pays Beneficiary pays Customer affordability Secure resourcing Delivery assurance

Step	Key tasks	Key IWCM themes
7. Set up sustainable governance structures Are the right people involved at the right times, and is the governance model enduring? If not, what are the governance gaps and how might they be addressed?	• Consider how to draw in expertise, support and guidance across all aspects of the water cycle (for example, water resource managers, water and sewer managers, stormwater managers, Traditional Owners and flood managers). • Identify key contributors and a method/ forum for collaboration with key stakeholders, Traditional Owners, government agencies and organisations. • Establish governance arrangements, including a steering committee and working groups with an independent chair and/ or that incorporate independent advisory and review processes, as appropriate to the complexity of the IWCM project. • Clearly articulate roles, responsibilities, accountabilities and collaborative expectations of those in the governance structure. • Establish buy-in for the project from those at senior levels in the organisations involved in the project. • Appoint a lead organisation responsible for the coordination of ongoing IWCM project investment and planning, and to champion ongoing collaboration. • Confirm with key organisations that they have committed sufficient staff and resources to support project governance. • Ensure the monitoring, evaluation, reporting and improvement plan includes review of the effectiveness of project governance at key stages.	Collaborative governance Clearly assigned roles and responsibilities Leadership and champions Enduring governance mechanisms Delivery assurance
8. Align water planning and land use planning How can land use planning and water management be better aligned to ensure effective strategic planning?	• Reference the IWCM project in land use planning strategies e.g. cross reference the project in masterplans or place strategies, where possible. • Embed targets into applicable development controls e.g. waterway health targets, water conservation measures and recycled water measures, where possible. • Place requirements on proponents to prepare site-specific IWCM plans which align with the overarching IWCM project. Such requirements should be embedded in Development Control Plans. • Ensure strategic land use plans (such as structure plans, lay-out plans and masterplans) reflect the location of IWCM infrastructure and reserve the acquisition land needed for IWCM infrastructure. • Work with local governments and other planning authorities to identify ways to maximise the inclusion of water in the urban environment e.g. in irrigation, water features, passive amenity. • Establish a process that allows for interaction between water and land use planners at different stages of plan development. • Ensure that the IWCM project informs strategic land use plans (for example, structure plans) during their preparation.	Systems approach Resource efficiency Resource recovery Circular economy approach

Stage 3 - Build skills, knowledge and capability

Ensure the community is empowered and organisations and industry are capable to deliver the IWCM project

Step	Key tasks	Key IWCM themes
9. Build organisational and industry capability How are organisations and industry building skills and internal capacity?	• Undertake an assessment of the existing levels of knowledge and capability in the organisations and industries relevant to the IWCM project. • Identify any skills and capacity gaps to implement IWCM projects, including lack of knowledge of new technologies and systems. • Consider organisation and industry capacity to deliver, operate and maintain the IWCM project to the standards required to achieve its objectives and outcomes. • Develop and deliver a capacity building program that includes activities to address gaps. • Ensure the capacity building program builds skills in the monitoring, compliance and enforcement of lot-level residential, commercial and industrial projects. • Identify and progress First Nations employment and business opportunities during implementation. • Develop guidance materials to assist those responsible for delivering IWCM solutions. • Develop new technical solutions and test them to ensure they are fit for purpose to the IWCM project's scale and to the local conditions.	Integrated and adaptive planning Delivery assurance Systems approach Continuous learning
10. Empower communities How is the community empowered to participate and contribute throughout the process?	• Determine the best way of engaging with customers to increase water literacy and empower stakeholders to have a role in the IWCM project. • Undertake an initial assessment of existing IWCM knowledge and capability held in the communities relevant to the IWCM project. • Invest in actions to build community and cultural awareness and capability to contribute to the IWCM project, targeted to the needs identified in the above assessment. • Involve customers and communities, including Aboriginal peoples, in operating and maintaining water systems and infrastructure. • Support Aboriginal representation, including through identified Aboriginal gender-balanced roles in the project team and/or supporting roles for Aboriginal community controlled organisations in decision-making relevant to the project. • Conduct meaningful and authentic knowledge sharing with the community throughout all key stages of the IWCM project. • Evaluate the IWCM project's success at delivering an inclusive, bottom-up process that empowered and built the capacity of project communities; and incorporate lessons learnt into the next IWCM project.	Water literacy Public participation Social equity Equitable access to resources Enduring benefits

Stage 4 - Explore and deliver integrated solutions

Ensure all options across the water cycle are identified and sound decisions are made to deliver the best outcomes with the IWCM project

Step	Key tasks	Key IWCM themes
11. All options on the table Are all potential options across the water cycle identified and considered, including diverse water sources and fit for purpose uses?	• Conduct a water mass balance that estimates water inflows and outflows in and out of the project boundary. • Identify the base case (what would occur under conventional servicing options). • Identify all potential options to deliver the IWCM project, including by considering emerging technologies. • Tailor options to the local conditions (local plants, soils and climates). • Conduct a water mass balance that assesses the water impacts of each option compared with a base case e.g. without the project. • Prepare an options analysis that assesses all feasible options and their risks. • Assess and respond to local climate conditions and impacts in the options analysis.	Whole-of-urban water-cycle Water mass balance All options considered Fit for purpose services, solutions and water use Total asset management planning
12. Sound decision making Are the right decisions being made, supported by a transparent and effective decision-making framework?	• Agree a decision-making framework at project outset that ensures accountability and is suited to the unique circumstances of the project. • Apply environmental law and ethical principles in decision-making. • Plan upfront how to resolve any decision gridlock. • Ensure decisions can be justified from a range of perspectives, and are supported by cost-benefit analysis, wherever feasible. • To deal with uncertainty in the project, identify a process for future adjustments as more information becomes available. • Apply best-practice decision support tools proportionate to the scale and complexity of the project. • Apply environmental economics approaches to guide decision-making, as suitable and feasible for the IWCM project. • Publish decisions and analysis for public transparency and accountability. • Reflect on decisions, identify any problems, and redirect the project as necessary at key project stages.	Evidence-based Environmental law principles Ethical principles Economic evaluation Economic efficiency Maximise public benefit Public participation

Step	Key tasks	Key IWCM themes
13. Adaptive planning and implementation Is the planning process and implementation plan adaptive and responsive to changing circumstances?	• Develop an adaptive project plan that addresses risks and uncertainty. • Develop a detailed implementation plan that sets expectations for all key aspects of the project and defines the scope of adaptiveness i.e. non-negotiable deliverables. • Identify interdependencies with other projects and processes, identify critical paths and develop adaptive planning options, as appropriate to the complexity of the IWCM project. • Ensure adaptive planning is integrated into the project that identifies and can respond to project risks and uncertainties. • Establish a post implementation review process to evaluate whether the IWCM project is operating as intended and is meeting its intended objectives and outcomes.	Adaptive planning Place-based approach Delivery assurance Community preparedness Enduring benefits

Figure 3 - Housing development in Googong, NSW. Credit: Jaime Plaza van Roon / DPHI

Stage 5 - Monitor, evaluate and learn

Monitor and evaluate in a continuous cycle that incorporates lessons learnt from the ongoing delivery and maintenance of IWCM projects

Step	Key tasks	Key IWCM themes
14. Ongoing monitoring, evaluation, enforcement and reporting **How well is the IWCM project achieving its vision, objectives and outcomes over time? If planned outcomes are not being achieved, who is accountable and what is being done to correct this situation?**	• Develop a monitoring, evaluation, reporting and improvement approach, that includes measuring against key performance indicators. • Ensure the monitoring and evaluation program includes mechanisms to review the ongoing performance and compliance of the IWCM project. • Develop processes to ensure ongoing compliance, reporting and tracking of asset performance and technology performance is in place. • Inform industry, property owners and asset contractors of their legal responsibilities for maintaining and operating IWCM infrastructure to an appropriate standard. • Investigate opportunities to include mandatory reporting requirements and, where appropriate, establish an owner reporting approach to maintaining WSUD systems. • Ensure compliance aligns with established standards under environmental and planning legislation, including water quality, pollution, land use planning, stormwater retention and urban heat island standards. • Conduct regular and transparent reporting to relevant authorities (i.e. councils and state agencies) on the achievement of targets, outcomes and milestones.	Water quality monitoring Enduring benefits Sustainable ecological health Maximise public benefit Transparency and accountability
15. Reflect, learn, engage and challenge **How are lessons being learnt from the IWCM project and how is expertise being built over time?**	• Engage in active reflection activities during project planning, delivery and evaluation. • Build a continuous learning culture via regular and planned reflection about project outcomes and impacts. • Engage across organisations and industries to build multi-disciplinary networks of expertise. • Document the opportunities that emerge from these discussions i.e. those that challenge BAU and find new ways to extend and achieve IWCM outcomes. • Share new ideas and insights within your organisation and across your networks. • Promote and incentivise IWCM in organisational strategies and policies. • Aim to incorporate resource recovery, resource efficiency and circular economy principles into the planning and delivery of IWCM projects.	Integrated and adaptive planning Systems approach Resource recovery Resource efficiency Circular economy Continuous learning

Frequently asked questions about the IWCM Framework

What is the NSW Government commitment to IWCM?

The NSW Government is committed to using IWCM to improve outcomes for communities in NSW:

- The NSW Water Strategy outlines the Government's intent to adopt an IWCM approach for urban planning, particularly under Action 6.9, which aims to support resilient and liveable cities. This involves promoting IWCM within the planning system and water management frameworks.
- The NSW Water Strategy is backed by implementation plans that regularly assess progress. In its first implementation plan, the NSW Government pledged to develop regional and metropolitan water strategies based on IWCM, including plans for Greater Sydney and the Lower Hunter region and regional water strategies. The 2022-24 Implementation Plan outlines further actions to enhance IWCM, such as creating a state-wide IWCM Framework.
- Additionally, promoting IWCM is also one of the strategic planning outcomes that the Department expects Local Water Utilities to achieve to demonstrate effective and evidence-based strategic planning under the Regulatory and Assurance Framework for Local Water Utilities.

Why is the IWCM Framework being developed now?

The Department is committed to responding to emerging challenges of a growing population and climate change by taking an IWCM approach to urban planning. IWCM seeks to promote consideration of the urban water cycle early in the land use planning process and recognise the critical role that water plays in creating places that contribute to community health and wellbeing. Action 6.9 of the NSW Water Strategy 'Promote and Improve IWCM' commits the Government to implement ongoing actions to increase uptake of IWCM and embed it within the NSW planning system and in water management practices.

Is this a linear process?

The IWCM Framework is not designed to be a linear process. Many of the steps, e.g. empower communities, are done at all stages of the process and are iterative and ongoing. The purpose of the Framework is to display the necessary actions towards achieving a consistent and robust approach to IWCM.

Is this a prescriptive or outcomes-focused approach?

We have designed the Framework to prompt stakeholders to strive for best-practice approaches that are relevant to their context and situation. Instead of laying down rules, the Framework takes a principles-based approach that can be used to address the unique circumstances of every city, town, and village across NSW.

Who can apply the IWCM Framework?

The IWCM Framework seeks to guide government, land use planners, water utilities and developers to better plan, manage and deliver water resilient cities and towns across NSW.

Is it for every water utility and council?

Ideally, every water utility and council should be working towards promoting IWCM using the guidance in the Framework. In practice, constraints on resourcing, funding, and capability mean that decision-makers, particularly at smaller councils and for small scale development, must choose where best to act.

How does this link with the Regulatory and Assurance Framework for Local Water Utilities?

The IWCM Framework complements the Department's expectations on effective, evidence-based strategic planning of local water utilities under section 3 of the Regulatory and Assurance Framework for Local Water Utilities (RAF) by providing a framework that contributes to local water utilities achieving the strategic planning outcome of promoting IWCM under section 3 of the RAF.

Figure 4 - Woman walking her dog by the picturesque wetlands located in Sydney Park, St Peters. Credit: Anna Kucera / Destination NSW

Supporting guidance material

Stage 1: Understand the context and set a strategic direction

1. Understand the local context

The essential first step in developing an IWCM project is to gather information to establish a sound understanding of all aspects relevant to the urban water system in the area that the project will take place.

There are a range of issues to investigate to identify the unique challenges and risks faced in the local context, including:

- Water security
- Water quality
- Environmental health
- Assets and infrastructure
- Customers
- Financial sustainability.

To help understand the local context proponents should systematically explore relevant issues affecting water management, including broader societal, economic and environmental trends and limitations, related to:

- population growth
- urban expansion
- climate change
- land and water resource scarcity
- high levels of flood risk
- the need to protect ecological systems, such as waterways, riparian vegetation communities, wetlands, and other water dependent ecosystems from further deterioration
- the need to meet community expectations and aspirations for improved liveability and amenity.

IWCM proponents should consider all elements of the water cycle and the interactions between these elements early on in project planning. IWCM projects typically involve urban development that changes land uses that in turn changes the local hydrology of an area. Proponents should consider the impacts of these land use changes on rates of infiltration, runoff and evapotranspiration as well as changes in anthropogenic flows from water use and discharge.

This consideration should be supported by an assessment of impacts on other natural resources and with the built environment. This includes assessing interactions with natural systems (such as soil, air, plants, animals, fossil fuels, minerals); built systems (such as transport, technology, utility connections); and of the movement of people in and out of the area.

Scale (catchment, precinct, lot), density and urban form are important elements to assess when developing an understanding of the project's local context and in considering fit for purpose water uses across the urban water cycle.

The evidence base on which the understanding of the local context is established should be accurate, apply best-practice standards and methodologies, and be substantiated by expert advice and input.

2. Understand communities' needs and values

A thorough understanding of project communities' needs and values is critical to IWCM project planning and delivery success. An IWCM project that responds to and listens to the communities' needs and values will build trust, help understand and breakdown opposing views, and help avoid any strong opposition as the project progresses.

Authentic engagement needs to take place, early and often, that can legitimately influence IWCM project planning and outcomes. Community engagement should be objective, representative, proportionate and meaningful, and supported by clear and accurate communication.

The term 'communities' is used in plural to emphasise that many different types of communities will be stakeholders in the IWCM project, and the individuals in each of these communities may each have differing needs and values. The communities of interest are those that live within the project area, are impacted by the project and/ or have a genuine interest in project outcomes. This will include existing populations, likely new populations (i.e. target communities who may move into a newly developed area), neighbouring communities, Traditional Owners, youth, the elderly and other vulnerable members of project communities.

Understanding the values held by communities and incorporating them into planning is important for numerous reasons, including that:

- Organisations involved in IWCM, such as state government agencies and local councils, are established to serve their communities and are obliged to respond to their needs, for today and into the future.
- Understanding communities' needs and values may play an increasingly important role in defining the remit and obligations of water businesses in the future.

A public participation process to determine the vision, objectives and outcomes may not be possible for some IWCM projects. For example, for large greenfield projects where the community does not yet exist. In such circumstances, different methods need to be used to set the vision, objectives and outcomes for the IWCM project, such as engaging with neighbouring communities, or the target population expected to move into the new area.

An IWCM project needs to deliver its services consistent with the requirements and expectations of regulators. Service delivery effort can be extended to achieve higher service levels and additional outcomes above regulatory expectations. Understanding of communities' needs, values, and preferences should determine such water service delivery decisions as revealed through engagement activities, that considers ability and willingness to pay.

Local communities need to be aware of their role in setting IWCM project expectations. They also need to understand and appreciate the range of costs, benefits and outcomes that can be achieved by taking an IWCM approach compared with business as usual (BAU) or less innovative approaches. Engagement activities should include an education element that builds local understanding and water literacy so that project communities are well informed of the local context and of the IWCM project impact (see Step 10).

To elicit needs and values proponents could consider a suite of tools for community engagement, such as focus groups, surveys and workshops. IWCM proponents should take care to tailor community engagement activities and practices to different target groups, and to be responsive, aware and adaptive to the circumstances and culture of the local context.

3. Understand environmental needs and values

IWCM projects should help to boost ecological resilience to ensure that risks to the health and regenerative capacity of the environment are mitigated and, where possible, environmental health is enhanced.

Nature is the support system for human life. Society, the economy and environmental assets are a part of nature and are dependent on it. All economic activity, including IWCM projects, is dependent on nature and its ongoing resilience and regenerative capacity.

The environment is sustained by biological, physical and chemical processes. Natural and human activities impact these processes. If biological, physical and chemical processes are disrupted beyond their regenerative capacity they will deplete over time and become unable to provide the ecosystem services that communities need and will enjoy into the future.

An IWCM approach should take explicit effort to understand the environment in which it is occurring; to measure the stock and health of the natural resources, including land and water resources, in which the project will operate; and to assess the impact the IWCM project is likely to have on local ecosystems. Cumulative impacts on the environment and the environment's resilience need to be explicitly considered.

IWCM proponents should partner with local Aboriginal representatives (Regional Aboriginal water Committees, NSW Aboriginal peaks and community controlled organisations, other Aboriginal water-interest groups and/ or Aboriginal communities) to draw on their knowledge of the local history of land and water stewardship, and to help build understanding of local environmental needs and values. Water plays a central role in supporting the ecosystem, storytelling for future generations, spiritual connections and caring for Country.

The IWCM project/ initiative should recognise and support, among others, i. Aboriginal rights, interests, and ownership of water (including through consultation around preservation of environmental flows), ii. cultural rights in sites of significance (e.g. by maintaining or improving access to waterways and other culturally significant water dependent places), and iii. the right of Aboriginal peoples to choose cultural authority or knowledge holders to enhance the exchange of cultural heritage knowledge.

IWCM proponents need to consider the intrinsic and utilitarian values of the environment and seek to understand the environment the community wants. Communities, including Traditional Owners, need to be involved in this process to elicit from them the environmental values they hold and the environment they want for the IWCM project. This involves reconsidering the project in terms of its likely risks to environmental health and resilience related to:

- Changes to environmental flows
- Changes to pollutant loads
- Loss and disruption of habitats and biodiversity.

IWCM proponents together with communities should appreciate the increasing scarcity of natural resources caused by urban development over time and consider how the IWCM project could minimise its environmental impact. Proponents should also consider how they might contribute to and add environmental services into the IWCM project area.

4. Set vision, objectives and outcomes

Setting a clear vision, objectives and outcomes at the beginning of an IWCM project helps ensure a shared and inclusive strategic direction.

The vision, objectives and outcomes need to be set in alignment with the local context and relate directly to the unique risks and challenges present in the IWCM project 'place' or area. A broad and deep understanding of communities' needs and values should shape the vision, objectives and outcomes of the project (see Step 2).

The vision is a high-level statement that captures what an IWCM project seeks to achieve for its communities and for the local environment. The vision is typically set first and is used to determine the strategic direction of the IWCM project. It should describe values, places and community outcomes. The vision should be co-designed through an inclusive engagement process and respond to communities' needs and values.

The objectives and outcomes are then set in alignment with and to achieve the vision. They provide the next level of detail and articulate the requirements of the IWCM project. Objectives refer to what the IWCM project is aiming to achieve. Objectives should be consistent with state and local government strategies and policies.

Clear targets that can measure the achievement of objectives should be agreed early in the IWCM project cycle, and a process established to monitor against them. Targets should be 'SMART' i.e. specific, measurable, achievable, relevant and timebound.

Targets are often termed 'levels of service' by water utilities and may include targets for water security, water reliability, water quality and waterway health. Additional targets can set limits for levels of nutrients in receiving waterways, stormwater runoff and sediment volumes. Targets can be set out in Environmental Planning Instruments and play a role in driving IWCM outcomes (refer to Step 8). Targets should be based on peer reviewed scientific analysis to ensure that they are fit for purpose and feasible.

Outcomes refer to the results that will be obtained by the IWCM project. IWCM outcomes include water security, water quality, public health, ecosystem health, environmental outcomes, urban amenity, liveability and resilience. IWCM projects should identify outcomes that will help achieve the project vision, and that extend beyond regulatory requirements to broader outcomes for environmental sustainability, productivity, liveability and resilience.

Objectives, targets and outcomes should be agreed and supported by community engagement, including with Traditional Owners. They should be designed with input from multidisciplinary experts, such as ecologists, hydrologists, urban planners, stormwater engineers, asset managers and other relevant experts, to ensure that targets match objectives and that outcomes drive positive benefits for project communities.

Stage 2: Create a supportive, enabling environment

5. Understand and comply with all relevant regulation, legislation, guidance and policies

IWCM proponents need to understand and comply with the requirements and expectations of regulators as reflected in relevant legislation and regulation. This includes regulatory requirements covering:

- Water quality standards and quality assurance programs
- Urban development standards
- Environmental standards
- Expected level of service standards.

- Key regulatory, legislative, guidance and policy to consider include:
- Environmental planning legislation and regulation
- Water management legislation and regulation
- Council local strategic planning statements
- Council Integrated Planning and Reporting Framework documentation, including the Community Strategic Plan
- NSW Government policies, including on housing, water management, land management, asset management and urban design
- Local Government policies, including on environmental sustainability, stormwater management and water sensitive urban design (WSUD).

IWCM proponents must develop a sound understanding of the regulatory environment to ensure that the IWCM project complies with all relevant requirements and standards.

Innovative IWCM projects may face regulatory challenges. The NSW Water Strategy recognises that a number of issues need to be examined and resolved regarding the regulation and governance of stormwater harvesting. IWCM proponents should engage early with regulators if they are uncertain about the regulatory settings that are relevant to their proposal to seek advice on best practice and on how to progress the project. The Recycled Water Roadmap also acknowledges that regulatory requirements are not currently uniform for recycled water – the Roadmap's implementation process aims to improve service to all proponents, water utilities and local councils with clear, transparent, fair and efficient processes.

IWCM projects over time will extend existing regulation and policy and create a more enabling regulatory environment.

6. Determine appropriate funding models

IWCM projects present unique funding challenges. There is often not a clear funding source available to achieve broader IWCM outcomes, particularly because IWCM projects' impacts and benefits are usually shared between multiple people and the environment. Therefore, it may be difficult to determine who should pay and how to best allocate project costs, risks and impacts in the short and longer term.

Project funding sources may include water utility charges, developer charges, stormwater management charges, council rates and levies and grants from local, state and federal government.

IWCM projects may require the development of new and innovative mechanisms to share costs, such as financial transfers between parties where there is misalignment between project impactors, risk creators and beneficiaries, and who can pay. Funding mechanisms need to be efficient, equitable and transparent, with the transaction costs of administering the funding flows minimised.

Project revenue should be raised based on the principle of environmental justice. Funding models should prioritise the raising of revenue from 1) impactors/ polluters 2) beneficiaries, and 3) a more even and/ or broader distribution for the sake of social equity. This funding hierarchy is efficient and transparent as it directs funding priority to those who create the risks and impacts first, and secondly to those who benefit from the project.

For example, applying beneficiary pays, developer charges may be collected upfront and held in a holding fund for ongoing financing of the operating and maintenance costs of shared assets, such as of open spaces and public WSUD assets that require ongoing upkeep for their benefits to endure. This could be suitable for greenfield urban developments that provide ongoing urban amenity to

residents where these benefits were reflected in the property prices that developers charged the new residents at sale.

IWCM proponents need to ensure funding models are enduring and can fund the lifecycle costs of IWCM project assets, including their ongoing operating and maintenance costs. For example, if an IWCM project involves the installation of WSUD assets, there needs to be adequate funding available for their ongoing maintenance and renewal.

7. Set up sustainable governance structures

IWCM projects often require organisations to work outside their authorised remit, particularly for highly innovative projects where responsibilities are unclear. Early engagement and well-designed governance structures will help resolve uncertainties at project outset and throughout the project and drive it towards its vision.

IWCM proponents need to bring relevant parties together, assign roles, responsibilities and accountabilities and garner commitment and resources to deliver the vision. IWCM projects often require multiple organisations to be involved that cover all aspects of the urban water cycle and who are responsible for strategic and operational decision-making related to the IWCM project.

IWCM proponents need to engage multi-disciplinary teams of experts to input into project design and delivery. At a minimum, the following expertise should be included in governance arrangements: urban planners, developers, economic regulators, environmental managers, water, sewer and stormwater managers, and flood managers. Planners and developers should be consulted early in the process to ensure planning and delivery challenges are addressed early.

A constructive leadership culture is necessary to support collaboration. Successful IWCM projects achieved to date have often involved individuals within organisations championing the project, particularly if there was no existing formal governance mechanism already in place to guide the project. It is important to design the governance model to be sustainable beyond the input of individual champions and to engage senior leadership within stakeholder organisations at the outset. Project governance may be through a steering group that would preferably have an independent chair, particularly for complex projects.

Champions need allies and early-adopters to deliver their vision. IWCM proponents should consider the projects strategic alignment with other policies, identify the political influences at play, and identify key allies and enablers of the project. A strategic approach can help garner early support and maintain project momentum throughout planning and delivery stages.

Governance tools and strategies include informal groups, committees, project working groups, technical working groups, data sharing agreements, legislated agreements, contracts and Memorandums of Understanding. Proponents may take on the various informal roles needed to ensure effective collaboration (for example, facilitator) or contract in these skills, as required.

8. Align water planning and land use planning

IWCM projects should consider how to integrate land use and water planning processes to complement and support achievement of the project vision, objectives and outcomes. It is important to have early coordination so that more innovative approaches to water management can be accommodated within land use plans and development proposals. The aim of this integrated approach is to ensure that IWCM project processes and their timing are aligned with those adopted by strategic land use planners at the start of the planning process, and with development assessment planners throughout the development assessment process.

Cross agency collaboration between water managers and land use planners is a critical step in the IWCM planning process. At a base level, water management information related to water availability and costs of upgrading and augmenting infrastructure should help in guiding where development can most feasibly be located. At a more advanced level, knowledge of water resources and systems (both constructed and natural) should positively influence urban development to be more responsive to the natural environment and move towards a 'water sensitive city' or landscape-oriented development approach.

IWCM requires early and meaningful integration between land use and water planning to ensure:

- alignment between land and water visions and objectives
- IWCM outcomes, such as those linked to waterway health targets, are achievable in an urban development area
- complimentary processes, so that projects are proposed at the appropriate scale and time
- consistency and coherence across scales (e.g. lot scale projects contribute to catchment scale outcomes)
- both processes are suitably flexible to change in the early stages of planning
- land use decisions are supported by robust water knowledge and data (including Traditional Owner knowledge)
- IWCM outcomes are embedded within planning tools and instruments.

Stage 3: Build skills, knowledge and capability

9. Build organisational and industry capability

Organisations and industry involved in IWCM projects should aim to build a continuous learning culture within their organisation. The organisational culture needs to be integrated and adaptive to changing circumstances and have a problem-solving focus. Over time this positive organisational culture will build skills and internal capabilities and improve IWCM project delivery assurance.

Capacity building is important because all organisations and individuals involved in IWCM are part of a long-term transformation toward a new way of doing things. Capability refers to the ability of an individual, group, organisation or system to deliver intended outcomes and capacity building refers to improving the ability of the individual or entity to perform.

IWCM requires organisations and industry to extend their understanding to consider broader issues and to develop new methods and practices. It requires proponents to develop their learning capacity, and to reflect, improve, test, trial and adjust.

The delivery of sustainability outcomes must shift from traditional infrastructure services and planning approaches to hybrid urban systems. Traditional infrastructure services are often designed to deliver a single service, which operate in silos, and have a single performance objective. Hybrid urban systems integrate different forms and modes of services to produce better overall outcomes for communities. They are hybrid in the sense that they may include both i. centralised and decentralised systems, ii. grey and green infrastructure, iii. social and technical interventions, iv. public, private and/or multi-level government investment and operation.

Capacity building activities help organisations and industry to improve their delivery of IWCM projects over time, learning how to manage new relationships, processes and types of infrastructure, and to develop new resourcing and funding approaches, tailored to local conditions.

Support for organisational champions, building cultural awareness, and city-to-city and town-to-town learning activities are proven mechanisms to build capability. IWCM proponents should consider First Nations employment and business opportunities. Pilot projects delivered within a monitoring, evaluation, reporting and improvement framework can also be useful.

New technologies are emerging to address important IWCM outcomes related to water conservation, flood protection and energy/ greenhouse gas emission targets. These technologies require new skills and capabilities. Research and investment are needed to develop technologies and systems and build local capability in industry for their effective design, implementation, and maintenance.

10. Empower communities

IWCM projects are enabled by 'water sensitive communities', who are literate in contemporary water issues, and are empowered to contribute. If the local community is informed and empowered to participate and contribute to the IWCM project, the project is more likely to be successful. Social equity is a key principle of IWCM. IWCM proponents should consider equity across their delivery of IWCM projects.

IWCM proponents should consider the communities relevant to the project, as identified in step 2, and assess their level of knowledge and capability to contribute to the project. Where there are identified gaps in knowledge and capability, these should be addressed with targeted engagement and capacity building activities.

IWCM proponents should develop community engagement activities that uplift community capability and empower the community to participate and contribute to the IWCM project. This should be done in the early stages of project planning and throughout the project. Empowered communities should also be involved in project closure and evaluation activities.

Activities to build community capability should focus on improving water literacy and understanding of an IWCM approach, and include building awareness of:

- the full range of uses of water across the whole of the urban water cycle in the local context.
- the range of IWCM benefits and outcomes that can be achieved by taking an IWCM approach compared with BAU or less innovative approaches.
- the range of costs and risks of taking an IWCM approach compared with BAU or less innovative approaches.
- the communities' role in setting IWCM project expectations.

IWCM projects may push the boundaries of community preferences. For example, in the past some recycled water projects have not proceeded due to community non-acceptance. While it is important to respond to community values, it is also important to seek participation from all sectors of the community – to engage with the silent majority as well as with vocal voices in the community. In some cases, the silent majority may have different values and opinions on project options and the IWCM outcomes they seek. In such cases, IWCM proponents should consider different forms of engagement with communities so as not to amplify some views over others and empower groups that do not represent the majority.

Overall, empowered and representative communities can be expected to positively contribute to achieving IWCM outcomes that reflect the needs and values of the local area and its environment.

Stage 4: Explore and deliver integrated and innovative solutions

11. All options on the table

Once the vision, objectives and outcomes of an IWCM project have been established a range of IWCM options should be developed. The IWCM options analysis process should be guided by the project's vision, objectives and outcomes, and ensure that all possible options are identified and considered, and an assessment undertaken of how well each option meets the project objectives.

The options analysis needs to be based on a sound understanding of the water cycle in the local context and ideally supported by a water mass balance analysis (quantification of all water flows, natural and anthropogenic, under at least two scenarios i.e. before and after the project). The options analysis should consider diverse water sources across the water cycle. Such an approach helps to identify the full range of potential options to deliver the best outcomes.

IWCM outcomes can be achieved by a range of structural (infrastructure) and non-structural options. An IWCM project option analysis should identify the range of potential fit for purpose water uses that may be available in IWCM project delivery, such as greywater recycling, rainwater harvesting, stormwater harvesting and treatment and recycled water for drinking. These options need to be designed according to their scale and density in relation to the existing area and neighbouring areas i.e. Is it an infill or greenfield development? Of what size? E.g. a single large commercial development? a 50-lot regional town precinct? a 200-lot regional centre development?

IWCM proponents should engage with multiple experts to consider and assess options. Relevant experts may include land use planners, urban designers, architects, landscape designers, stormwater engineers and other experts relevant to the local context. Multidisciplinary expertise is required to fully and comprehensively identify the available options to meet IWCM outcomes, including urban amenity, liveability and resilience.

Project leads need to consider how decentralised and centralised systems connect and ensure that they continue to function effectively once the IWCM project is introduced. Questions to consider include: Do the existing sewer and water treatment plants have sufficient capacity for the IWCM project? Do the existing water and sewer trunk mains have capacity for the IWCM project? Does the existing mains stormwater network have capacity or require upgrade? What new decentralised approaches to manage stormwater are possible?

Robust options analysis should consider existing and emerging risks, such as climate change and natural resource scarcity. Engagement processes to support options analysis should be participatory.

The aim of the IWCM project should be to maximise the benefits, including environmental and community benefits, of the project and ensure that any environmental impacts are acceptable to the environment and to communities, including Traditional Owners.

12. Sound decision making

Sound decision making for IWCM projects should be principle-based, evidence-based and apply best-practice decision-making tools and approaches.

Environmental law principles such as sustainable development, intergenerational equity, polluter pays, and the precautionary principle should be applied in IWCM project decision-making. Decisions should be ethical and reflective and should be justified from a range of perspectives. For example, economic, environmental, delivery risk, affordability, and best-for-community. Good decision-making

is enabled by a sound regulatory framework, effective governance and by a participatory process that draws on all relevant expertise.

Decisions should be delivered under an agreed decision-making framework that includes broad framing, tests assumptions, identifies constraints, transparently evaluates trade-offs, is non-biased and objective, systemises ways to manage risks and decision gridlock, and includes periodic re-evaluation.

Establishing an agreed decision-making framework early in the IWCM project is important. It ensures that all decision-makers have a common reference for decision-making at project outset and helps keep the project on budget and on track. Periodic reflection enables decision-makers to diagnose mistakes, identify unintended consequences, input new information, and redirect the project as necessary.

IWCM proponents should make use of best-practice decision-making support tools that apply quantitative and/ or qualitative analysis. These tools are typically designed to justify the need for the project against its base case (without the project), by demonstrating its benefits outweigh its costs, and to help identify the preferred project solution that stakeholders, customers and communities are willing and able to pay for.

Tools should be chosen in accordance with the scale of the project and its costs, benefits and risks. For larger projects that require significant investment, the project and its preferred solution should be justified in relation to its quantified costs and benefits in accordance with best-practice economic approaches, such as cost benefit analysis (CBA). CBA is the preferred method for appraising the economic, social, environmental and cultural value of all government policies and proposals. The NSW Government Guide to CBA should be referred to when developing IWCM projects.

Where quantitative economic approaches are not cost-effective or feasible, qualitative approaches can be applied, such as desktop research on impacts and community engagement activities e.g. surveys.

Environmental economics decision-making approaches can assist IWCM project decision-making. Environmental economics is a sub-discipline of economics that provides frameworks and tools to incorporate the environment in decision-making. It provides techniques to value natural resources and to enable understanding of the trade-offs between environmental costs and other benefits. IWCM proponents should consider whether environmental economic methods can be effectively applied to help analyse and make IWCM project decisions.

13. Adaptive planning and implementation

An adaptive planning and implementation approach helps to manage the risks and uncertainty often inherent to the operating environment for IWCM projects. Risks involve known probabilities and measurable outcomes, while uncertainty deals with unknown probabilities and unpredictable outcomes. For example, climate change is a known risk, but its impacts are uncertain.

IWCM projects often involve doing things that are innovative and haven't been well-trialled before. Therefore, it is necessary to plan upfront to be adaptive. The innovative nature of the project may also have implications on timeframes (e.g. might need to test first) and resourcing (e.g. might need to train staff). For IWCM projects there is a need to set expectations more clearly from the beginning, as expectations may need to be tempered as the project is trying to do new things.

IWCM proponents should take particular care to design methods into the project for managing key risks and uncertainties. Project planning processes should include building understanding of project

risks and uncertainties and deciding what aspects are, and are not, available for compromise i.e. what are the project's non-negotiables?

IWCM projects need to apply an iterative and adaptive process that can respond to changes, such as climate and other risks; changes in population and/or demographics; changes in customer preferences for urban water cycle outcomes; and changes in resource recovery and water efficiency-related actions.

Adaptive planning works by establishing and testing a new way of working, monitoring what happens, and adjusting the next phase of activity to incorporate any lessons learnt. It is useful for:

- improving future planning, design and construction approaches
- information and knowledge sharing with industry
- confirming how constructed assets perform compared to modelled estimates
- learning how to best adapt in terms of future design
- applying similar designs in different locations or under different conditions.

Adaptive planning also relies on monitoring and evaluation that can guide how to continually improve approaches and processes.

While being adaptive, the project's vision, objectives and outcomes should be consistent throughout. Otherwise, the project risks under-delivering and only retaining the façade of having an IWCM approach.

A clear project plan supported by a detailed implementation plan provides the foundation for project delivery success. The project plan and implementation plan should identify and consider interdependencies and related projects so that critical paths and adaptive planning options can be developed.

Stage 5: Monitor, evaluate and learn

14. Ongoing monitoring, evaluation, enforcement and reporting

Monitoring and evaluation of an IWCM project refers to:

- the monitoring and evaluation of the IWCM project itself
- understanding and ensuring the ongoing performance of IWCM assets in delivering IWCM outcomes once the project has been implemented.

Monitoring and evaluation are important to be able to understand the timing and resources required to implement an IWCM program and for other aspects, such as monitoring the buy-in and contributions of project stakeholders. Monitoring, evaluation and reporting plans should establish indicators that are directly related to the project's key outcomes and targets/ levels of service, and that can be measured and monitored on a regular basis e.g. annually.

The implementation of IWCM projects requires a systematic approach to checking that adopted IWCM technologies continue to comply with their intended project performance standard. The compliance and ongoing performance of many IWCM projects is often poor. IWCM assets may not be properly installed at the outset and may not be maintained in a manner that keeps them fully operational and able to achieve planned IWCM targets and outcomes on an ongoing and enduring basis. For privately owned IWCM technologies, such as WSUD systems, the community and industry may have legal obligations for compliance. For larger projects, local council or state agency may have legal responsibilities to comply with regulated responsibilities.

Compliance should be complemented with education programs. It is important that enforcement activities are carried out and that there are corrective mechanisms in place for non-compliance with IWCM targets, and with regulated standards and legal obligations.

IWCM proponents should investigate opportunities to include mandatory reporting requirements into project design and, where appropriate, establish an owner reporting approach. This is particularly important for the maintenance of WSUD infrastructure.

15. Reflect, learn, engage and challenge

Given the risk inherent in IWCM projects that trial new approaches and technologies and differ from well-established BAU, it is crucial for IWCM proponents to build a continuous learning culture. Organisations need to develop formal systems to learn from their trials and failures. This should include periodic reflection activities that reflect on project performance, identify any broader and/or unintended impacts of the IWCM project and find ways to solve problems.

The reflection should encourage project proponents and project communities to ask broader and bigger picture questions. For example, that examine the potential impacts of the project on other aspects of urban sustainability and resilience. (e.g. waste, energy, housing). Such practices will build an enabling environment for IWCM to grow in maturity over time.

IWCM needs to be supported by multidisciplinary teams of experts who can cross-pollinate learning within and between individuals, organisations, industry, and to other spheres of influence such as to leading urban developers, and to financial and political players.

As societal values shift, and other disciplines and sectors are also guided by similar integrated management principles, IWCM should become the BAU approach to managing water. With maturity, water management will join up with other holistic approaches to managing natural resources. Circular economy approaches will become mainstream, and cities and towns will become more sustainable and resilient to climate risks and urban growth.