

Water Sensitive Cities Benchmarking and Assessment

Tāmaki Makaurau - Auckland



Water Sensitive
Cities Index

Document Title

Water Sensitive Cities Benchmarking and Assessment: Tāmaki Makaurau – Auckland

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Executive Summary

Tāmaki Makaurau - Auckland has been on a long journey towards becoming a water sensitive city. The three great harbours and numerous waterways of the “city of a thousand suitors” supported a rich diversity of Māori peoples and visitors who relied on a close partnership between humanity and nature. Over a century of colonisation and development has given rise to New Zealand’s largest city with a regional population of over 1.7 million people and an area within the rural/urban boundary of over 920km².

Towards the end of the 20th century, and into the 21st, there were some signs of a change in council approach to management of water. The Resource Management Act 1991 and development of Regional Plans and guidance, for example, signalled a shift of focus from continued modification of the urban water cycle towards protection and enhancement. The Auckland local government amalgamation in 2010 also provided opportunities to integrate activities at the regional and local council levels.

Completing the Water Sensitive Cities (WSC) benchmarking is another step on the journey towards greater outcomes for water in Tāmaki Makaurau – Auckland.

Water sensitivity is characterised by adaptive, multi-functional infrastructure and urban design that operates as part of the water system. The Co-Operative Research Centre for Water Sensitive Cities has developed a Water Sensitive City’s Index and benchmarking tool to assess a city’s progress towards greater water sensitivity. Benchmarking is conducted through a collaborative, democratic process of voting from 1-5 against 34 primarily qualitative indicators grouped under seven goals for water sensitivity as noted in Figure One.



Figure 1. Seven Goals of a Water Sensitive City.

To support the development of an Auckland Council water strategy, benchmarking was conducted on October 12th and 13th, 2021 following data collection and an on-line pre-survey. Due to Covid-19 public health restrictions, the benchmarking was conducted on-line in two full-day workshops. Participants were drawn from departments across the Auckland Council Group responsible for water management and planning. Participants engaged in information sharing ahead of the benchmarking sessions. Across the benchmarking sessions, 43 experts reached consensus on each of the 34 WSC indicators.

Auckland Council has accepted that the Water Sensitive Cities framework is not entirely fit-for-purpose for Auckland. This is because it does not account for the Te Tiriti relationship and context of Aotearoa - New Zealand, or Tāmaki Makaurau - Auckland. Therefore, a parallel process to the Water Sensitive Cities benchmarking has been established whereby the Tāmaki Makaurau Kaitiaki forum have partnered with the Auckland Council Environment and Climate Change Committee (via te Pou Taiao, the Environment Subcommittee) to develop a mana whenua-led framework.

As of writing, this mana whenua-led framework is currently under development. It is intended that, in time, findings from the WSC benchmarking would be viewed alongside those from the mana whenua-led framework.

The Water Sensitive Cities framework envisages six city states in a continuum from “water supply city” at the centre outwards to “water sensitive city” (Figure 2) moving through addressing basic needs to achieving higher outcomes of productivity, liveability, sustainability and resilience. Tāmaki Makaurau - Auckland performs very well in attainment of water supply (red), sewerage (orange) and waterway city (light green) status as defined by the framework. Full attainment of a drained city (yellow) has not been achieved given the movement in recent years to a waterway city focus, further flood protection work has the opportunity to adopt a multiple benefit approach in meeting drainage needs.

Tāmaki Makaurau - Auckland's current journey lies in the water cycle city phase, where limits on natural resources are driving diverse fit-for-purpose sources, end-use efficiency and the restoration of waterway health. Progress against all goals and indicators of the framework will support future water sensitive city attainment.

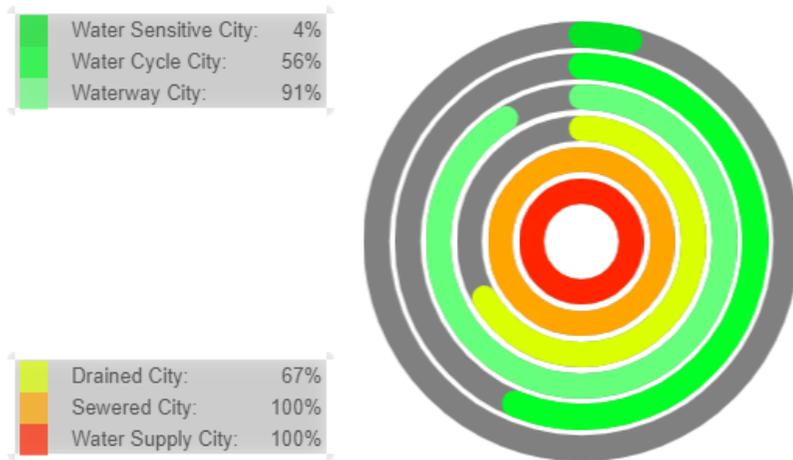


Figure 2. Benchmarking Results for Tāmaki Makaurau – Auckland.

The goals benchmarked as meeting water cycle city standards include:

- Ensure good water sensitive governance.
- Promoting adaptive infrastructure.

- Improving productivity and resource efficiency.

The benchmarking results highlighted key areas where improvements can be made towards water cycle city attainment. These include the following indicators for the remaining four goals:

Increase community capital;

- water literacy,
- shared ownership, management and responsibility of water assets, and
- community preparedness and response to extreme events.

Achieve equity of essential services;

- equitable access to flood protection, and
- equitable and affordable access to amenity values of water related assets.

Improve ecological health;

- healthy and biodiverse habitat,
- surface water quality and flows,
- groundwater quality and replenishment, and
- protect areas of high ecological value.

Ensure quality urban space;

- urban elements functioning as part of the urban water system, and
- vegetation coverage.

Achievements are being made across the WSC Index Outcomes of productivity, liveability, sustainability and resilience with slightly stronger outcomes against liveability and productivity.

The WSC Practices of valuing water and managing on a catchment basis are strong in Tāmaki Makaurau – Auckland, with opportunity to further harvest stormwater, rainwater and re-use greywater and wastewater to deliver a wide range of benefits. The state of urban ecosystems needs to improve.

A comparison with a selection of other cities that have completed the benchmarking is available. An example comparison with four other cities is included in Figure 3. This shows Tāmaki Makaurau – Auckland is part of an international community of benchmarked cities with varying progress towards a water sensitive city attainment and areas where sharing experience and learnings would be beneficial. This city comparison

illustrates that Auckland is currently performing better than both Sydney and Cape Town across the combined WSC goals but is behind both Melbourne and Perth.

A 15-point action plan (Figure 4) is offered by the providers drawing together insights from the benchmarking process for consideration within water strategy development. The action plan is set out within three transition pathways of enabling structures, on-ground practices, and socio-political capital. This aims to build on the journey to date with increasing leadership, engagement, and funding commitment to move towards a more water sensitive Tāmaki Makaurau - Auckland.

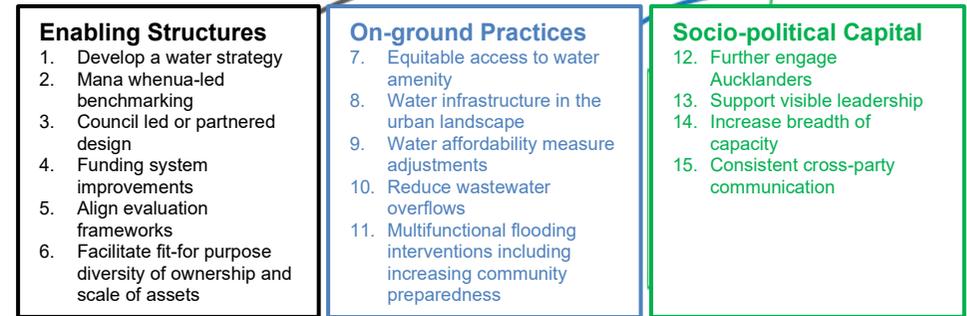
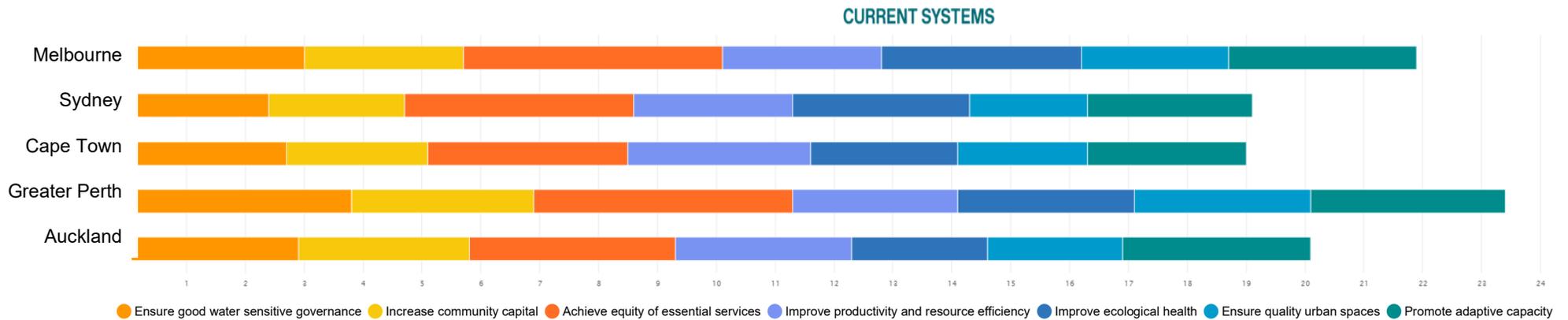


Figure 4. Transition Pathways to Improve Water Sensitive Practices and Deliver Water Sensitive Outcomes.



1. Introduction

Water sensitive cities are cities where water system services are optimised to enhance the liveability, sustainability, productivity and resilience of the city. Water sensitivity is characterised by adaptive, multi-functional infrastructure and urban design that operated as part of the water system. Citizens are involved in planning and decision making and can participate in service delivery individually and collectively. Large scale, centralised infrastructure is integrated with small scale, decentralised infrastructure.

The concept of a water sensitive city is increasingly recognised as a means to support aspirations around liveability and community health and wellbeing as well as to reflect the increasing regulatory and non-regulatory drivers from central government down. Central to this is the increasing recognition of the importance of Te Mana o te Wai in the National Policy Statement – Freshwater and the imperatives to reflect Te Mauri o te Taiao in future strategic planning on the built and natural environment.

The Co-operative Research Centre (CRC) for Water Sensitive Cities is an Australian led program which has funded over \$120M of applied research into the interconnected social, economic, design and environmental aspects of transitioning towards more water sensitive outcomes. As part of this the program has developed a standardised benchmarking methodology and tool to evaluate how cities are progressing which has been applied at a city scale across Australia, and parts of Asia, Europe, Southern Africa and USA.

This methodology is based on a collaborative and engaged process whereby input from a diverse range of stakeholders and partners, who are instrumental in shaping our cities, can support facilitated discussion and qualitative appraisal against a suite of indicators relating to land-use, infrastructure, natural environment and community understanding. This can then support an easily understood evaluation against a wide range of urban performance metrics and start to map out areas of focus to improve or expand on current activities.

The indicators relate to 7 goals:

- Ensure good water sensitive governance
- Increase community capital
- Achieve equity of essential services
- Improve productivity and resource efficiency
- Promote adaptive infrastructure
- Improve ecological health
- Ensure quality urban space.

Tāmaki Makaurau – Auckland is New Zealand largest city and home to a regional population of over 1.7 million people and an area within the rural/urban boundary of over 920km². Auckland Council Group was formed in 2010 by the amalgamation of the Auckland Regional Council and seven local government councils. This included the formalisation of Council Controlled Organisations (CCO's) including Watercare Services Ltd (Watercare), Auckland Transport and Eke Panuku Development Agency. Watercare owns and manages the water and wastewater networks whilst Auckland Transport own the stormwater networks draining the road and Auckland Council owns the remainder of stormwater networks and manages the stormwater network.

The Auckland Council chose to undergo the WSC index process to take a holistic and integrated look at the region with regards to how it is tracking on its journey towards a more water sensitive position. This is intended to build on the significant investment and change in practice that has occurred over recent years driven by constituent local councils prior to amalgamation and more recently via Auckland Council, CCO's and the community.

This benchmarking process sets a baseline for Tāmaki Makaurau – Auckland which is intended to feed into the development of Auckland's Water Strategy by the Auckland Council Group. This strategy will elaborate on the Auckland Plan 2050. The Auckland Water Strategy intends to set a clear strategic direction to the council group and their activities to support the vision of "Te mauri o te wai o Tāmaki Makaurau - the life supporting capacity of Auckland's water is protected and enhanced".

This report sets out Auckland’s benchmarking results as a baseline understanding for Auckland Water Strategy development.

It is noted that the CRC for Water Sensitive Cities undertook an earlier benchmarking process for Auckland Council’s stormwater management in 2014. This preceded the development of the current benchmarking framework and process, however served as an important pilot in the development and testing of the WSC index and a context point on Auckland’s journey towards water sensitivity. This study reported in

Auckland Council Technical Report 2014-007 benchmarked Auckland’s stormwater management in a waterways city phase in aspiration, policy and individual project examples but still within a drained city phase in on-the-ground practice



2. WSC Index Tool

Many cities and towns face pressures of climate change, population growth and rising urbanisation. Water Sensitive Cities recognise the fundamental importance of managing water resources and water systems services to enhance a city’s liveability, resilience, sustainability and productivity. Less clear is how an individual city or municipality can understand its current performance, and how water can contribute to these outcomes.

To address this gap, the Co-operative Research Centre developed the Water Sensitive Cities (WSC) Index, to help cities measure their performance and identify where they may improve their water sensitive practices. The Index is a functional, reliable and scientifically robust tool for benchmarking areas against 34 indicators (Figure 6) that characterise a water-sensitive city. It has undergone two years of testing and validation with industry partners, supplying reliable evidence to use in seeking project funding or approval, and to track progress over time. Over 65 cities have completed the WSC benchmarking process so far.

The indicators relate to seven goals noted in Figure 5:



Figure 5. Seven Goals of a Water Sensitive City.

An accredited provider presents and explains the index during workshops, bringing together experts, professionals and other interested groups. Workshop participants typically include representatives from councils, water authorities, state government agencies, developers and peak bodies. The workshops allow participants to start developing the collaborative relationships necessary to bring about real change.

These workshops ensure that participants think about water-sensitive cities concepts and principles in the same way. Participants start by scoring an indicator individually, and then discussing their scores as a group, allowing participants to present their perspectives and ask questions of each other. All participants then agree on a final score for each indicator. The index then translates these final scores into several measures of city status, to show the city’s progress towards greater water-sensitivity. In this way, the index helps participants identify what the city needs to improve.

The provider prepares a benchmarking and assessment report, which presents comprehensive results. This report also summarises the workshop discussions and the evidence supporting the ratings. The benchmarking results are also available on a web interface.

1. Ensure good water sensitive governance	2. Increase community capital	3. Achieve equity of essential services	4. Improve productivity and resource efficiency	5. Improve ecological health	6. Ensure quality urban space	7. Promote Adaptive infrastructure
1.1 Knowledge, skills and organisational capacity	2.1 Water literacy	3.1 Equitable access to safe and secure water supply	4.1 Benefits across other sectors because of water-related services	5.1 Healthy and biodiverse habitat	6.1 Activating connected urban green and blue space	7.1 Diverse fit-for-purpose water supply system
1.2 Water is key element in city planning and design	2.2 Connection with water	3.2 Equitable access to safe and reliable sanitation	4.2 Low GHG emissions in water sector	5.2 Surface water quality and flows	6.2 Urban elements functioning as part of the urban water system	7.2 Multi-functional water system infrastructure
1.3 Cross-sector institutional arrangements and processes	2.3 Shared ownership, management and responsibility of water assets	3.3 Equitable access to flood protection	4.3 Low end-user potable water demand	5.3 Groundwater quality and replenishment	6.3 Vegetation coverage	7.3 Integration and intelligent control
1.4 Public engagement, participation and transparency	2.4 Community preparedness and response to extreme events	3.4 Equitable and affordable access to amenity values of water-related assets	4.4 Water-related commercial and economic opportunities	5.4 Protect existing areas of high ecological value		7.4 Robust infrastructure
1.5 Leadership, long-term vision and commitment	2.5 Indigenous involvement in water planning		4.5 Maximised resource recovery			7.5 Infrastructure and ownership at multiple scales
1.6 Water resourcing and funding to deliver broad societal value						7.6 Adequate maintenance
1.7 Equitable representation of perspectives						

Figure 6. Seven Goals And 34 Indicators of A Water Sensitive City

2.1. Rating Process

Evidence Base Inputs Gathering

In the preparation of the rating process, facilitators met with representatives from different departments across the Auckland Council Group to introduce the WSC Indexing process and indicators, and guide participants on the requested evidence which is used for justification of scores.

Pre-scoring

As a response to Covid-19 public health settings precluding a physical workshop, and to speed up the process of rating during the workshops, pre-workshop scoring through survey monkey was used to gather the initial scores for discussion. This survey was sent to the workshop invitee list to rate each of the indicators on a 1-5 scale and provide comments where appropriate. The results were used to identify subject matter experts and start discussion in the pursuing workshops.

Workshop

A series of two full-day workshops facilitated by Morphum Environmental were held virtually over zoom on Tuesday 12th and Wednesday 13th October 2021. Participants included 43 experts from different departments responsible for water management and planning across the Auckland Council Group. A full list of workshop participants is provided in Appendix 1. These participants represented:

- Auckland Council
- Watercare
- Watercare's Environmental Advisory Group
- Auckland Transport
- Eke Panuku

Each indicator went through a similar process:

1. Facilitator explained the intent of the indicator,
2. Reviewed the pre-workshop survey results,
3. Subject matter experts were called on to present evidence and justification to inform the indicator's score,
4. Open floor discussion and clarifications,

5. Live polling through the Mentimeter platform,
6. Review results and consensus reached amongst the group.

All participants were involved in all socio-institutional and biophysical indicators rather than separating into two smaller groups as is often undertaken in WSC benchmarking. This approach was taken as the facilitators and Auckland Council felt it remained more authentic to the multi-disciplinary approach drawing on multiple perspectives to feed into the rating of each indicator. Additional benefits included supporting cross-department relationship and knowledge development and sharing of initiatives.

Mana whenua partnership

Auckland Council has accepted that the Water Sensitive Cities framework is not entirely fit-for-purpose for Tāmaki Makaurau – Auckland. This is because it does not account for the Te Tiriti relationship and context of New Zealand, or Tāmaki Makaurau – Auckland.

Some language and concepts in the Water Sensitive Cities framework convey a worldview that is not reflective of Te Ao Māori. For example, words like 'water management' are not aligned to a whakapapa view of reciprocal relationships.

Therefore, a parallel process to the Water Sensitive Cities benchmarking has been established whereby the Tāmaki Makaurau Kaitiaki forum have partnered with the Auckland Council Environment and Climate Change Committee (via te Pou Taiao, the Environment Subcommittee) to develop a mana whenua-led framework.

As of writing, this framework is currently under development. It is intended that findings from the WSC benchmarking would be viewed alongside those from the mana whenua-led framework.

2.2. Interpreting WSC Index Scores

The index scores are intended to provide a basis for interpretation in several ways. Against each of the goals and indicators, and through three diagnostic lenses. These lenses are summarised below and can ultimately be used to benchmark the water related outcomes between future years, other comparable cities (internationally) or aspirations to improve outcomes.

Water Sensitive City Goals

This presents the results in terms of strengths and weaknesses against each of the seven goals- Each goal is assessed on a score out of 5 based on an average of the contributing indicators, with 5 representing outcomes which support a water sensitive city.

City State Benchmarking

City state benchmarking maps the percentage attainment for progress against each of the city states in the Urban Water Transitions Framework continuum (figure 7).

This is not presented in a linear fashion as a city can be achieving multiple city states at the same time. These results are presented as both percentages attained against individual city states and as circular bar plot.

Principles of Water Sensitive Outcomes

This lens assesses the city against the four outcomes of a water sensitive city: liveability, sustainability, productivity, and resilience.

Resilience in this context is defined as the capacity to maintain water system services under acute or chronic disturbances, through adaptation or recovery. Sustainability is the capacity of water system services to deliver benefits for current and future generations. Liveability is the capacity of the water system to deliver a high quality of life for communities (such as thermal comfort, aesthetics, amenity, connection to place, etc.). Productivity is the capacity of the water system services to generate economic value.

Outcomes are scored out of 5 with scores based on averages of indicators scored during workshoping which are considered to influence the Principle.

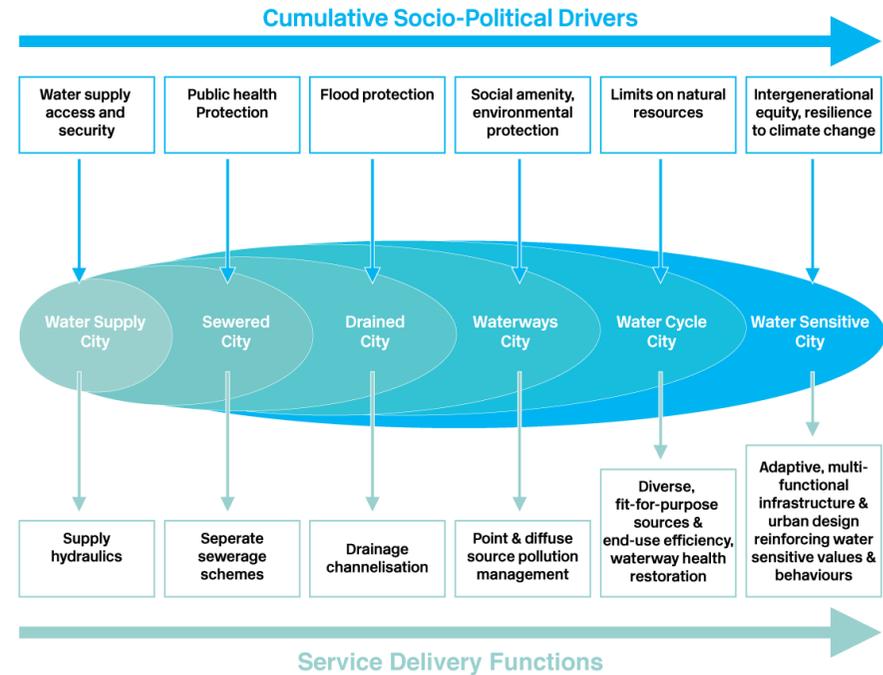


Figure 7. Urban Water Transitions Framework City State Continuum.

The ratings from each indicator can contribute one or more of these outcomes. For example, improving the rating for the indicator 'diversify self-sufficient fit-for-purpose water supply' related to provision of alternative water supplies would improve both resilience and sustainability outcomes.

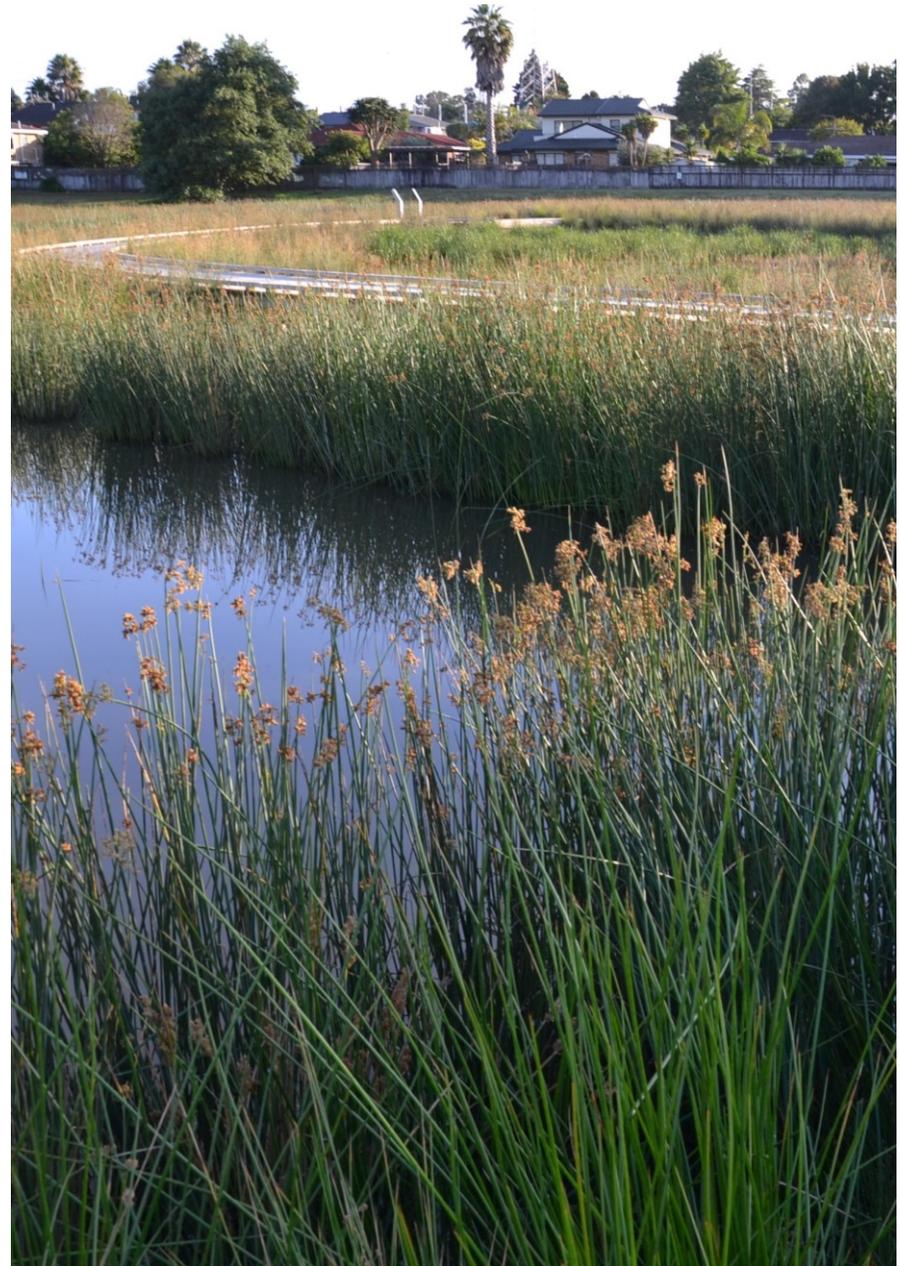
Water Sensitive Practices

The final lens looks at the three pillars considered essential to delivering water sensitive services. These broadly reflect the ability for cities to function as a diverse mix of informed communities who understand how water and catchments work and the need to carefully manage all water which touches developed land.

The pillars are:

- Water sensitive communities – Communities are connected to water in multiple ways including an understanding of the urban water systems, critical receiving environments and how governance can enable innovation to support transformative change in how urban water is regarded.
- Cities as catchments – water is valued as a fundamental element that sustains our lives and enables our unique flora and fauna to flourish. To do this, water must be managed on a catchment basis (Mountains to sea) with opportunities to harvest stormwater, rainwater and greywater to deliver a wide range of benefits.
- Cities providing ecological services – Ecosystems flourish in our urban areas with indigenous flora and fauna supporting biodiversity, ecological corridors, community connection, education and community health/wellbeing.

Practices are scored out of 5.



3. Evaluating Performance

3.1. City State Benchmarking

The City State Benchmarking results for Tāmaki Makaurau – Auckland are shown in Figure 8. Scoring was based on current performance and specifically excluded works which are to be delivered in coming years (already planned and/or commenced construction). It is noted that for most indicators, the level of confidence was medium or low as a reflection of a level of divergence in participants scoring or where a lack of quantified data prevented conclusive scoring.

The WSC indicators are arranged as a framework designed to assess where a city or region is on a continuum from ‘Water-Supply City’ to ‘Water-Sensitive City’. There are detailed definitions of each city state. Figure 7 shows this continuum.

Tāmaki Makaurau – Auckland attained 100% of the indicators for ‘water supply city’ and ‘sewered city state’ but just 4% of the indicators for ‘water sensitive city.’ This section summarises the key elements that contribute to the overall percentage attainment of each city state.

100% attainment of water supply city and sewered city

Communities across the city have equitable access to safe and secure drinking water which is universally metered. Water is considered affordable at less than 1.5% of average household income and low-income earners can access discounted bills (with limitations). However, participants noted that this measurement doesn’t follow international best-practise which is to measure using a threshold of less than 3% of the median income (and ideally disposable income). Similarly, almost everyone has access to safe and reliable sanitation. All households are connected to the sewer system (except for known ‘disconnected’ areas where septic tanks are used) which is transferred to Watercare wastewater treatment plants prior to discharge of treated effluent to the coastal discharge. Current issues with wastewater overflows to stormwater network and/or open streams have motivated programs such as ‘Safeswim’ and ‘Safe Networks’ investigations to find cross connection points, network improvements (including telemetry controlled pump stations) and pipe condition assessment. The Central Interceptor was widely recognised as a significant change in performance

for part of the city. However it will not be completed until late 2025 so the benefits of this cannot be considered in this benchmarking.

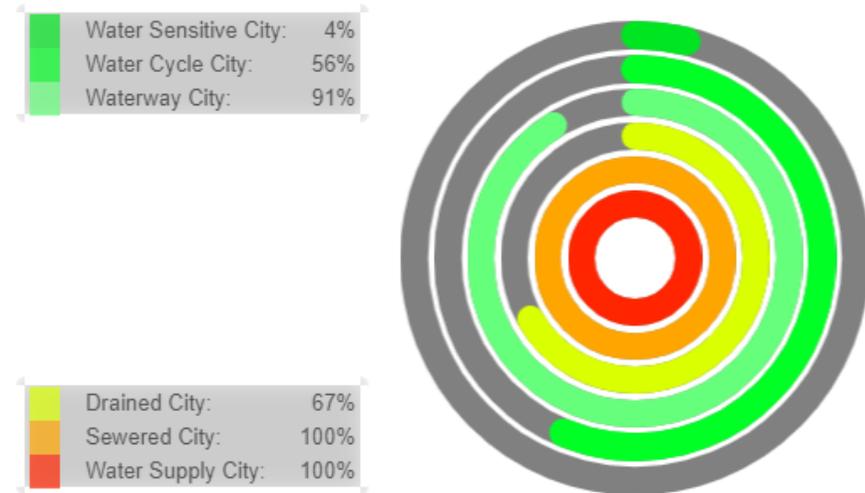


Figure 8. Benchmarking Results for Tāmaki Makaurau - Auckland

67% attainment of drained city state

Regular rainfall events generally do not disrupt everyday activities. People (rather than property) are considered to be well protected against flood risks. Due to high intensity rainfall, topography, urban development and under capacity piped infrastructure there are areas which remain prone to flooding and overland flow through properties. Recent work on forecasting is anticipated to improve ability to warn communities and potentially align with innovation in SMART systems. Tāmaki Makaurau – Auckland will be vulnerable to climate change impacts through both rainfall and sea level rise. Many freshwater streams and tidal margins currently receive untreated or undertreated stormwater with discharge of urban contaminants and adverse outcomes for stream biodiversity. Substantial change in practice has

occurred in new development areas with significant investment by Council in guidance, training and community partnerships. Further work to improve flooding level of service can leverage water sensitive approaches to adopt wider co- benefits.

91% attainment of waterway city state

Tāmaki Makaurau – Auckland rated 91% as a waterway city reflecting the well-embedded planning and design approaches directed at protecting the water quality and quantity discharged to local waterways and connecting local communities to waterway corridors. Communities hold strong connections to the harbours and coastlines with increasing connection to urban streams and well-designed water sensitive design led open spaces. Clear policy around standards and design of water assets (including nature-based solutions) have built on early work by previous councils and are now well implemented by Auckland Council and CCO's (Watercare, Auckland Transport and Eke Panuku). New greenfield and brownfield developments adopt water sensitive design principles including increasing high amenity spaces and works to enhance previously engineered waterways such as Te Auaunga and La Rosa gardens. Many older developments include distributed ponds (often in poor condition) and early water-sensitive design assets with lessons learnt applied to new guidance documents and policy (such as the Auckland Unitary Plan and Network Discharge Consent processes).

Approximately 20% of the Auckland urban area currently discharges stormwater into some form of stormwater management device (including treatment and attenuation) but many of these are not sized appropriately for catchment or are in poor condition. Freshwater streams remain in many parts of the city including many with high ecological values. Investment in stream assessments, ecological survey and hydrological monitoring and modelling provide an improving body of knowledge around existing ecological conditions, instream water/sediment quality and localised stress points. Linear parks are located in many streams and connectivity is an increasing focus. In many places however streams are piped (23% of streams currently piped) and the urban stormwater remains untreated with adverse outcomes on stream habitats and conditions.

All areas of Council are increasingly implementing water-sensitive design projects with some challenges remaining (such as concerns with highly distributed raingardens in road corridor) and ongoing issues with

maintenance, developer intent and incentives for best practice. City centre enhancements and Eke Panuku are increasingly adopting more aspirational project planning to integrate water sensitive design into major urban renewal projects which recognise social as well as environmental benefits but this is not included in all projects

Further work to be done with community awareness and water literacy to ensure effective and reflective engagement to inform future projects and increase connection with urban water elements. Good opportunity to build on high rate of connection to water from proximity to coastlines and water environments.

56% attainment of water cycle city state

Tāmaki Makaurau – Auckland rated 56% as a water cycle city. The city has developed a wide suite of water supply sources including catchment dams, Waikato River take and aquifers which enable highly automated network controls to optimise performance and provide a high-quality supply of clean safe water. Wastewater is managed via an aging wastewater network including overflows which is being gradually upgraded alongside the significant investment such as the Central Interceptor. Recent drought conditions and supply stressors have prompted works to identify, quantify and enable metered takes from distributed non potable water source for non potable uses such as dust suppression, street cleaning and garden irrigation. Use of effective rainwater reuse tanks (plumbed to internal non potable demands) is limited with previous consenting barriers being removed to encourage more uptake. Limited stormwater harvesting being undertaken at scale with preference for large volume tank storage from industrial buildings. Consideration being given to future uses for appropriately treated wastewater with nursery irrigation trials underway but currently no supply to commercial or residential users.

Many members of the community are considered to have limited water literacy and do not necessarily understand the governance and funding structure for diverse council teams delivering water services. This presents opportunity to build on programs such as Safeswim to increase understanding and awareness around urban water cycle which could drive change in willingness to pay through the recently implemented water quality targeted rate, and community involvement in transition to more water sensitive outcomes. Opportunities to adopt more innovation in the design of integrated urban water systems including use of accurate weather

forecasting, well designed nature-based solutions and a mix of centralised and de-centralised water assets based on consideration of a wide range of costs and benefits. Need to improve ecological health outcomes through transition to more water sensitive investments in line with community aspirations for improved urban ecology and clean healthy beaches and coastal waters.

4% attainment of water sensitive city state

Tāmaki Makaurau – Auckland rated 4% as a water sensitive city. Whilst isolated examples of good water sensitive design exist and high amenity projects in the public realm are supported, connection with urban water and understanding of vision of a water sensitive future is limited. There is still work to be done to communicate the value of aspects such as shared ownership and distributed technologies such as stormwater harvesting and greywater and wastewater re-use. Changing legislation (National Policy Statements for Freshwater Management (NPS-FM) and Urban Development (NPS-UD)) are driving change in practice with a recent drought increasing awareness around water supply context and Safeswim providing greater understanding of wastewater risks. Residential water usage is considered reasonably good for Aotearoa New Zealand at approximately 250 l/pp/day including allowance for commercial users.

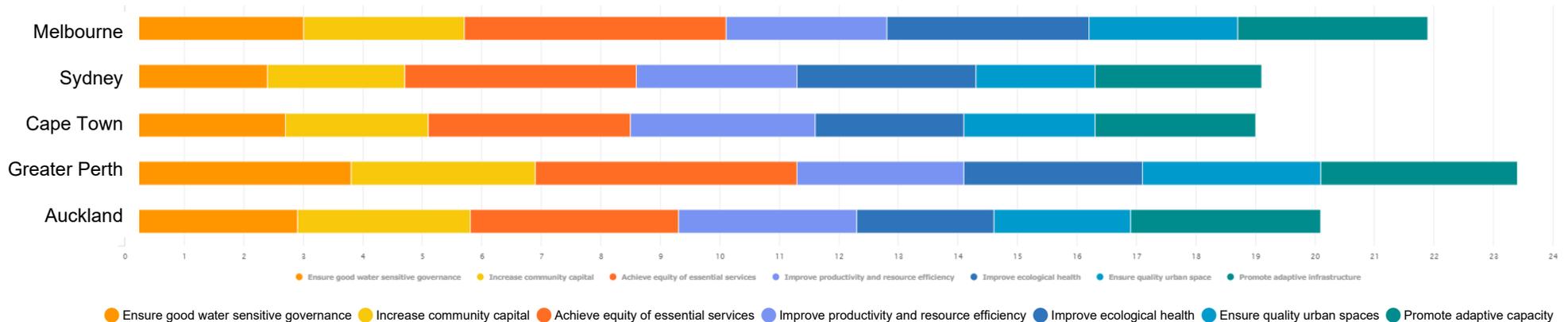
Makaurau – Auckland is tracking in comparison to other cities and watersheds where the same benchmarking process has been undertaken. This includes cities/regions across Australia, South Africa, South East Asia and the Pacific. Comparison with other cities of similar scale and demographics can enable Tāmaki Makaurau – Auckland to identify where others are performing well in areas where they may not be and foster a wider network of water stakeholders to share experience and knowledge. Similarly, Tāmaki Makaurau – Auckland can support other cities/regions to improve performance in key areas to enable improved outcomes globally.

For the purpose of comparison, the benchmarking results of Tāmaki Makaurau – Auckland have been compared with results from Melbourne, Sydney, Perth and Cape Town. These cities have all been benchmarked at the metropolitan scale with additional benchmarking of local government areas also often undertaken to drill into spatial variabilities.

Figure 9 provides a comparison against Melbourne, Sydney, Cape Town and Perth. This illustrates that Auckland is currently performing better than both Sydney and Cape Town across the combined WSC goals but is behind both Melbourne and Perth. It is noted that the results for Perth are based on a recent benchmarking (2021) which demonstrated a significant improvement following focussed resourcing in areas identified as needing improvement in WSC benchmarking 5 years prior

3.2. International Comparison

The benchmarking results provide the opportunity to evaluate how Tāmaki



Considering the seven WSC goals a comparison can be made between and against the same metropolitan cities. Figure 10 to Figure 13 shown the spider plots for these. This shows that within each city there remains variability with performance against specific goals. For example quality urban space is low in both Sydney and Cape Town (similar to Auckland) whereas both Perth and Melbourne score well for this same goal due to the implementation of public spaces with water elements incorporated with design to connect communities and enhance environmental outcomes. Similarly, Australian cities were found to score better in regard to equity of essential services whereas Cape Town scored poorly in this goal.

Tāmaki Makaurau – Auckland scored similarly to both Perth and Melbourne for promoting adaptive infrastructure but was worse than both with regards to improving ecological health. Further comparison at an indicator level is possible through the WSC dashboard.

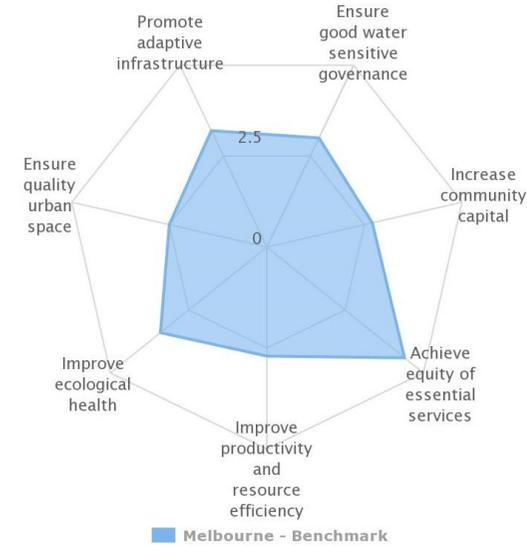


Figure 11. Melbourne Benchmarking Results – Goals.

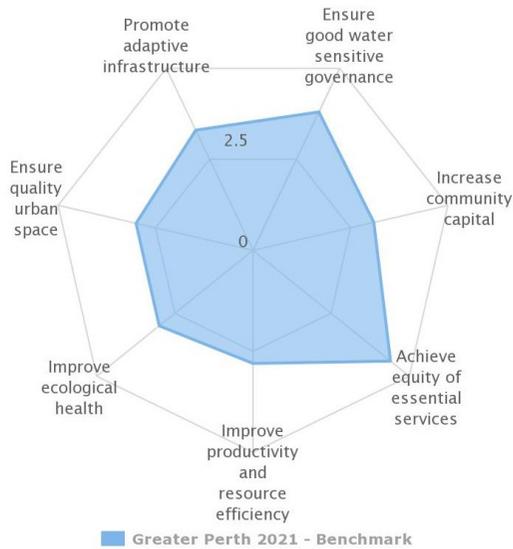


Figure 10. Perth Benchmarking Results – Goals.

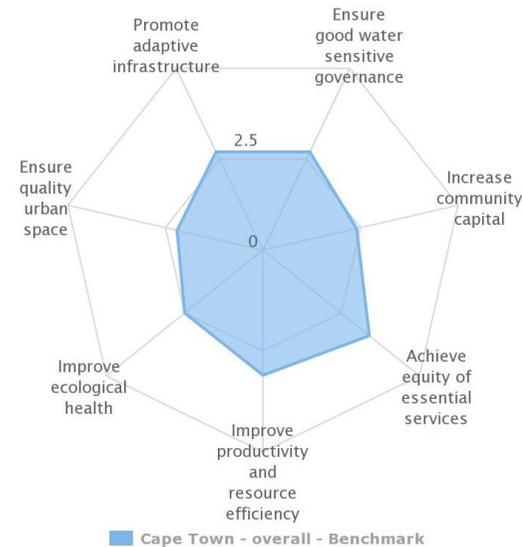


Figure 12. Cape Town Benchmarking Results – Goals.

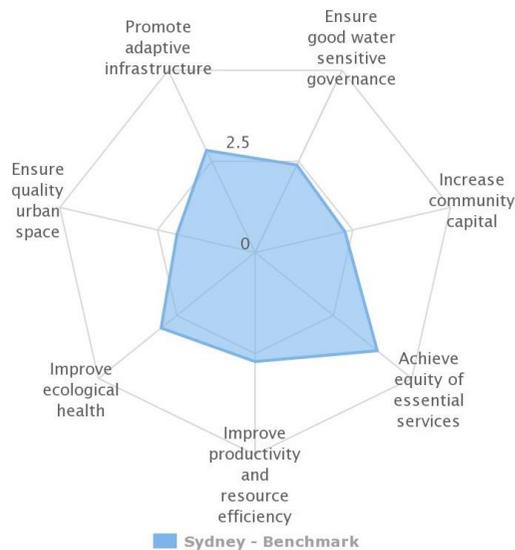


Figure 13. Sydney Benchmarking Results – Goals.

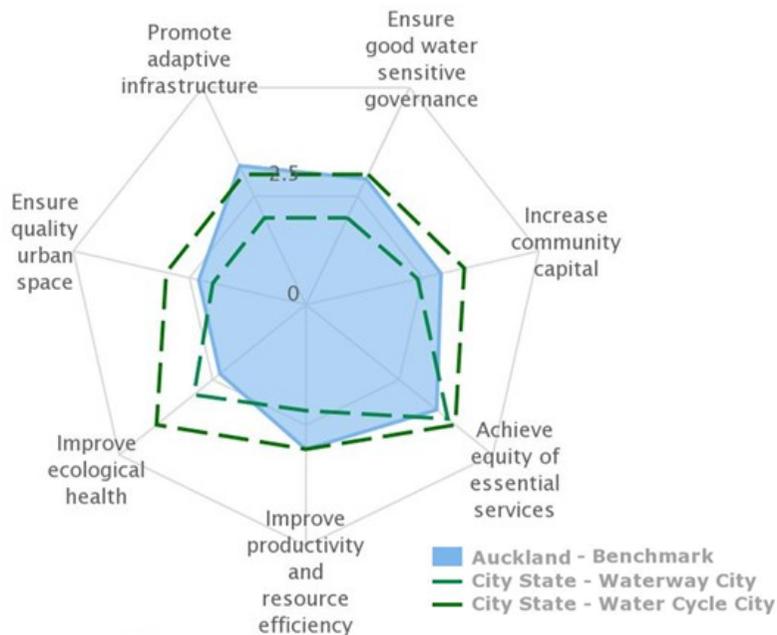


Figure 14. Tāmaki Makaurau – Auckland Benchmarking Results

3.3. Water Sensitive Goals

The Index summarises the performance of the Tāmaki Makaurau – Auckland peri-urban area against the 7 goals of a water sensitive city (Figure 14). The overarching goals include:

1. Ensure good water sensitive governance;
2. Increase community capital;
3. Achieve equity of essential services;
4. Improve productivity and resource efficiency;
5. Improve ecological health;
6. Ensure quality urban space; and
7. Promote adaptive infrastructure.

As shown in Figure 14, Tāmaki Makaurau – Auckland is performing strongly against the idealised waterway city (shown as the inner dashed line) and is progressing towards a water cycle city (outer dashed line). This section compares performance against water cycle city attainment, with a focus on priority areas for improvement. Progress can be still made against all goals and indicators towards water sensitive city attainment. Appendix 2 provides the full discussion against indicators and indicator rating descriptions have been provided to Auckland Council separately.

Tāmaki Makaurau - Auckland has attained the following water cycle city goals:

- Promote adaptive infrastructure,
- Improve productivity and resource efficiency, and
- Ensure good water sensitive governance.

In order to achieve water cycle city attainment, key improvements can be made in the following goals:

- Increase community capital.
- Achieve equity of essential services.
- Improve ecological health.
- Ensure quality urban space.

Low scoring indicators within these goals that fall short of water cycle city attainment are listed below. Workshop discussion on the remainder of indicators is contained in Appendix 2. It is noted that several indicators were scored with medium or low confidence. This generally represents a

distribution of responses along with diversity of opinion. This can be due to many factors such as the scale of the benchmarking for a large city with spatial variability, diverse organisations involved in water management being at different stages, or a reflection of qualitative indicators encapsulating multiple axes of value.

Increase Community Capital

Indicator 2.1 Water literacy.

Current Status: Efforts made to improve but engagement and understanding of complex issues across the across the community is mixed. General lack of understanding of the complete water system including interrelationships and range of impacts on freshwater and coastal receiving environments.

Notes: This relates to indicator 1.4 on engagement and discussions on means to achieve two-way conversations rather than informing. Drought water quality targeted rate and safe swim have stimulated the conversation and publicised water more. Three waters reform communications provide an opportunity to increase knowledge of water affairs.

Indicator 2.3 Shared ownership, management and responsibility of water assets.

Current Status: Water, wastewater and stormwater assets are largely in centralised ownership aside from some rain tanks and peri-urban on-site systems. Recent policy has focussed on removing barriers rather than facilitation or incentivising. Council's stormwater department is currently working on Private asset management support systems.

Notes: Some work required for issue agreement for this water sensitivity indicator, with pros and cons seen from shared ownership that could benefit from more evaluation. The indicator is about ensuring people can chose to adopt decentralised technologies distributed within a centralised system rather than either/or.

Indicator 2.4 Community preparedness and response to extreme events.

Current Status: Local Government is only mandated to indirectly disclose flood hazards but not to educate community on flood preparedness. There

have been programmes to engage communities for specific issues, e.g., Piha, Whangaparoa and Watercare dam catchments.

Notes: This indicator may evolve in response to national direction and education or Council's proposed 'Too Much Water policy'.

Achieve Equity of Essential Services

Indicator: 3.3. Equitable access to flood protection

Current Status: Less than 1% of people at risk for loss of life, however an estimated 20% of Auckland properties are affected by overland flowpaths or floodplains. Factors such as high rainfall, pipe capacities and shortfalls of rules and consent process for private development addressing cumulative effects are issues.

Notes: This relates to indicator 2.4 with potential to build resilience through preparedness in addition to structural interventions. Lack of complete management of conveyance systems may be an advantage to enable council to pivot to a more water sensitive flood management approaches.

Indicator 3.4. Equitable and affordable access to amenity values of water-related assets

Current Status: As a coastal city, with 25% of urban streams in public parks, there are large lengths of waterway margins many of which have defined access. Watercare assets, such as water supply dam catchments and wastewater plant areas, are accessible for recreation use (walking and bird watching). Access to amenity and the value of that amenity is understood to be unmapped and impressions are that there is inequity in some parts of the city. Stream restoration and ecological enhancement projects are common, but stream loss is still occurring.

Notes: This relates to indicator 6.1 and 6.2 and opportunities can be informed by analysis of equitable distribution and value of streams, coastal and riparian zones akin to the Urban Ngahere Strategy.

Improve Ecological Health

It is noted that the goal of improve ecological health is complex to achieve and is likely to have some time lag between regenerative actions and restoration outcomes being realised.

Indicator: 5.1. Healthy and biodiverse habitat

Current Status: Approximately 23% of urban stream length is piped. Auckland Council's State of Environment reporting demonstrates urban stream ecological performance is low. Some improvements are occurring. Relatively high expectations of ecological health and presence of peri urban values in part leads to a range for this indicator.

Notes: The complexity of ecosystem interactions including reliance on flow, water quality, connectedness and biodiversity, and delay in ecosystem health improvements from restoration or improvement initiatives are pertinent issues. A focus on connectedness of restoration efforts is important.

Indicator 5.2. Surface water quality and flows

Current Status: State of Environment reporting shows failing grades against National Policy Statement - Freshwater objectives or Tāmaki Makaurau - Auckland specific attributes for E.coli, Sediment (Turbidity) zinc and phosphorous. Annual low flows are consistent with impervious surface increasing flushing flows and erosion. Approximately 20% of Urban areas have some form of stormwater control (including water). New developments now include controls defined under the Auckland Unitary Plan and Network Discharge Consent processes.

Notes: Definition of healthy ecosystem is complex across aquatic and marine environments including biodiversity.

Indicator 5.3. Groundwater quality and replenishment

Current Status: Groundwater quantity indicators are positive; some groundwater quality issues for volcanic aquifers and other aquifers not monitored. Likely some flow impacts from impervious surfaces and groundwater dependant ecosystems lost or not monitored.

Notes: Low confidence in score agreed due to information gaps.

Indicator 5.4. Protect existing areas of high ecological value

Current Status: Policy and legislation from UP for SEA protections and DoC processes. Loss of previous tree protection and consent processes erode protection outcomes. Approximately 23% of permanent streams within the rural/urban boundary are piped.

Notes: Some limitation of mapping of high value freshwater systems, with Watercourse Assessment Report (WAR) program progressing.

Ensure Good Quality Urban Spaces

Indicator 6.2. Urban elements functioning as part of the urban water system

Current Status: Heat mitigation is not planned for, examples of water sensitive integration with urban spaces and 0.25% of the urban area in treatment device footprint. Very few green roofs and green walls, rain tanks and raingardens often poorly integrated into built form.

Notes: Opportunities exist to better integrate precinct, neighbourhood and higher density building design as functional water elements

Indicator 6.3. Vegetation coverage

Current Status: Canopy cover is estimated at 20% of the public realm; made up of 9% canopy cover in the road reserve and 30% canopy cover in park reserves. However, coverage is not evenly distributed across Auckland. For example, the Urban Ngahere (Forest) Strategy assesses canopy cover across both Private and Public land, with southern local board areas have significantly lower canopy cover (1-15%) The Urban Ngahere Strategy includes a target of 30% on average (public and private areas) and no less than 15% cover in any local board area.

Notes: Spatial assessment of distribution of canopy cover in parks and roads was not available. Proximity of regional parks and other non-urban areas contribute to greater overall vegetation access for Aucklanders.

3.4. Water Sensitive Outcomes and Practices

The Water Sensitive Cities (WSC) Index Tool filters results based on defined WSC Outcomes and Practices. These are discussed in following sections.

WSC outcomes

WSC Outcomes assess the performance of the urban water system against the delivery of resilience, sustainability, liveability and productivity, as described in Section 2.2.

The results shown in Figure 15 indicate how Tāmaki Makaurau - Auckland is performing across the WSC outcomes on a 1 – 5 scale. Good achievements are being made towards all Outcomes with slightly stronger outcomes for liveability and productivity.

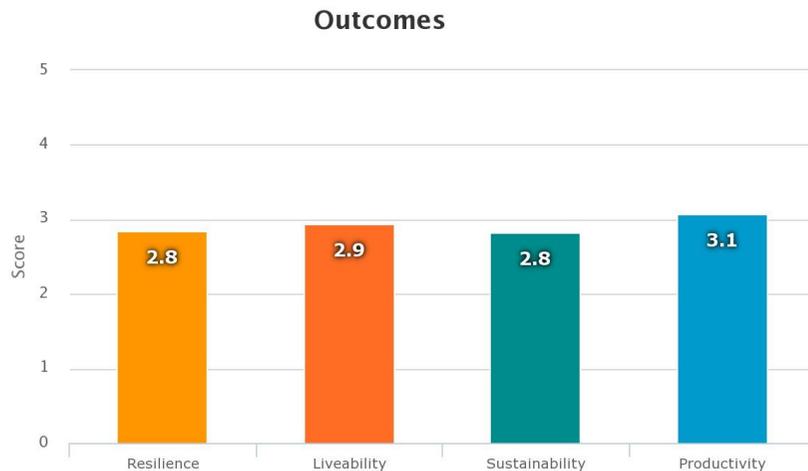


Figure 15. Assessment of Water Sensitive Outcomes.

WSC practices

The results shown in Figure 16 indicate how Tāmaki Makaurau – Auckland is performing with regard to WSC Practices. Improvements in practice should be directed at:

1. Strengthening social capital to empower individuals to:
 - make choices that support a water sensitive future,
 - modify behaviours that impact on receiving waters, and
 - become actively involved in the planning, management and maintenance of green infrastructure and other water related systems where appropriate.
2. Providing high quality and connected open space networks, which support thriving natural systems or engineered systems that mimic natural processes (such as, systems that use soil and vegetation to infiltrate, evapotranspire, treat and/or reuse urban runoff). Systems may include establishing riparian vegetation along waterway corridors, wetlands, rain gardens, tree pits, green roofs and walls, as well as urban forests. These systems deliver multiple benefits to communities (including mitigation of the urban heat island effect, reduced nuisance flooding, improved health and well-being, etc.) and have widespread community appeal.

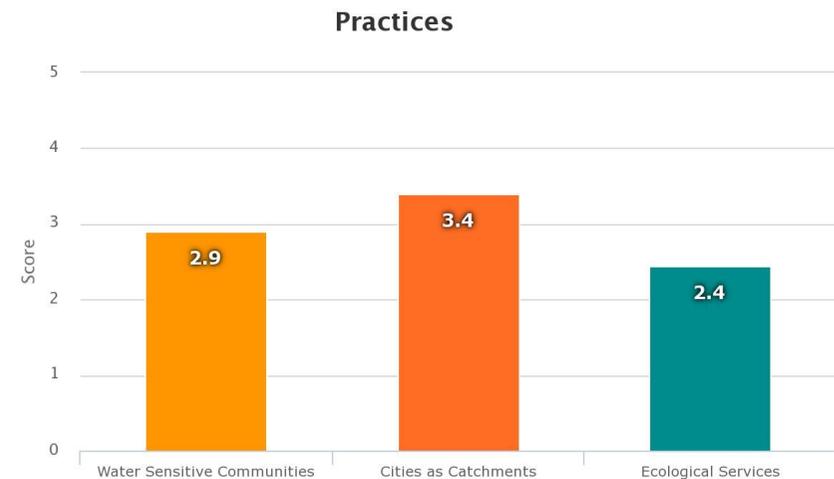


Figure 16. Assessment of Water Sensitive Practices

4. Fifteen Point Plan

A 15-point action plan has been developed for Auckland Council summarising some of the key insights from the benchmarking results.

Actions are listed under the three transition pathways identified in Figure 17, and do not reflect the priority of actions to be undertaken. Actions are mutually reinforcing and provide an overarching framework for consideration in the development of the Water Strategy and to guide initiatives across the council group to progress towards the aspiration of becoming a water sensitive city. It is noted that targeted improvement of ecological health is often a long-term process with complex processes. Whilst actions to improve against the Water Sensitive Cities framework aim to have benefit for ecosystem health, significant work in council strategies and plans will be required to align to achieve ecosystem health outcomes over time.

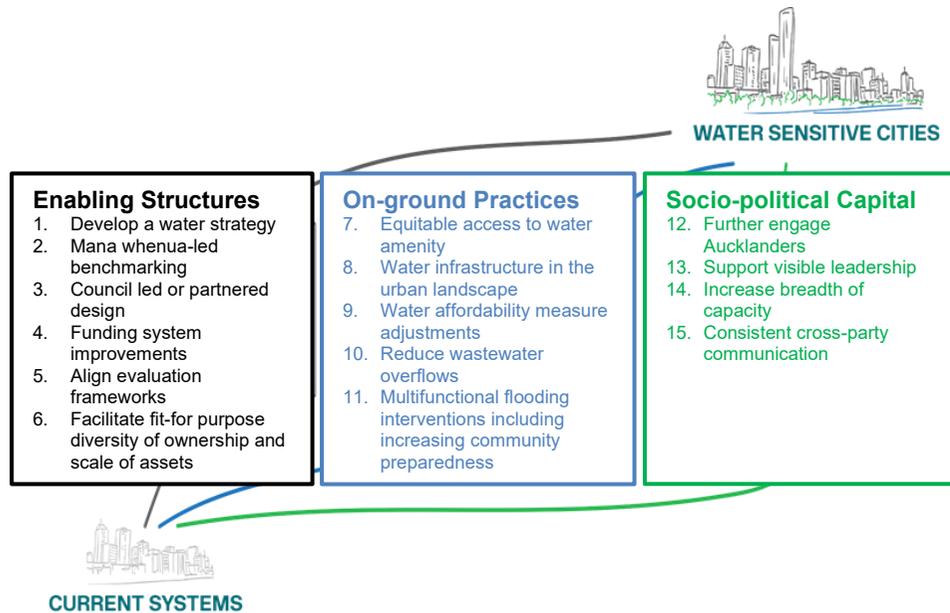


Figure 17. Transition Pathways to Improve Water Sensitive Practices and Deliver Water Sensitive Outcomes

4.1. Enabling Structures

The formal and informal rules and frameworks (regulatory, policy, and economic) that structure urban water management and practices (including such aspects as vision and narrative, evaluation frameworks, policy, and strategy).

Action 1: Develop a water strategy. The development of Auckland’s Water Strategy is underway. This will support cohesive and co-ordinated approaches to water management. This will increase integration of approaches and is likely to support shared agreement, funding alignment and greater outcomes across Auckland’s water sector through upcoming reform.

Action 2: Mana whenua-led benchmarking. Auckland Council has accepted that the Water Sensitive Cities framework is not entirely fit-for-purpose for Auckland. This is because it does not account for the Te Tiriti relationship and context of New Zealand, or Auckland. Therefore, a parallel process to the Water Sensitive Cities benchmarking has been established whereby the Tāmaki Makaurau Kaitiaki forum have partnered with the Auckland Council Environment and Climate Change Committee (via te Pou Taiao, the Environment Subcommittee) to develop a mana whenua-led framework. As of writing, this framework is currently under development. It is intended that findings from the WSC benchmarking would be viewed alongside those from the mana whenua-led framework.

Action 3: Council-led or partnered design. Many opportunities to deliver WSD are missed through greenfields and brownfields development processes where significant pressures including affordability, timeframe and resourcing pressures can result in developer led design. This has the potential to, compromise water sensitive outcomes for Auckland. Best practise examples exist such as the City centre waterfront or Puhinui Regeneration where council-led or partnership-based development improves urban design and connectedness between high-value urban environments and the ubiquitous water systems that thread the city. There may be potential for Unitary Plan changes to further require water sensitive outcomes with greater council-led planning.

Action 4: Funding systems improvements. Funding issues including operational expenditure restrictions for operation and maintenance of public water spaces can hamper land vesting for safe, public access to weed-free waterway environments or cause resistance to water assets with overall wellbeing benefits. Funding models (including evaluation of intangible benefits and costs) could be reviewed for improvement. Explore opportunities for incentivising improved practice through planning concessions or refined developer contribution schemes which reward integrated water initiatives.

Action 5: Align evaluation frameworks. The various parts of the Auckland Council group struggle to fully quantify the multiple benefits from water assets, which limits conviction and support for diverse and distributed options. For example, more information is required to support advocating narratives and reduce contesting narratives on the benefits of stormwater/rainwater harvesting and reuse on receiving environments and the overall water system. There is potential to improve consistency of approaches to benefit evaluation across the council group including combining disjointed funding streams for multiple outcome projects and supporting life-cycle cost security.

Action 6: Facilitate fit-for-purpose diversity of ownership and scale of assets. There is significant centralised network inertia in Auckland which helps with robustness, cost effectiveness and risk management, however this limits adaptive capacity, water literacy and catchment-scale capture and use of water that can be integrated in a distributed approach drawing on both centralised and decentralised capacity. It does not have to be one or the other. Active facilitation of such diversity from Auckland Council Group requires funded private asset management compliance systems, plans and policies that promote rather than obstruct or omit action, and commitment to support pilots and contribute to their success. There is work to do on issue agreement in these areas including benefit articulation. Auckland Council Group is well placed to develop guidance and compliance systems to ensure risks of distributed systems are appropriately understood and accounted for.

4.2. On-ground Practices

The on-ground activities that deliver water-related services (includes such aspects as water system planning, cost-benefit analysis, and monitoring and evaluation).

Action 7: Equitable access to water amenity benefits. Auckland Council Group is delivering amenity and access as a part of many new projects for its water assets above-ground. Ongoing spatial analysis of vegetation, stream and coastal amenity and ecological value and safe access for residents has potential to focus investment and tactical intervention to improve ecological connectivity, equity of accessibility for all parts of the city, and citizen connectedness to waterways.

Action 8: Water infrastructure in the urban landscape. Blue-green water assets can be further drawn into our high value town centres and building precincts along with deeper engagement to celebrate water and provide increased touch points for Aucklanders. Green roofs, daylighted streams and town centre green infrastructure can regenerate water connections as Auckland intensifies.

Action 9: Water affordability measure adjustments. Whilst water affordability is considered good, standard water affordability metrics based on average household income and average bills may mask affordability for some disadvantaged citizens. Improving the metrics used to assess affordability to align with emerging best practice such as average bill against median disposable income, will support policies to improve affordability and ensure equity of access to water services is universal.

Action 10: Reduce wastewater overflows. Overflows across the network leading to public health risk and environmental degradation require further improvement. Wastewater interventions such as smart sensors, storage and separation must continue to be funded to ensure significant programs such as the Central Interceptor (completion 2025) and the ongoing Safe Networks programme realise comprehensive benefit.

Action 11: Multifunctional flooding interventions including increasing community preparedness. Auckland has areas that are vulnerable to flooding. Structural solutions that are implemented to manage these can adopt water sensitive approaches to improve flood resilience while including multifunctional infrastructure such as daylighted streams or multipurpose attenuation areas. Other solutions include increased community preparedness and understanding through education and awareness building, and contingency planning such as for access. Where necessary retreat can be applied, especially through intensification redevelopment. National education programmes and Auckland's proposed "too much water

policy” can provide enabling structures, while on ground practices can pilot and build action, such as the Te Auauanga project.

4.3. Socio-Political Capital

The commitment, knowledge, and skills needed from people and organisations to establish the enabling structures and implement water sensitive practices in the real world (includes such aspects as leadership, community connection, and learning cultures).

Action 12: Further engage Aucklanders. Auckland’s water literacy has been expanded through initiatives such as Safe Swim and Drought Response. Citizens who are actively engaged with water matters have increased capacity to change behaviour or support investment, and Council action. More progress could be made in moving from informing on collateral to more actively engaging citizens from varying backgrounds in targeted conversations to improve awareness of the function and issues for water and actively engage with a diversity of perspectives.

Action 13: Support visible leadership. Significant determination is required to promote water sensitive outcomes at all levels from decision making through to operations in the face of competing pressures. Whilst strong water leadership exists across the system, any inconsistency of resolve from political commitment through to compliance enforcement has the potential to jeopardise water sensitive outcomes on the ground.

Leadership should continue to be fostered including enabling a diversity of voices and ideas to carry through to governance and decision making. Means to celebrate success such as awards may promote courageous leadership.

Action 14: Increase breadth of capacity. Some parts of the system don’t exhibit as great breadth of skills or knowledge relating to water. Examples include being engineering focussed such as in transport, or without specific water specialist knowledge, such as in regulatory and planning. Strong existing programmes for water sensitive training, integrative skills and research institution partnerships could be more widely promoted and distributed to improve capacity.

Action 15: Consistent cross-party communication to avoid silos of isolated action. There is a great challenge in joining all parts of a complex socio-technical system such as the Auckland Council Group water sector. The council’s stormwater department and parts of Watercare have a collaborative relationship that has been improving over time. There is potential to increase working relationships between many areas of the council group. Greater industry outreach and communication of Council Group programme can also allow businesses to plan and support innovation. This may become increasingly important following water reform to ensure existing institutional stakeholders applying important contrasting perspectives on water are not left on the periphery.

Appendix 1: List of Participants

Participants attended two full-day virtual workshops facilitated by Morphum Environmental on Tuesday 12th and Wednesday 13th October 2021. Participants included 43 experts from different departments responsible for water management and planning across the Auckland Council Group. All participants were involved in all socio-institutional and biophysical indicators rather than separating into two smaller groups as is often undertaken in WSC benchmarking.

Organisation	Name	Role
Auckland Council	Adrian Wilson	Manager Proactive Compliance
Auckland Council	Alastair Jamieson	Principal Advisor Biodiversity; Environmental Services
Auckland Council	Andrew Chin	Head of Healthy Waters Strategy
Auckland Council	Brendan Judd	Analyst, Natural Environment Strategy
Auckland Council	Claire Gomas	Principal Advisor; Council Controlled Organisation Partnerships
Auckland Council	Coral Grant	Lead Water Scientist
Auckland Council	Dave Allen	Manager Natural Environment Strategy
Auckland Council	Dawne MacKay	Manager Growth & Spatial Strategy
Auckland Council	Georgina Hart	Principal Analyst; Natural Environment Strategy
Auckland Council	Greer Lees	Principal Advisor; Infrastructure Strategy
Auckland Council	Hana Kashkari	Analyst; Natural Environment Strategy
Auckland Council	Jacquie Reed	Senior Analyst; Natural Environment Strategy
Auckland Council	Janet Kidd	Principal Wai Ora Strategic Programmes
Auckland Council	Kath Coombes	Senior Policy Planner
Auckland Council	Kolt Johnson	Senior Scientist; Hydrology
Auckland Council	Liz Kirschberg	Senior Specialist Publicity
Auckland Council	Megan Howard	Senior Advisor; Infrastructure Strategy
Auckland Council	Melanie Hutton	Head of Resilience, Auckland Emergency Management
Auckland Council	Nick Brown	Regional Planning Manager
Auckland Council	Pippa Sommerville	Principal Parks Advisor, Park Services
Auckland Council	Sarah Smith	Project Manager; Infrastructure Strategy
Auckland Council	Sarisha Hurrissunker	Asset Sustainability Specialist; Community Facilities
Auckland Council	Simon Fraser	Senior Advisor; Natural Environment Strategy
Auckland Council	Toby Shephard	Lead Strategist; Auckland Plan, Strategy & Research
Auckland Council	Tom Mansell	Sustainable Outcomes Programme Manager
Watercare	Amanda de Jong	Manager Compliance Monitoring
Watercare	Amanda Singleton	Chief Customer Officer

Organisation	Name	Role
Watercare	Andrew Lester	Water Resources Manager
Watercare	Apra Boyle Gotla	Head of Innovation
Watercare	Brent Evans	Manager Local Board and Stakeholder Liaison
Watercare	Chris Thurston	Head of Sustainability
Watercare	Drew Thorensen	Head of Learning & Organisational Development
Watercare	Elizabeth Walker	Environment Advisory Group
Watercare	Ilze Gotelli	Head of Major Developments
Watercare	Judy Bishoff	Environment Advisory Group
Watercare	Nathaniel Wilson	Environmental Care Manager
Watercare	Nicky Willcox	Senior Learning and Organisational Development Business Partner
Watercare	Priya Thurai	Head of Customer Insights
Watercare	Rebecca van Son	Head of Strategy
Watercare	Suzanne Naylor	Head of Water Value
Auckland Transport	Cathy Bebelman	Environmental Specialist
Eke Panuku Development	Sara Zwart	Principal Regenerative Design Lead
Tektus Consulting	Emily Afoa	Director

Appendix 2: Workshop Notes

The following provides a summary of discussions and deliberations during the 2 day workshop process. These therefore are based on a mixture of quantified data (where available), opinions based on professional judgement/experience and observations as part of the community. Participants organisations include Auckland Council (AC), Watercare Services Limited (WSL) Auckland Transport (AT).

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
1. Ensure Good Water Sensitive Governance			
1.1. Knowledge, skills and organisational capacity	3	Medium	Auckland Council (AC) maintains a library of Guidance documentation and through its 'Tupu' training portal undertakes 1–3-day training with GD01 having been delivered to 150 people mostly from council's stormwater department (Healthy Waters) and development engineering departments. Basic e learning modules are available for GD01, GD05 and GD07. Auckland Council stormwater department provides Green infrastructure training for maintenance staff and engages with University of Auckland on a project basis. Watercare Services Limited (WSL) runs Technical Competency Pathways, Skills Matrix and Leadership Program. Water New Zealand accesses a range of training such as Connexis and the Stormwater Training Plan. Parts of the system don't exhibit breadth of skills or knowledge relating to water such as: Auckland Transport (AT) – engineering focussed, regulatory and planning, and parts of the political /decision making. Range across the system results in three with medium confidence given diversity.
1.2. Water is key element in city planning and design	3	Medium	Auckland Plan 2050 reflects water in many aspects of the Environment and Cultural Heritage Outcome, with Focus area 5: Adapt to a changing water future and Focus area 6 Green Infrastructure. The Auckland Unitary Plan encourages water sensitivity more than requiring it and some key strategy and policy is yet to arrive e.g., Water Strategy. Section 35(2b) of the Resource Management Act 1991 requires monitoring of AUP effectiveness which occurs every five years. Auckland Council Network Discharge Consents and Watercare Network Discharge Consents include development process. Puhinui Regeneration example of water-centric renewals that are still becoming widespread. Some participants rated this lower as the planning and resultant designs on the ground are still very reactive and developer driven reflecting in medium confidence.
1.3. Cross-sector institutional arrangements and processes	2.5	Medium	Substantive CCO's Statement of Intent process results in some operational alignment and collaboration including Service Level Agreement between AT and AC stormwater department, Network Discharge Consents and Plan Change Processes (e.g., Stormwater Water Management Plan). Development processes are integrated but timelines and volumes drive some examples of disconnected approvals of water assets. Information sharing is by request and not by default with

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			disjointed funding streams and inconsistency in communication which can reinforce silos. There is some disconnect from strategic, planning and regulatory drivers. Variable (both better and worse) results in different parts of the system provides only medium confidence.
1.4. Public engagement, participation and transparency	3	High	Auckland Council has transparency and engagement policy with consistent Long-Term Plan and the Auckland Unitary Plan communication processes including public engagement events. Project engagement is largely driven by statutory requirements, and often members of the public are unable to have deeper engagement with integrated catchment outcomes or outcomes wider than an already defined sub-set. Auckland Council Whangaparoa hazard conversation and Watercare are engaging in more complex collaboration with customers using a citizen jury model in the last year to 18 months in moving from research with customers to facilitating more participatory engagement.
1.5. Leadership, long-term vision and commitment	2.5	Medium	There is leadership commitment and are examples of senior leadership including elected members who are champions of water sensitivity, and many good outcomes are promoted such as blue-green and waterfront renewals. However, many competing pressures on resources dilute the commitment to water and potentially erode resolve to achieve the outcomes through compliance or catchment scale shifts. A financial system which is focused on Capex considered to limit the Opex support required for many water sensitive outcomes (maintenance). The Water Quality Targeted Rate has made a huge difference including an Opex component.
1.6. Water resourcing and funding to deliver broad societal value	3.5	Medium	Watercare Statement of Intent, Board Reports and Business Cases include 6 capitals to be considered but not a formal informant of the business cases., Auckland Council stormwater department Business plan and Business Case template include Sustainable Outcomes, carried through into Auckland Council sustainable procurement with guidelines. AT are only funded to deliver transport outcomes and not clearly defined for resultant water quality outcomes. Some difficulty when funding needs to come from separate silos to maximise the outcomes. In general, multiple outcomes are championed within projects. Water Quality Targeted Rate is leading to improvement in deeper water sensitive funding
1.7. Equitable representation of perspectives	3	Low	Auckland Council Inclusive Auckland Framework demonstrates an intent to improve institutional diversity. Improved diversity at Watercare board level, however participants agreed less so at senior management level. Auckland Council Public Advisory Panels provide limited input in some work area. Formal Māori representation with the Independent Māori Statutory Board and Mana Whenua Kaitiaki Forum, Watercare. Some difference of opinion among participants on whether power and influence is achieved rather than just representation, work required to enable diversity of voice and ideas to carry through to Governance decision making. Water NZ study 2018 indicates lower age

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			and gender diversity in the Water Sector in general. Significant range of views in particularly of effectiveness in this area leads to lower confidence of score.
2. Increase Community Capital			
2.1. Water literacy	2.5	Medium	Efforts being made to improve community water literacy but still limited understanding in many areas of the water cycle and across the city. Literacy directly linked to Engagement (1.4) and a need to go beyond collateral to reach as many different parts of the community as possible. No current agreed measure for effective water literacy in Auckland to enable monitoring of improvements. This indicator relates to more than just 3 waters. People’s water literacy is highly variable and depends on what part of the water system an individual has a connection to (i.e., beach versus wastewater overflow or other). Works by Watercare have increased in recent years including education programmes in schools, research with commercial and residential segments to get an understanding of the levels of knowledge. Level of water literacy appears to depend on which part of the system people connect with, resulting in variable understanding across natural freshwater and coastal ecosystems. Existing Safeswim programme considered to be very successful and provides a point of connection to water for communities even though many people are considered to not fully understand the purpose (i.e., risk management versus pollution indicator tool. It can be difficult for the general public to understand the complexity of some issues highlighting need to monitor effectiveness of communications and look for improvements.
2.2. Connection with water	3.5	Medium	<p>Discussion on difference between connection with harbour and beaches versus connection with urban streams or water sensitive design-based assets such as raingardens or wetlands. Clearly agreed that Aucklanders are very connected to harbour and coastline but less so with green infrastructure, particularly with small raingardens in road corridor. People seem to have an emotional connection to water and through drought appear to have become more protective (starting to view water as an important resource?). Based on Auckland Quality of Life survey 63% of Aucklanders proud of look and feel of area for example, about half are worried about water pollution. Māori (62%) and European (52%) were significantly more likely to feel water pollution is a problem in their area. Asian (31%) respondents were significantly less likely. Noted that for land use under Auckland Unitary Plan– landscape quality ranking – water features or water views are hugely valued by Aucklanders.</p> <p>Hard to connect with infrastructure that you can’t see (reticulated network). Many people hold connection with water supply dams and catchments and Māngere Waste Water Treatment Plant used regularly by bird watchers.</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			People who scored highly tended to base this on connection with receiving environment. Opportunities to improve connection with water assets such as green infrastructure through improved urban spaces and engagement.
2.3. Shared ownership, management and responsibility of water assets	2	Medium	<p>Clarification at outset that we were focussed more on metro Auckland urban areas and not satellite towns (although same issues important). Question raised as to why distributed water assets (and ownership) are preferable to centralised. Noted there are pros and cons with shared ownership and that questions around resilience to climate change is important. Move to increased rainwater reuse tanks discussed with some disagreement on benefits – need to consider full range of benefits rather than focus on potable water augmentation only. Clarification provided by WSC (Jamie) that the Index is not saying that we need to shift fully to decentralised. Rather the indicator is asking how community members are supported if they want to adopt a decentralised system.</p> <p>In general terms Auckland remains reliant on centralised potable water distribution system (with multiple water sources) and largely centralised wastewater. Almost all ownership by Auckland Council and CCO's. Stormwater owned by Auckland council but assets more distributed by nature. Value in increasing understanding broad Pros and Cons of move to more distributed ownership.</p>
2.4. Community preparedness and response to extreme events	2.5	Medium	<p>Noted that Auckland Council don't actually have a legal requirement to educate the public about specific flood risks. A disclosure regime is focussed on including on property Land Information Memorandum (LIM) reports etc rather than direct disclosure. Increased disclosure currently viewed as a moral question. Considered that public willing to play their part when informed (social media). Watercare work with communities around supply dams where localised risks from extreme events exist.</p> <p>Opportunity to firstly understand risks across water system (including climate change at a range of scales) and inform communities more.</p>
2.5. Indigenous involvement in water planning	Please see notes	Medium	<p>Auckland Council has accepted that the Water Sensitive Cities framework is not entirely fit-for-purpose for Auckland. This is because it does not account for the Te Tiriti relationship and context of New Zealand, or Auckland.</p> <p>During the session participants agreed a score of 4 after agreeing to apply the indicator descriptions as written. While the score on this index may provide for some comparison internationally, this is not recommended. There are legal requirements in Aotearoa New Zealand for indigenous involvement.</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			<p>In Auckland there are provisions for engagement and participation of mana whenua and Māori for example through the Independent Māori Statutory Board, and mana whenua fora and partnerships.</p> <p>Participants agreed that there is much work to be done in this space to reach Tāmaki Makaurau – Auckland’s aspirations and that a single indicator could not describe these. Please see section 2.1 for discussion on a parallel process.</p>
3. Achieve Equity of Essential Services			
3.1. Equitable access to safe and secure water supply	4	High	<p>Watercare meets water supply safety and security standards and has a KPI for water affordability with water costs less than 1.5% of mean household income, and are performing well, currently 0.77%. However, this metric is based on mean incomes only and water could still be above 3% of income for some households (Estimated at 50,000 dwellings assuming average water bills). Support for disadvantaged groups through Watercare Hardship Fund is limited and has low uptake. Water Strategy will target improvement disadvantaged access. Central Government (via Kainga Ora) cover the costs of water services to approximately 28,000 state houses which could otherwise be a burden on low socio-economic tenants.</p>
3.2. Equitable access to safe and reliable sanitation	4	Medium	<p>Sanitary connections are available across the Watercare network, with on-site wastewater for peri-urban areas effectively providing sanitation for all. Treatment plant compliance and network discharge consents manage discharges, however there are still overflows across the network leading to public health risk. While a small part of the Urban region, the quality of on-site wastewater discharges is likely somewhat variable.</p>
3.3. Equitable access to flood protection	3	Medium	<p>Less than 1% of people at severe risk of life. While not life threatening as per the focus of the indicator, an estimated 20% of Aucklanders are affected by flood plains or overland flowpaths, with flood management measures not universal. Resilience surveys reveal people feel affected by severe weather. Areas for improvement include private development, shortfalls of rules adopted through unitary plan. Difficulty to assess cumulative effects, and education for preparedness. A “too much water” policy is under development to address some of the issues and to reduce risks.</p>
3.4. Equitable and affordable access to amenity values of water-related assets	3	Medium	<p>Auckland is a coastal city with extensive coastlines. 25% of permanent streams in the RUB are in parks. Auckland Council hasn’t undertaken specific spatial analysis of Amenity value and access however distribution is considered to be inequitable, with cost to travel for some, and safety limiting access for some. Park’s access statistics relating to water amenity values were unknown. Watercare assets open for public, e.g., water supply dams, Mangere and Omaha wastewater treatment areas have high use by public. Existing water sensitive assets are not often accessible to public (i.e., stormwater ponds) though this is increasing through assets built in public parks and town centres with distributed WSUD devices. Eke Panuku and Healthy Waters are working to implement regeneration, e.g., Te Auaunga, Te Awa Awataha, and Puhinui, Council’s stormwater department</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			include amenity aspects to their projects as their “way of building”. the consensus among participants is that while the examples have been increasing, high accessibility has not reached most areas.
4. Improve Productivity and Resource Efficiency			
4.1. Benefits across other sectors because of water-related services	3	Medium	<p>Six capitals (Natural Environment, People and Culture, Customer and Stakeholder Relationships, Assets and Infrastructure, Intellectual Capital, and Financial Capital and Resources) intended to be used in all business cases by Watercare but quantification is the challenge. In the transport stormwater network, benefits from water sensitive design approach are significant. Whilst these benefits are readily described they tend to get value engineered out which suggests quantification is also a challenge. Overall, the level of quantification is not consistent across all agencies.</p> <p>Existing tools such as ‘More Than Water’ tool (developed by Manaaki Whenua to assist assessments of projects in terms of costs and benefits of adopting water sensitive design projects) provide means of visualising benefits; these can resonate with engineers. From a consenting perspective, developers can come back later and go for Sec 127s (change of consent conditions) to remove need for water quality assets due to capital costs.</p>
4.2. Low GHG emission in water sector	3	Medium	<p>Noted that in Aotearoa we have a very low-carbon energy supply through dominance of hydropower sources. Any power from coal (Huntly) is fed to national grid so not user specific. Discussion included the importance of embodied carbon in infrastructure rather than just operational carbon. Follow up from WSC highlighted that this indicator is typically only considering operational carbon – therefore some participants may have scored this indicator lower due to current lack of formal consideration of embodied carbon which will improve with Healthy water carbon portal in coming years.</p> <p>Watercare have reduced emissions through uptake of solar arrays at plants etc and methane capture to reduce emissions and utilise energy. Overall Watercare report 90 tonnes/1000 properties per year, stormwater not reported. Decarbonisation at Watercare looking to reduce operational carbon by 50% by 2030 with plans to put treatment plants fully off grid (this was not factored into scoring of current performance).</p> <p>Overall, it was considered that Watercare were doing well with Low CHG emissions but significant work still to do across Auckland Council and AT.</p>
4.3. Low end-user potable water demand	3	High	Existing reported water use at cusp between ratings of 3 and 4 (250l/pp/day). Noted that recent drought has reduced demand but it is expected that it will bounce back once restrictions lift. Active work with larger commercial water users e.g., food and beverage sector on how they can improve

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			<p>with limited campaigns to encourage reduced residential water use. Recognised that Auckland is doing well compared to other cities across Aotearoa but work to do.</p> <p>Watercare have undertaken over 6000km of leak detection in mains water pipes to reduce losses. Watercare to commence roll out of smart meters across larger commercial users and schools with smart meter residential programme to follow. These future meters were not considered in scoring.</p> <p>Question raised as to suitability of targets and whether they adequately reflect regional hydrology? i.e., wet or dry cities. This was noted as a point given that the benchmarking is intended to be used across geographies and the fact that in all cities water is a precious resource.</p> <p>Projection and modelling shows there is room to improve over time with demand and Auckland Council has recently adopted targets for water consumption for 2025, 2030 and 2050 that will reduce demand through collective Council Group action.</p>
4.4. Water-related business opportunities	2.5	Medium	<p>Question raised around whether private business input is beneficial. Clarification from WSC moderator that indicator is not meant to reflect privatisation but rather it's talking to is contributing to economic prosperity for Auckland. How can we create opportunities for that?</p> <p>'Two in a ute' program (enabling program to support small business operators to undertake inspection and maintenance on council owned green assets) considered a good example with huge opportunities to involve broader commercial operators in maintenance and operations. Opportunity for businesses for carbon sequestration as a better use of unproductive land.</p> <p>In some other sectors, having open data has driven innovation so that is something to think about for the water sector. "Safety to fail" within council group where risks are understood and manageable can also really stimulate the innovation space.</p> <p>Discussion on role of data to enable innovators and entrepreneurs to understand opportunities. Need for transparency and exchange of data to support transition.</p> <p>Noted potential for local/central government to support innovation – best way to support innovation is to get out of the way?</p>
4.5. Maximised resource recovery	3	Medium	<p>Watercare recovers biogas from wastewater plants and a nursery has been developed which is growing 10000 trees, using recovered biosolids and treated effluent. Plan to upgrade this to 100,000 trees. Recently developed a biosolids strategy, some will go through worm farms with next steps</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			<p>looking at water treatment sludge for reuse. New team looking at recycled water but currently not being recovered. Started pasture trials with struvite nutrient recovered from water treatment process.</p> <p>AT harvesting some roof run-off to flush toilets at in new subdivisions and promoting sustainable procurement action plan requirement to use non potable water for non-potable water activities (e.g., dust suppression). More work to do with construction waste.</p>
5. Improve Ecological Health			
5.1. Healthy and biodiverse habitat	2	Medium	<p>Approximately 23% of permanent streams within the Rural Urban Boundary are piped. State of Environment reporting demonstrates urban land use stream ecological performance is low as exhibited by MCI impacted by contamination and flushing flows. Some restoration and mitigation activities and some reducing contaminants are improving conditions in some areas. Riparian vegetation is often poor condition and lack of riparian shade contributes to temperature as an issue. Ongoing stream loss is occurring. Connectedness both from mountains to sea and across other ecological corridors is patchy and effectiveness of restoration practices relies on connectedness. Complexity of ecosystem function and contribution from peri-urban and regional stream health adds to conceptual range.</p>
5.2. Surface water quality and flows	2	High	<p>State of Environment shows failing stream grades against NPS, Copper, Nitrate and Ammonia less of issue than Zinc, e.coli, phosphorous and sediment. Approximately 20% of area inside Rural Urban Boundary has some form of downstream stormwater management (treatment or detention). Annual Low flows are consistent. Wet weather flows increased by impervious runoff, baseflows potentially reduced. Complexity of Healthy Ecosystem definition for marine, freshwater and biodiversity.</p>
5.3. Groundwater quality and replenishment	2.5	Low	<p>Indicators include protection of groundwater quality and quantity and resultant support of ecosystems. Groundwater quantity indicators are positive with no signs of depletion of urban levels and flows. Non volcanic aquifers not highly monitored and may suffer from urban stream syndrome with less infiltration and flashy wet weather flows. Groundwater dependant ecosystems are severely depleted through reclamation, with little knowledge on microbial ecosystems. Untreated soakage discharges, and potential wastewater sources impact on basalt aquifer water quality. Score and confidence lowered due to knowledge gaps on ecosystem and sandstone aquifers.</p>
5.4. Protect existing areas of high ecological value	2.5	Medium	<p>Elements across indicators 2,3 and 4. Policy and Legislation exists in the Auckland Unitary Plan Significant Ecological Areas, Department of Conservation Consent Processes and Covenants. Water infrastructure follows these processes but blanket tree protection has gone and the strongest protection outside of urban areas. Stream reclamation rules exist however consent processes chip</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			away at protection outcomes and policy could be strengthened. Approximately 23% of permanent urban streams are piped. Mapping of value (and access equity) may be limited.
6. Ensure Quality Urban Space			
6.1. Activating connected pleasant urban green and blue space	3	Medium	Greenway strategies have been developed and implemented for parts of the city at the local board level. Lots of good exemplars exist both on the coast and inland but distribution is unequal. Some questions whether we are taking full advantage of water as a connector and drawing blue green into the growth and activity nodes of town centres. While some iconic parks celebrate blue green networks, many natural waterways are not accessible. Tensions exist in land vesting processes and ongoing maintenance costs due in part to consent process time pressures and some water sensitive opportunities in development s are being lost. Weed management on various water-related public open space is a challenge.
6.2. Urban elements functioning as part of the urban water system	2	Medium	Heat mitigation is not planned for. Some good examples such as the City centre waterfront, Karangahape Road and Hurstmere Road. AT looking to set targets including climate change adaptation road raingardens on new developments but lacking built form. Approximately 0.25% of Urban area in treatment devices including ponds, wetlands, biofilters and dry detention ponds. some wetland and raingarden retrofits. Very few Green roofs and green walls, rain tanks often poorly integrated to built form. Opportunities to better integrate precinct, neighbourhood and higher density building design as functional water elements such as green roofs.
6.3. Vegetation coverage	2	High	Urban Ngahere (Forest) Strategy (2019) sets out 30% target with no less than 15% (includes Private properties) Currently vegetation coverage for Roads and Parks (Public Realm) at 20%. Some inequity of distribution across the urban region with less vegetation in the south. Loss of general tree protection and compliance with remaining protection is an issue. Ngahere strategy being progressed with Ngahere growing programmes with increased funding planned. Proximity of regional parks and other non-urban areas contribute to greater overall vegetation access for Aucklanders.

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
8. Promote Adaptive Infrastructure			
Goal 7 introduced with case study slides of what innovation with adaptive infrastructure could look like based on international exemplars. Hassalo on Eighth (Portland/Oregon), Aquarevo (Melbourne) and Copenhagen integrated flood management.			
<i>Breakout room discussion prior to Indicator:</i>			
<ul style="list-style-type: none"> • Insights around needing to create a "safe-to-fail" culture to identify levers, barriers and to practice getting it right. • Key points about a lack of incentives to adopt more innovative adaptive infrastructure. And appropriate solutions being enablers in the right place (i.e., where there is an opportunity to take pressure off the traditional water, wastewater or stormwater infrastructure). • Existing Regulatory roadblocks raised and legislative barriers. • Cost/value discussion – current low-cost model isn't driving change. How we need to look to the future, i.e., Board of Inquiry re Waikato river take, need to plan for future reconnecting of Māngere, and that we are relatively water quantity rich with our aquifers but need to protect quality. • Inflexibility to innovative solutions due to reliance on minimum design standards / lack of incentives not encouraging it. • Need for local government and central government to champion innovative solutions through Kainga Ora, Ministry of Housing and Urban Development, Eke Panuku etc. 			
7.1. Diversify self-sufficient fit-for-purpose water supply	3.5	Medium	<p>Good diversity and adaptive source selection in mains water supply with sources including catchment dams, Waikato river take and some aquifers. Ability to select optimal source depending on range of factors with good supply reliability at all times. General agreement that current system performs well in terms of adaptiveness of centralised system but work to do in other areas such as using recycled wastewater, uptake of rainwater tanks with fit for purpose reuse and distributed stormwater harvesting. Following recent drought there appears to be move towards promotion of rainwater tanks but still limited advice on how best to use tanks in city (limited advice on range of inter-related benefits?). Works to identify de-centralised non potable sources for commercial uses good initiative and AT move to require non potable water in construction to be from alternative sources starting to influence change.</p> <p>Work to do with quantification of benefits of more decentralised sources at variable scale.</p>
7.2. Multi-functional water infrastructure system	3	High	<p>Public access to water supply catchment (especially Waitakere Ranges) enable people to enjoy natural reserves and protected forest. Panuku delivering flood storage integrated with sports fields but note ongoing challenges with parks managers and misunderstanding with impacts on drainage etc. Few examples of new infrastructure builds (pump stations) with integrated landscape amenity and public facilities (public toilets) to support multi-function outcomes. Recognition that change will take time but increasing examples of where landscape amenity and integrated ecology into water</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			<p>projects such as Te Auaunga/Oakley Creek, New Lynn culvert, Long Bay, Flat Bush and La Rosa daylighting.</p> <p>Accepted that there are a number (and increasing) of great examples but still not a BAU mindset for all new infrastructure. Part of the challenge is that stakeholders being driven by different motives e.g., open space, stormwater, wastewater etc without a joined-up view. Noted that at the end of the day the customers are the same people and examples where cross agency and community input is basis of shared vision and objectives proving successful to move things forward where adopted.</p> <p>High confidence reflects the increasing number of real-world examples but overall, more effort needed to normalise multi-functional infrastructure system.</p>
7.3. Integration and intelligent control	3.5	Low	<p>Wastewater system is highly telemetered with real-time data inputs and some automation to optimise flows and pump arrangements. All alarms are actively monitored 24/7. The Watercare Nerve centre is a recently competed data acquisition and control room. This includes cross sector partnership between Watercare and council's stormwater department and integrates SMART management of customers, operations and environment. Flood forecasting getting more automated and Safeswim program provides predictive water quality reporting to inform communities more proactively.</p> <p>No intelligent control of decentralised systems (such as house scale technologies seen in case studies). Room to embrace innovation at local scales.</p>
7.4. Robust infrastructures	3.5	High	<p>Water supply considered to be very robust/reliable, but wastewater has less redundancy. Programs to monitor infrastructure integrity and prioritise capital works with critical assets (such as CCTV program). Recent investments in energy resilience for key assets such as batteries, generators and on-site generation for pump stations etc. All treatment plants have duplicate incoming power lines and standby generators with ability to withstand power outages without disruption.</p> <p>Noted that central interceptor will likely improve future wastewater outcomes but the current occurrence of wastewater overflows and stormwater impacts reduce current robustness ranking.</p>
7.5. Infrastructure and ownership at multiple scales	2	High	<p>Recognition that overall system is reliant on central ownership with negligible shared ownership. Discussion on role of residential rainwater tanks, current work on plan change to require on new builds but current experience is that getting people to plumb in for internal re-use is challenge. Lack of clear requirements considered barrier. The current unitary plan change may remove discouragement but may not be effective as encouragement.</p>

Indicator	Rating 0 to 5	Confidence High/Med/Low	Discussion
			Opportunity to increase shared ownership of aspects of water system based on realistic understanding of risks (human health, environmental and resilience).
7.6. Adequate maintenance	3.5	Medium	<p>Tendency for small, distributed raingardens in road corridor that have adverse impact on maintenance due to high cost when compared to larger consolidated raingardens in public realm. Healthy Waters are active in guidance, training and funding for maintenance. Recognition that still resolving some historic issues from previous individual councils prior to amalgamation. Limited funding for monitoring of private assets to ensure these are being maintained appropriately.</p> <p>Overall score did not meet the description for 4 due to challenges with maintenance of existing road assets and private devices (commercial and residential). Opportunity to develop proactive monitoring program.</p>



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