

Urban water planning framework and guidelines

OCCASIONAL PAPER 29: CASE STUDIES

MARCH 2014



WATER SERVICES
ASSOCIATION OF AUSTRALIA



CASE STUDY : ACTEW Water Climate Risk Modelling

Example climate risk modelling and scenarios to provide for resilience and adaptability

Reference : ACTEW Water

Sustainable Water Supply Planning in the Australian Capital Territory: Choosing Future Climate Scenarios

Drivers

- Climate variability, including increased frequency of extreme events and changes to seasonal rainfall / runoff
- Millennium drought posing threat to water security and severe restrictions
- Price regulator requirement to demonstrate robust planning to support investment decisions including a wide range of scenarios
- Industry practice including COAG and productivity commission reports driving a more flexible and adaptive planning approach to water security

Purpose

Planning for climate scenarios that minimise the spread of uncertainty and manage risks of extreme dry and wet weather.

Key Innovation

The adoption of climate scenarios and a stochastic data approach since 2004 was a shift from a reliance on historical data.

Recently updated stochastic data including:

- 13 rainfall and evaporation sites
- Improved generation technique (EMD)
- Longer period of record
- More replicates (1,000 v 200)

Developed four scenarios from SEACI models including Wet; Median; Dry and a scenario representing the millennium drought.

Development of 'in-house' climate scenario templates to analyse climate stochastic data for the ACT and impact on rainfall, run-off and demand.

Modelled impact on dam inflow projections and storages as well as implications for restrictions (stage 1 - 5)

A net economic benefit assessment assessed the benefit of avoiding restrictions compared to the cost of improved water supply security.

The climate scenarios informed the urban water security program that included a portfolio of demand and supply options, a water security plan including triggers for action and adaptive implementation.

Outcome

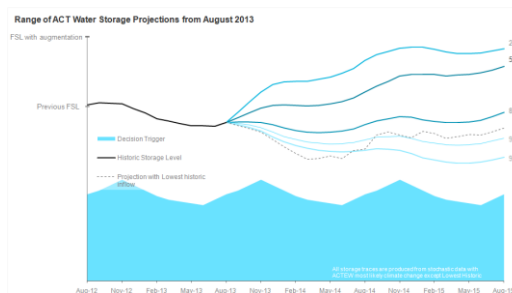
The climate scenario analysis resulted in an investment in water security projects, including the upgrade to the Cotter Dam. Although water storages and annual rainfall have improved, there is an ongoing seasonal trend resulting in lower autumn rainfall and run-off.

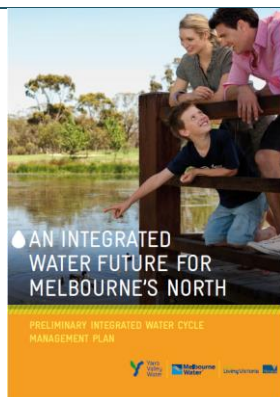
The planning tool will continue to evolve and templates can be adapted to accommodate updates to climate data and climate scenarios e.g. to align with the ACT government and Murray Darling Basin scenarios.

Lessons Learned

The water supply-demand planning process is now part of a regular and ongoing process that allows for a flexible and adaptable approach to planning and investment in response to triggers.

Increased stakeholder engagement and collaboration will improve ownership and acceptance of the climate data and scenarios.





CASE STUDY : An Integrated Water Future for Melbourne's North – Preliminary Integrated Water Cycle Management Plan

Example of Inter-agency cooperation to achieve IWCM outcomes

Reference : Yarra Valley Water | Melbourne Water | Office of Living Victoria

<https://www.yvw.com.au/yvw/groups/public/documents/document/yvw1003862.pdf>

Drivers

- Growth in northern corridor creating at least 90,000 new residential homes and 1,050 ha of employment land
- Integrating urban and water planning
- Increasing use of alternative water sources to reduce pressure on drinking water supplies

Challenges

- Existing infrastructure is remote from the area
- Enhance public health and liveability values whilst protecting of ecologically threatened frog populations in Merri Creek

Purpose

To identify integrated water cycle management opportunities that minimise the impacts of urban development on the area's environment and water cycle.

Key Innovation

This preliminary study analysed options using an inter-agency approach including Yarra Valley Water ,Melbourne Water and Office of Living Victoria.

Five high level options were assessed including:

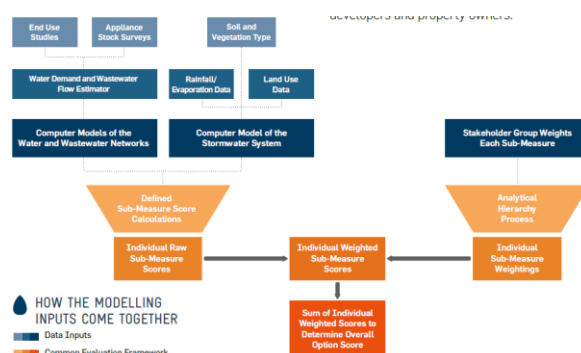
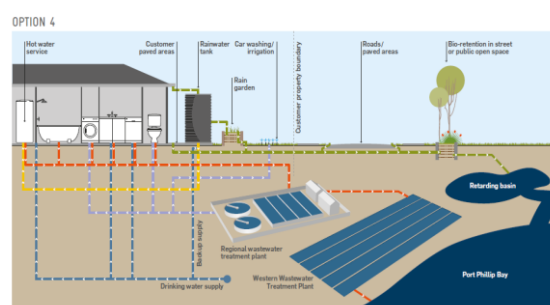
- Traditional option
- Recycled water option
- Integrated Options including management of issues associated stormwater run-off and frequency

A common evaluation framework with 12 sub-measures was developed to assess options against the shared vision. The framework was peer reviewed by a panel of experts and stakeholders were engaged in the assessment of weightings and sensitivity analysis.

Tools included

- Water demand and wastewater flow estimator
- Water and wastewater network models
- Stormwater models
- Financial models

A Community Value Ratio tool was developed to measure the value of 'bang for buck' for a unit of environmental benefits



Outcome

Impacts were measured comparing water use, wastewater discharges, nitrogen discharged, stormwater quality and run-off volumes / frequency, groundwater flow and costs.

The recycled water options were more cost -effective due to avoided cost of a large diameter wastewater tunnel. The community value ratio improved the outcome of the options incorporating stormwater and recycled water by valuing the environment and liveability benefits – the additional community cost of additional environmental and liveability benefits are in the order of NPV \$149 - \$393M and need to be tested with the community using willingness to pay research and comparison of avoided costs.

Lessons Learned



CASE STUDY : SEQwater Catchment Valuation

Example of evaluating economic value of ecosystem and recreational benefits.

Reference : SEQ Water

Drivers

- Provide direction for future management of all Seqwater land and water supply catchments
- Identify actions that will maximise the treatment capacity of the natural assets to achieve a water quality outcome.
- Understand the multiple benefits that flow from land e.g. reduced water treatment costs, enhanced recreational opportunities, scenic amenity and biodiversity.
- Identify management levers.

Purpose

Quantify economic value of catchment land, management levers and multiple benefits of catchment land management.

Key Innovation

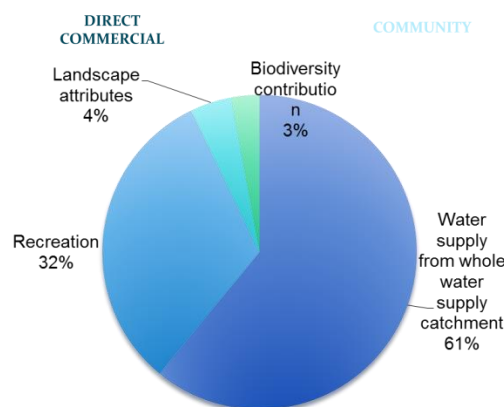
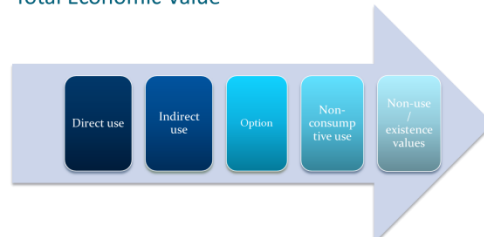
A Total Economic Value framework has been used to identify the most effective activities that Seqwater can undertake relating to catchment land management. The analysis:

- Estimated the economic value of benefits attributable to catchments (base case)
- Assessed the benefits, costs and efficiency of additional interventions and investments (incremental benefits)

Key points to note from the analysis are:

- Avoided production costs would be \$161M (60% operating costs) if the raw water supply had to be replaced with an alternative (manufactured) source.
- The benefit of quality catchment water underlines the importance of proactive catchment management to manage risk
- Recreational values of \$84M derived from third parties using Seqwater assets.
- There are also significant landscape attributes i.e. scenic amenity (\$11 million) and biodiversity values (\$8 million) within the catchments.
- Seqwater's operating expenditure on catchment management and water quality monitoring equates to just 1.5% of its total cost structure and recreation infrastructure 0.5%.

Total Economic Value



Outcome

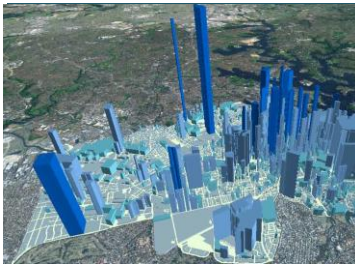
The strategy provides guidance on actions including region wide matters such as:

- Maximise catchment value (annual benefit from catchments)
- Base spatial information
- Science and knowledge gaps
- Planning and policy matters
- Stakeholder engagement
- Community awareness and education
- Staff training and awareness

Insights gained from the economic model, risk assessment and stakeholder engagement were used in development of strategic actions and management levers. Management levers included the sale and acquisition of land and rights, on-ground actions, planning and policy levers and stakeholder engagement.

Lessons Learned

As actions move through the cycle from strategy to planning to business case development they are subjected to rigorous examination by the Queensland Government on behalf of our customers. Valuing ecosystem services has helped Seqwater to determine who the beneficiaries are and therefore who should pay. Where there are shared benefits it informs what an equitable split might be.



Decentralised Water Master Plan 2012–2030

CASE STUDY : City of Sydney Decentralised Water Master Plan 2012 - 2030

Example of spatial analysis of supply and demand and WSUD opportunities to inform public and private investment

Reference : City of Sydney, 2012

http://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0005/122873/Final-Decentralised-Water-Master-Plan.pdf

Drivers

- Sustainability 2030 Vision incorporating sustainability and liveability objectives
- Green Infrastructure Master Plan including water, energy and waste solutions
- Provide data and cost-benefit assessment to inform future council, government and private investment

Purpose

- Reduce mains water consumption by 10% through water efficiency
- Reduce council mains water consumption by 10% through efficiency and park or precinct scale non-potable water supplies
- Replace 30% of mains water demand with recycled or alternative non-potable water generated from local water resources
- Reduce sediments and suspended solids by 50% and nutrients by 15% discharged to waterways from stormwater

Key Innovation

Project included an evidenced based approach to analyse opportunities across the water cycle incorporating:

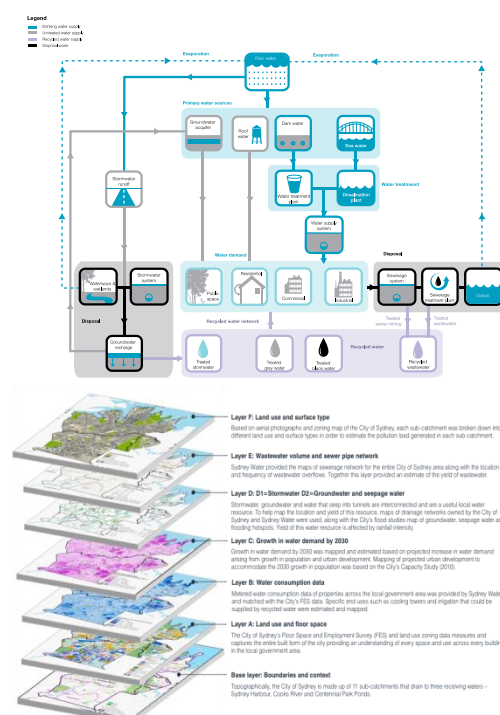
- Combined water consumption and floor space data to analyse existing consumption uses
- Comparison of current (2010) and future (2030) consumption data incorporating projected growth including major precincts and infill development
- Use of GIS and land use data to analyse opportunities at a receiving water (Sydney Harbour, Cooks River, Centennial Park) and sub-catchment level
- Used good and best practice benchmarks to analyse water efficiency opportunities by sector
- MUSIC modelling by sub-catchment to identify opportunities to reduce pollution through redevelopment, renewal, retrofit and recycle, re-use opportunities
- Multi-criteria assessment of over 300 opportunities, and levelised cost analysis of prioritised opportunities
- Case Studies and Concept Plans developed for priority options

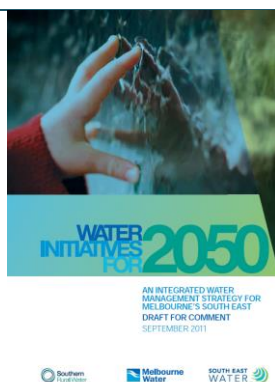
Outcome

The Master Plan was made available for public exhibition to receive community feedback before it was adopted. The analysis will be used to inform short, medium and long term planning including engagement with Sydney Water, developers and other private service providers.

Lessons Learned

The City of Sydney has different drivers to a water utility and has a vision that more explicitly embraces sustainability and liveability objectives. The report demonstrates the broader menu of options that need to be considered under broader objectives and provides valuable data and analysis to inform public and private investment in decentralised solutions. These may not be least cost options, but they represent a suite of options that align with a vision for the future of the city, and the added value that may be found for development that wishes to stand apart in a competitive international economy.





CASE STUDY : Water Initiatives for 2050

Example of Inter-agency cooperation to achieve IWM outcomes and influence land use planning

Reference : South East Water | Melbourne Water | Southern Rural Water

Drivers

- Population growth from 1.2M to 2.5 Million by 2050
- Climate and rainfall uncertainty
- Cost of living pressures
- Community desire for increased water efficiency, lot-scale and localised solutions
- Important environmental features include wetlands, waterways and marine parks which drain into Port Phillip and Westernport catchments
- Upgrades to Eastern Treatment Plant and local treatment plants will facilitate investment in recycled water use
- Moving from energy efficient to energy intensive water and wastewater solutions

Purpose

Vision – A community working together to manage water wisely to support a vibrant and thriving region.

Themes – Productive | Liveable | Sustainable

Key Innovation

Strategy is focussed at the precinct and allotment scale and included a high level of engagement between project partners and stakeholders using the IAP2 principles of engagement. The 25 member stakeholder reference group met monthly to discuss and deliberate on key elements of the strategy. This was followed by a public exhibition of the draft strategy.

Land use characteristics were used to divide the area into four zones. The south-east metro zone includes four sub-zones.

A tailored package of initiatives was tailored for each zone based on small, medium and large change scenarios. The analysis measured impact of the package of initiatives for each zone on supply volumes, greenhouse gas emissions, nutrients to water ways as well as environmental outcomes for environment flows, wetlands, groundwater systems and WSUD.



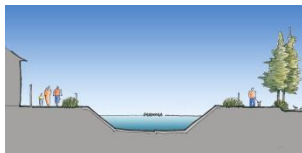
Outcome

The strategy included six recommendations and actions relating to:

- Delivery of initiatives
- Water policy and planning
- Innovation and incentives
- Research and development
- Collaboration
- Implementation

Lessons Learned

- IWM is about managing multiple objectives – setting clear unambiguous objectives that cascade to the assessment criteria and strategy is critical
- Integrated planning requires collaboration with stakeholders representing extensive interests
- Methodology to bundle initiatives into packages was innovative but complex to assess and communicate



CASE STUDY : Cooks River Naturalisation

Example of an alternate approach to concrete channel renewal and multiple stakeholders working in partnership to maximise community benefits.

Reference : <http://www.sydneywatertalk.com.au/crbnp/>

Drivers

- Renewal of deteriorated concrete river banks
- Strong community and stakeholder desire to rehabilitate the Cooks River



Purpose

Renew deteriorated concrete riverbanks, in a way that ensures the structural stability of the banks and maintains the hydraulic capacity of the river whilst also improving its ecological, aesthetic and social values.

Key Innovation

The replacement of steep concrete riverbanks with gently sloped banks stabilised with sandstone and native plants.

The partnership model adopted for the project with key stakeholders such as local councils and community groups.



Cooks River before naturalisation



Cooks River after naturalisation

Outcome

- A joint funded flood study, up to date flood model and a strategic masterplan of opportunities for naturalisation along the entire river available to all parties
- Construction commenced to replace 1.1km of deteriorated concrete riverbank across three sites along the river
- Designs have been able to expand into non Sydney Water Land allowing significantly improved ecological and social outcomes at limited additional cost
- The joint funded construction of the Cup and Saucer Creek wetland as part of the naturalisation designs for one site <http://www.sydneywatertalk.com.au/crbnp/2013/03/19/cup-and-saucer-wetlands-informational-video/>
- The inclusion of social amenities including cycle and walking paths, seating, viewing areas and interpretive signage, to be owned and managed by councils
- Relationships formed during the project have led to coordinated ongoing river management



Cup and Saucer Creek Wetland

Lessons Learned

- Collaborative partnerships resulted in significant stakeholder buy-in including financial and in-kind contributions toward the project
- With good design, and at relatively little additional cost, social and environmental outcomes can be greatly improved
- A shared long term vision enables the 'tyranny of small decisions' across many stakeholders to converge towards desired outcomes.

CASE STUDY : Wet Weather Overflow Strategic Framework

Example of regulator engagement and outcome based regulation

Reference : Publicly available in 2014

Drivers

- Expectations to invest more with a poor understanding of customer value and waterway benefits
- The relative contribution of overflows and stormwater to urban water quality is not well understood
- Perceived bias towards swimming areas over environmentally sensitive sites
- Meeting existing frequency targets was considered unaffordable

Purpose

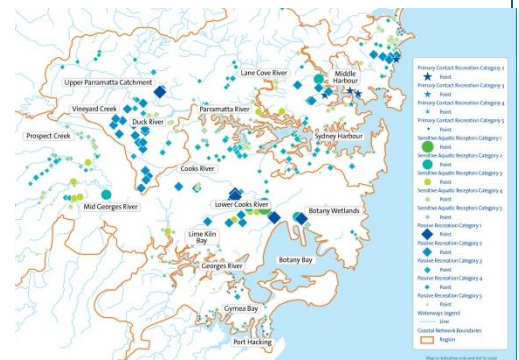
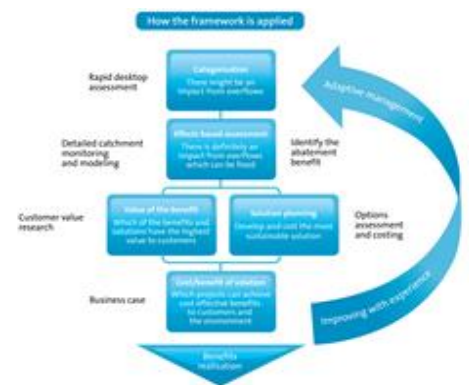
Develop an affordable and transparent framework for outcome based regulation of wet weather overflows from major wastewater systems.

Key Innovation

Overflow frequency targets now drive large and expensive containment solutions. Continuing to apply frequency targets across all wastewater systems will cost several billion dollars and have significant community impacts from construction, and the size and location of works.

A new framework was developed to better understand the drivers of urban water quality to target future investment in wet weather overflow abatement. The new framework includes:

1. **Categorisation** – a rapid desktop assessment to identify priority catchments
2. **Effects based assessment** – detailed monitoring and modelling to confirm the magnitude and source of impacts
3. **Community value research** – To enable investment to be directed to areas with the highest community value (including the environment)
4. **Solution planning** – Options assessment and costing to identify the most sustainable solution
5. **Cost/benefit analysis** – Determine which solutions can achieve a cost effective benefit to the community and the environment



Outcome

This new approach has led to a number of improvements:

- Improved regulator engagement and more constructive relations
- Greater transparency of priorities to improve aquatic recreation, sensitive environmental areas and amenity
- Clusters of problem areas can be managed simultaneously
- Capital solutions directed to areas where there is certainty about water quality impacts and improvements
- Collaborations with state government and council water cycle managers Environmental and community benefit of expenditure will be more certain
- Separating categorisation and solution planning allows the highest priorities to be identified regardless of the cost to fix them
- There is greater flexibility around solutions that address waterway outcomes rather than frequency is not solely containment/storage but treatment, water sensitive urban design and source control.

Lessons Learned

- Involving the regulator throughout the development of the framework allowed a number of refinements to ensure expectations were understood and addressed, and built confidence in the approach.
- Challenging existing regulatory approaches can lead to better customer and environmental outcomes.
- Collaboration is required to drive effective solutions.