7.1 Diverse fit-for-purpose water supply system - To provide a flexible and adaptive water supply system appropriate to the quality water and demand requirements of the end user.

Objectives	Rating Scale	Guiding questions	Suggested data collection sources	Facilitator guiding questions and notes
Water system design To provide a flexible and adaptive water supply system appropriate to the quality water and demand requirements of the end user.	1. Water supply system is **vulnerable** and not backed up by systems and processes to make it secure. It often relies for the most part on a **single centralised distribution network** and **one source** for consumers. The system is **locked in**, and the only change considered to meet increasing demand is augmentation of legacy infrastructure. 2. Water supply system relies for the most part on a **single centralised distribution network** supplied by **one source** and may be **supplemented** by a **secondary centralised supply network** based on a **fit-for-purpose water supply** in **some areas**. The **system is substantially locked in** even though some alternative solutions may be present. Radical system change would be necessary as the alternatives are technically or politically challenging or simply not viable. 3. Water supply system relies for the most part on a **single centralised distribution network** but is supplied by **more than one type of source** for consumers. Alternative augmentation options are being considered but yet to be confirmed. There is still a strong commitment to maintaining the existing centralised supply model. 4. Water supply system relies on a **diversified mode of supply** with **access to multiple fit-for-purpose water supplies** across different areas. The system is reasonably flexible, and a **portfolio of alternative options** is available and implementation plans are ready for augmentations or responding to supply shortages. 5. A **diversified water supply system provides fit-for-purpose water**. Appropriate source and quality water for different end uses, is available to (almost) **all consumers**. The system is highly flexible; and local supply and treatment options are designed and managed in an integrated manner. **Portfolios of alternative options** for augmentation are available and implementation plans are ready. **Implementation can be gradual** and step wise because a **long-term strategy is in place for adaptation of legacy infrastructure**. The system is able to rapidly switch between sources if/when needed.	**Water system design** What sources of supply are currently available and at what capacities? How easy is it to switch between them? Are alternative options and contingency plans in place to respond to shortages of supply if required? Are any sources of water dependant on supplies from other countries? What are the city water policies and strategies that take into account fit-for-purpose water supplies? Are there plans that identify alternative options? Does legacy infrastructure lock the system into high cost or high impact (environmental or social) augmentation? Have alternative water supply options with lower cost or impacts been explored? Have alternative water supply options with lower cost or impacts been implemented? To what extent? Are contingency plans in place for alternative water supply options to be implemented when shortages or other supply issues arise? Are there policies and regulations in place to allow for third parties to provide alternative water supply systems?	Proportion of customers (residential and industrial) that have alternative water assets, e.g. recycled water, rainwater tanks, onsite recycled water Existing policies and strategies Inventory of assets (identify sources outside of country borders) and supplies: - catchment/river sources - recycled water - rainwater (roof runoff) - groundwater - stormwater - desalination or other Overview of water supply system Plans and strategies e.g. long-term strategies for the water supply system to accommodate population growth and a changing climate Thresholds and triggers for implementing alternative options	**Hierarchy** • Single source and single system and unlikely to change due to system lock in. • Increasingly diversified supply sources and supply network with flexible options for augmentation. • Adaptation of legacy infrastructure also underway. **Examples** Perth has increasing dependence on desalination and groundwater but generally using a centralised delivery system. Now developing aquifer recharge using recycled water. Many households have an individual groundwater bore but these have historically been unregulated and not managed as an integrated part of the system. i.e. not all water supply is dependent on the centralised system but this has not come about because of integrated planning of the system. Score would be 3.5 to 4. **Definitions** 'Source' refers to catchment runoff, rainwater, recycled water, groundwater, licenced river extractions or desalination 'Fit-for-purpose water supply' refers to the appropriate source and quality water to supply different end uses, such as, recycled water for toilet flushing and garden irrigation Vulnerable system: subject to influence of political direction, economic investment, physical events **Common Q and A's** This is not about sustainability – e.g. desalinated water Acceptance of fit-for-purpose water – something to consider System needs to be designed and implemented **Must mention**

7.2 Multi-functional water system infrastructure - To provide multi-functional water infrastructure seamlessly integrated into the urban landscape.

Objectives	Rating Scale	Guiding questions	Suggested data collection sources	Facilitator guiding questions and notes
Water system design To provide multi-functional water infrastructure seamlessly integrated into the urban landscape.	1. Water infrastructure assets typically function to serve **a single purpose**. **These assets** (including the surrounding land) are **generally not available** for public access which is seen as conflicting with operational requirements. 2. **Most** water infrastructure assets (function to serve a **single purpose**. **Few** assets (including the surrounding land) are **available** for public access where not seen as conflicting with operational requirements. 3. **Some** water infrastructure assets are **multi-functional and co-located** with other assets to deliver multiple beneficial outcomes for the community. **Some** assets (including the surrounding land) are available for **public access**. Policy recognises public access as a benefit. 4. **Most** water infrastructure assets are **multi-functional and co-located** with other assets to deliver multiple beneficial outcomes for the community. **Most** assets (including the surrounding land) are available for **public access**. **Policies** are in place which recognise the benefit of multipurpose infrastructure and encourage public access. 5. **Almost all** water infrastructure assets are **multi-functional and co-located** with other assets to deliver multiple beneficial outcomes for the community. **Almost all** assets (including the surrounding land) are available for **public access**. The importance of multipurpose infrastructure and public access is taken for granted.	**Water system design** What is the major infrastructure for supply, wastewater treatment, flood and stormwater management (for example, reservoirs, treatment plants, retarding basins and floodplains)? What services do they provide beyond essential services? Do the site and/or assets have public access? Which assets? Do retarding basins or floodplains include stormwater treatment assets such as wetlands? Do they form part of an open space network? Is land, such as pipe easements, also used for other beneficial purposes? Are there policies in place which recognise the benefit of multipurpose infrastructure and encourage public access?	Water system description. What is the main purpose of the infrastructure? What other services do they provide? Refer to relevant websites - do the assets or surrounding land have public access? Contact water authorities about infrastructure services?	**Hierarchy** • Single purpose assets • Single purpose assets, few available to public • Some multi-functional and co-located assets, some available to public • Most assets are multi-functional and co-located, most are available to public • Almost all assets are multi-functional, co-located and available to the public **Examples** • Waterways are channelized, have few attractive elements, may be protected by fencing to exclude people • Retarding/detention basins may be single purpose and protected by fencing or alternatively, may be landscaped and incorporate community facilities such as trails and shelters. • Reservoirs may incorporate parklands **Definitions** 'Water infrastructure assets' can refer to reservoirs, treatment plants, retarding basins and floodplains. Includes both formal and informal uses/assets **Common Q and A's / Notes** There may be a difference between how water businesses typically manage their assets and councils. Need to take an overall view that considers all asset types. Ratings should be based on all infrastructure that services the area. For example, water supply reservoirs may not be within the geographic area being benchmarked but are included for consideration as part of the rating. Water or sewerage treatment plants are isolated and exclude community uses or may be more integrated into local urban or non-urban landscapes and support community uses. For example, Western Treatment Plant in Melbourne encourages bird watching activities and incorporates a 'discovery centre' for education. Singapore uses a recycled water plant for functions and events including weddings. **Must mention**

7.3 Integration and intelligent control - To optimise water system network performance through the use of a smart city approach.

Objectives	Rating Scale	Guiding questions	Suggested data collection sources	Facilitator guiding questions and notes
Water system design To optimise water system network performance through the use of intelligent control systems.	1. **Limited monitoring** and automated **control systems** in place. 2. Intelligent control typically limited to the monitoring and control of **systems in isolation** (e.g. water supply system only). 3. There are some examples of **monitoring and control** systems that are **integrated. Some assets owned by water authorities** are equipped with intelligent control systems. Where automated monitoring exists on council owned assets a manual response is typical. 4. Intelligent monitoring and control is used in **some parts** of the system allowing **multifunctional assets** to be **optimised**. Local examples of managing parts of the urban water cycle in an integrated manner exist. 5. Integrated intelligent system monitoring and controls are typical across **all scales**, and allows operation and performance of multifunctional assets to be **optimised**. System capacity and resources across all levels can typically be monitored and adjusted in real time.	**Water system design** Is there planning and management of water systems to achieve integration? Can the available solutions be applied for different benefits if required? What processes and techniques are in place (e.g. IT solutions, real time control systems, etc.)?	Water system description and infrastructure arrangements for managing supply (including alternative water sources), sewerage and drainage/flood control	**Hierarchy** **Hierarchy** is based on the degree to which • Monitoring and intelligent control provides feedback and system operation is adjusted in response. • All elements of the water system are monitored and operated with intelligent control systems. • Operation of different elements of the water system are integrated by monitoring and intelligent systems. **Examples** Intelligent control systems examples include: • Supervisory control and data acquisition (SCADA) systems. • Release of rainwater tank water or stored stormwater prior to intense rainfall events to allow for peak flow reductions downstream. Stored water is used as alternative water supplies during other times. • Irrigation systems coupled to respond to soil moisture sensors or weather monitoring systems. • Different water sources at different scales used dynamically to cope with demand changes or shocks. **Definitions** Integration may refer to: • Between sites and/or scale • Different elements of the water cycle **Common Q and A's** **Must mention**

7.4 Robust infrastructures - To create a water system network that is virtually insensitive to stresses through the use of redundancy measures and by-pass systems.

Objectives	Rating Scale	Guiding questions	Suggested data collection sources	Facilitator guiding questions and notes
Water system design To create a water system network that is virtually insensitive to stresses through the use of redundancy measures and by-pass systems.	1. The system is **highly sensitive** to stresses and the number and frequency of **failures** per capita per year is **very high**. 2. The system is **sensitive** to stresses though **some redundancy** measures are in place. The number and frequency of **failures** per capita per year is **moderate**. 3. The system is **fairly robust**. There are **some redundancy** measures and by-pass systems. Infrastructure integrity is **checked** on an **ad hoc basis**. The number and frequency of **failures** per capita per year is **low**. 4. The system is **robust**. There are **redundancy measures** and **by-pass systems**. Infrastructure integrity is **checked** on a **regular basis**. The number and frequency of **failures** per capita per year is **very low**. 5. The system is **highly robust** and **virtually insensitive to stresses and failures**. The system has **redundancy** and **by-pass systems** and infrastructure integrity is **actively monitored**. The number and frequency of **failures** per capita per year is **extremely low**.	**Water system design** What is the specified performance of key assets and the water system (level of service, design standards)? Is capacity sufficient to meet demand or loads? How often does the system fail? Can the system cope well with occasional failures? Are failures monitored and reported? What system or asset failures have occurred and how often? Consider formal and informal infrastructure. Stresses might be different in different contexts.	Performance standards relative to the stressors of the water system and the operational capacity KPI's and performance data (including failure data) Complaints made by the community	**Hierarchy** **Hierarchy** is based on resilience of water systems and the integrity of infrastructure and systems, and ultimately reflected in the frequency of failures. **Examples** • Loss of services due to asset failures (pipes, pumps, control systems. • Ability of system to cope with failures by-pass systems and in-built work-arounds. **Definitions** Failures: not performing as designed and having negative impacts Stresses: external factors putting pressure on system performance (e.g. climatic extreme, interference by people, neglect, human error) **Common Q and A's / Notes** This indicator refers to supply, sewerage and drainage systems. Flooding is only an indicator of system failure if it is related to asset failure (collapse, blockage etc.), or failure of monitoring and warning systems. **Must mention**

7.5 Infrastructure and ownership at multiple scales - To optimise water system performance through the integration of centralised and decentralised infrastructure.

Objectives	Rating Scale	Guiding questions	Suggested data collection sources	Facilitator guiding questions and notes
Water system design To optimise water system performance through the integration of centralised and decentralised infrastructure.	1. Essential services owned and operated by **one or a very small number** of **centralised authorities**, and are **locked in** to this approach. **Decentralised and onsite water systems** are used by property owners to supplement poor or non-existent central services and are often poorly constructed and maintained by property owners. 2. Essential services are owned and operated by **one or a very small number** of **centralised authorities,** and are **locked in** to this approach. **Policy and regulation** discourage or are silent on the use of decentralised and on-site systems. The vulnerability of this system is recognised and actions are being taken to consider diversifying the infrastructure scales. 3. Essential services are mostly owned and operated by **one or a very small number** of **centralised authorities**. **Decentralised and onsite systems** are **encouraged** and part of integrated water system planning for the city. 4. Essential services are owned and operated by **one or more authorities**. **A combination of centralised/decentralised infrastructure** is **common** and is **planned and operated** as part of an integrated and **well-maintained system**. Private companies have opportunities to own and operate water system assets and be part of the integrated service provision. 5. Essential services are owned and operated by a **combination of property owners**, **companies and one or more authorities**. Diversified and decentralised water system services are **planned and operated** as part of an integrated system which includes increasing neighbourhood run cooperative facilities such as rainwater harvesting schemes.	**Water system design** What are the available water services and what scale do the different services operate? (e.g. bore water in x% households) Who owns and operates the services? Is there integrated oversight and management?	Ownership the water system with respect to supply (including alternative water sources), sewerage and drainage/flood control Policies and strategies related to the planning and operation of the water system	**Hierarchy** • Only centralised system and single authority present • One or multiple authorities, decentralised systems not encouraged • Centralised system present, decentralised systems encouraged • Centralised system present, decentralised planned for and maintained • Combination of centralised and decentralised system, diversified ownership and operation contribute to highly resilient and efficient system **Examples** **Decentralised and onsite water systems:** rainwater tanks, domestic wastewater systems, groundwater bores, rain gardens **Definitions** **Common Q and A's / Notes** Septic tanks should only be considered as an appropriate decentralised response in a non-service area. They must be well maintained and not contributing to downstream environmental issues. **Must mention**

7.6 Adequate maintenance - To undertake appropriate maintenance policies and practices ensuring operation and maintenance of all water infrastructure (including green infrastructure)

Objectives	Rating Scale	Guiding questions	Suggested data collection sources	Facilitator guiding questions and notes
Operation and maintenance To undertake appropriate maintenance practices ensuring the long term integrity of all water infrastructure (including green-blue assets). **Policy and strategy** To provide clear and transparent policies for the operation and maintenance of all water infrastructure.	1. Evidence of **systematic failure** of traditional water infrastructure. There are **inadequate budgets** allocated to maintain the long term water system performance. 2. **Some** evidence of **systematic failure** of traditional water infrastructure. System **maintenance** addresses immediate needs of **aging infrastructure**, although an extensive backlog of activities may exist in some areas resulting in a **decline in the standard of service** provided. 3. Access to adequate **funding** for maintenance activities is **limited**. **Maintenance guidelines** and procedures are **widely available** for traditional water infrastructure. Long term maintenance needs of traditional water infrastructure are well understood and undertaken to a reasonable standard. Maintenance procedures for **green-blue assets** are **less well understood** and often **inadequately undertaken**. Asset registers for green infrastructure are starting to be developed. 4. Access to **funding** for maintenance activities **is available**. Long term maintenance needs of traditional water infrastructure and **green-blue assets** is **well understood**, planned for and **undertaken** to a reasonable standard. **Maintenance guidelines** and procedures are **widely available** for all water related infrastructure including green-blue assets. **Assets** are all recorded on a GIS system supported by **comprehensive databases.** 5. Access to **adequate funding** for maintenance activities is available (perhaps secured through user-based charges). Long term maintenance needs of traditional water infrastructure and **green-blue assets** is **well understood**, planned for and **undertaken** to a reasonable standard. **Maintenance guidelines** and procedures are **widely available** for all water related and green-blue infrastructure. **Assets** are all recorded on a GIS system supported by **comprehensive databases**. Asset audits and **proactive maintenance** programs are undertaken. **Asset information** is used to **adapt practices** and **support innovation**. **Co-operation** between **multiple asset owners** occurs to ensure all assets at all scales are maintained to enable integrated operation.	**Operation and maintenance** What is the specified maintenance of the water related assets (supply, sanitation and stormwater, including blue-green infrastructure)? Do responsible authorities allocate appropriate budgets to maintenance to ensure there is no decline in the condition of the asset? What is the budget allocation for maintenance? Are failures monitored and reported? A formal asset management systems in place? Do they include all asset types e.g. waterways, vegetation? **Policy and strategy** What are the existing policies and strategies related to the operation and maintenance of the water system? What maintenance guidelines are available? What asset management systems are used?	WSUD maintenance manuals and audits Budget allocations for maintenance Formal asset management systems	**Hierarchy** **Hierarchy** is based on level of maintenance of water infrastructure, extent to which green-blue infrastructure is maintained and integrated into asset management systems and the degree to which asset information is used to adapt practice and support innovation and shared between asset operators. **Examples** Failure due to maintenance, not external stresses. E.g. Rain garden failed because it was clogged with rubbish (Indicator 7.4 Robust infrastructure also captures failures but due to it being poorly designed) **Definitions** ‘Traditional water infrastructure’ refers to supply, sewerage and stormwater assets ‘Green-blue assets’ refers to waterways, open space, trees, WSUD, SQID or LID, such as wetlands, tree pits, rain gardens, infiltration systems. **Common Q and A’s** Indicator 7.4 Robust infrastructures is about the design, this indicator is about maintaining what has been built **Must mention**