AdaptWest

Integrated Vulnerability Assessment: Environment and Natural Resources
Workshop Summary

During March 2015 three workshops were held for AdaptWest to gather input to the Integrated Vulnerability Assessment (IVA) process. Workshops were held in relation to three themes - Environment and Natural Resources, Economy and Infrastructure and Social and Community.

This summary relates to the Environment and Natural Resources workshop.

Objectives of the workshop

The objectives of the workshop were to bring together a range of stakeholders that have a role or interest in the Western Adelaide Region to:

- Explain the IVA process;
- Involve stakeholders in confirming, refining and adding to the 'first pass' assessment undertaken by the AdaptWest project team; and
- Draw on the expertise and knowledge of stakeholders to complete the IVA.

Workshop process

Participants at the workshop were assigned a group and tasked with assessing a selection of indicators using the IVA framework.

The IVA is a tool that helps to identify areas of vulnerability to the impacts of climate change. The IVA is designed to consider both the potential impacts of climate change (exposure and sensitivity) and the adaptive capacity of the region (the attributes that support its ability to cope or adjust to climate change impacts).

At the Environment and Natural Resources workshop the following aspects and features were assessed:

- Condition and extent of beaches and dunes
- Condition and extent of native vegetation cover by vegetation type
- Condition and extent of native vegetation cover by vegetation type (Native wetland and riparian plant communities)
- Condition of benthic habitat (e.g. sea grass, pests)
- Quality of water – coastal/estuaries
- Quality of water - inland waters

During the workshop participants confirmed the preliminary assessment undertaken by the project team in relation to the aspects or features listed above. Participants also considered the aspect or feature's ability to adapt, referred to as its adaptive capacity. In discussing adaptive capacity, a number of opportunities to adapt were also identified which will be taken through to the next stage of the project.

At the workshop, a facilitator facilitated and recorded discussion and entered scores in relation to the assessment directly into an Excel spreadsheet. During this process it was emphasised that the qualitative information being collected during discussion amongst participants was just as, if not more important, than the numbers being entered.

The information collected by this process as input to the IVA being prepared for AdaptWest is provided in the attached Excel spreadsheet.

Next steps

The information collected across the three IVA workshops will be consolidated, documented and analysed in the IVA report to be prepared for stage two of the AdaptWest project. The information collected will directly inform the identification of key areas of vulnerability and resilience for the Western Adelaide Region and drive the adaptation planning process to be undertaken in stage three of the project.

Grouping	Subgroup	Indicator /s	Feature to score	Exposure (Climate Variable)	Exposure Score	Sensitivity to Climate Variable	Comment	Potential Impact	Adaptive Capacity Score	Adaptive Capacity Workshop Comment	Vulnerability Score	Adaptation Options
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Coastal shrubland and remnant dune vegetation (including Spinifex grassland)	Sea level rise	5	5 - High	Coastal shrubland will be impacted by sea level rise through loss of habitat such as dunes.	10	2	Urban development restricts the movement of dunes inland. Lost a lot of beach near Semaphore last year. Out front of Largs Bay has become wider. Dunes that are well stabilised are not necessarily gong to blow inland. Narrower range of vegetation is impacting succession rates of vegetation.	18	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Coastal shrubland and remnant dune vegetation (including Spinifex grassland)	Heat wave increase frequency and intensity	5	3 - Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	8	4	Increasing drought periods may make vegetation more susceptible to dieback. Reducing resilience. Large number of plantings after drought at Barker Inlet died off because no follow up rainfall. Local knowledge and volunteers is important to know how, where and when to plant. Some Councils have already adapted their planting regimes by deep stemmed planting and different watering regime e.g. At least one watering during summer. Prolonged periods of hot weather can have a greater impact on coastal areas through greater usage. Human impact can be important. In natural setting adaptive capacity would be moderate to high, but given human impacts adaptive capacity scores is low-moderate.	14	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Coastal shrubland and remnant dune vegetation (including Spinifex grassland)	Rainfall reduction: winter-spring	5	3 - Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	8	4	Increasing drought periods may make vegetation more susceptible to dieback. Reducing resilience. Large number of plantings after drought at Barker Inlet died off because no follow up rainfall. Local knowledge and volunteers is important to know how, where and when to plant. Some Councils have already adapted their planting regimes by deep stemmed planting and different watering regime e.g. At least one watering during summer. Prolonged periods of hot weather can have a greater impact on coastal areas through greater usage. Human impact can be important. In natural setting adaptive capacity would be moderate to high, but given human impacts adaptive capacity scores is low-moderate.	14	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Coastal shrubland and remnant dune vegetation (including Spinifex grassland)	Rainfall intensity increase	5	3 - Moderate	Localised impacts only from increased rainfall intensity. Erosive impacts unlikely as no major discharges occur through areas of coastal shrubland and remnant vegetation.	8	5	Increasing drought periods may make vegetation more susceptible to dieback. Reducing resilience. Large number of plantings after drought at Barker Inlet died off because no follow up rainfall. Local knowledge and volunteers is important to know how, where and when to plant. Some Councils have already adapted their planting regimes by deep stemmed planting and different watering regime e.g. At least one watering during summer. Prolonged periods of hot weather can have a greater impact on coastal areas through greater usage. Human impact can be important. In natural setting adaptive capacity would be moderate to high, but given human impacts adaptive capacity scores is low-moderate.	13	

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Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Coastal shrubland and remnant dune vegetation (including Spinifex grassland)	Temperature increase	5	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.(AC Species composition may change)	7	4	Increasing drought periods may make vegetation more susceptible to dieback. Reducing resilience. Large number of plantings after drought at Barker Inlet died off because no follow up rainfall. Local knowledge and volunteers is important to know how, where and when to plant. Some Councils have already adapted their planting regimes by deep stemmed planting and different watering regime e.g. At least one watering during summer. Prolonged periods of hot weather can have a greater impact on coastal areas through greater usage. Human impact can be important. In natural setting adaptive capacity would be moderate to high, but given human impacts adaptive capacity scores is low-moderate.	13	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Coastal shrubland and remnant dune vegetation (including Spinifex grassland)	Rainfall reduction: summer-autumn	2	3 - Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	5	4	Increasing drought periods may make vegetation more susceptible to dieback. Reducing resilience. Large number of plantings after drought at Barker Inlet died off because no follow up rainfall. Local knowledge and volunteers is important to know how, where and when to plant. Some Councils have already adapted their planting regimes by deep stemmed planting and different watering regime e.g. At least one watering during summer. Prolonged periods of hot weather can have a greater impact on coastal areas through greater usage. Human impact can be important. In natural setting adaptive capacity would be moderate to high, but given human impacts adaptive capacity scores is low-moderate.	11	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Eucalyptus woodland	Rainfall reduction: winter-spring	5	4 - Moderate to High	Eucalypt woodlands are more typical of moderate rainfall areas in the state (e.g. 250 to 600 mm). Woodlands are less sensitive to temperature than rainfall.	9	4	Area has been fenced off which has protected the soil surface. There is greater habitat value. Regeneration from existing seedbank. Because it is well established it has higher adaptive capacity. There is a potential impact from pest species such as fungii, insect species, foxes. Small size means it has lower adaptive capacity.	15	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Eucalyptus woodland	Heat wave increase frequency and intensity	5	3 - Moderate	Eucalypt woodlands are more typical of moderate rainfall areas in the state (e.g. 250 to 600 mm). Woodlands are less sensitive to temperature than rainfall.	8	4	Area has been fenced off which has protected the soil surface. There is greater habitat value. Regeneration from existing seedbank. Because it is well established it has higher adaptive capacity. There is a potential impact from pest species such as fungii, insect species, foxes. Small size means it has lower adaptive capacity.	14	
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Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Eucalyptus woodland	Rainfall reduction: summer-autumn	2	3 - Moderate	Eucalypt woodlands are more typical of moderate rainfall areas in the state (e.g. 250 to 600 mm). Woodlands are less sensitive to temperature than rainfall.	5	4	Area has been fenced off which has protected the soil surface. There is greater habitat value. Regeneration from existing seedbank. Because it is well established it has higher adaptive capacity. There is a potential impact from pest species such as fungii, insect species, foxes. Small size means it has lower adaptive capacity.	11	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Mangroves	Sea level rise	5	5 - High	Highly sensitive to sea level rise. Although it can tolerate daily inundation it cannot tolerate permanent deep inundation.	10	2	In Mangrove Cove, mangroves are moving into samphire flat areas. Local observations of ability for mangroves to re-establish. Areas such as Torrens Island, they will be able too move further inland. Mangroves typically grow in areas that have been impacted by industrial/urban development.	18	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Mangroves	Rainfall intensity increase	5	4 - Moderate to High	Localised impacts only from increased rainfall intensity. Erosive impacts may occur from localised stormwater discharges as well as additional siltation of the root zone.	9	8		11	

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Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Mangroves	Heat wave increase frequency and intensity	5	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	7	8	Already growing in areas of the State with lower rainfall and higher temperatures.	9	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Mangroves	Rainfall reduction: winter-spring	5	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	7	8		9	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Mangroves	Temperature increase	5	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	7	8		9	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Mangroves	Rainfall reduction: summer-autumn	2	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	4	8		6	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Samphire shrubland	Sea level rise	5	5 - High	Unable to tolerate permanent inundation for extended periods.	10	2	Ability to migrate inland is low.	18	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Samphire shrubland	Heat wave increase frequency and intensity	5	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	7	8		9	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Samphire shrubland	Rainfall intensity increase	5	2 - Low to Moderate	Localised impacts only from increased rainfall intensity. Erosive impacts unlikely as no major discharges occur through areas of samphire shrubland.	7	8		9	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Samphire shrubland	Rainfall reduction: winter-spring	5	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	7	8		9	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Samphire shrubland	Temperature increase	5	1 - Low	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	6	8		8	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type	Samphire shrubland	Rainfall reduction: summer-autumn	2	2 - Low to Moderate	Vegetation type also occurs in areas of the State with higher temperatures and lower rainfall. Suggest that its sensitive to temperature and rainfall is low--moderate.	4	8		6	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type (Native wetland and riparian plant communities)	Condition of wetland plants	Rainfall reduction: winter-spring	5	5 - High	Wetland plant communities are influenced by the water regime which is directly influenced by rainfall in the region or run-off generated in upstream catchments. Some species are temperature sensitive but this is less important than water regime. Also impact on recharge of groundwater.	10	5	Constructed wetlands are micro-managed and so will assist other wetlands in the region. Wetland plants will find a way to distribute to wetlands in the region. Species mix will change in response to water regime.	15	
Environment	Biodiversity	Condition and extent of native vegetation cover by vegetation type (Native wetland and riparian plant communities)	Condition of wetland plants	Temperature increase: summer-autumn	4	2 - Low to Moderate	Wetland plant communities are influenced by the water regime which is directly influenced by rainfall in the region or run-off generated in upstream catchments. Some species are temperature sensitive but this is less important than water regime.	6	5	Constructed wetlands are micro-managed and so will assist other wetlands in the region. Wetland plants will find a way to distribute to wetlands in the region. Species mix will change in response to water regime.	11	

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Environment	Coast, marine and aquatic	Condition and extent of beaches and dunes	Beaches with backshore vegetated dunes north of Bower Road	Sea level rise	5	5 - High	Will lead to erosion of beaches and loss of dunes,	10	6	Limited natural ability to migrate Sand pumping / transfer Revegetation provides ability to store sand within dunes Some buffers increasing in northern beaches north of Bower Road	14	
Environment	Coast, marine and aquatic	Condition and extent of beaches and dunes	Beaches with backshore vegetated dunes south of Bower Road	Sea level rise	5	5 - High	Will lead to erosion of beaches and loss of dunes,	10	2	Limited natural ability to migrate Sand pumping / transfer Revegetation provides ability to store sand within dunes	18	
Environment	Coast, marine and aquatic	Condition and extent of beaches and dunes	Beaches without backshore vegetated dunes	Sea level rise	5	5 - High	Will lead to erosion of beaches and loss of dunes,	10	1	Hard infrastructure almost directly behind sand dunes	19	Planning regulation, restricting development along the coast, restricting development along the coast, making homeowners accept risk and liability, acquire land in coastal risk areas, property incumbrancers, sea walls, compulsory acquisition, sea to sea wall with no beaches may be future in some areas, sand replenishment programs, may be less sand available, rate increase or levy for coastal properties, community benefit for protection of beaches
Environment	Coast, marine and aquatic	Condition of benthic habitat (e.g. sea grass, pests)	Seagrass	Sea surface temperature increase	5	4 - Moderate to High	Sea grass chloroplasts are sensitive to water temperature. Large dieback observed in Spencer Gulf in 2003 following extreme surface heat event	9	1	WQIPs potential	18	
Environment	Coast, marine and aquatic	Condition of benthic habitat (e.g. sea grass, pests)	Seagrass	Sea level rise	5	4 - Moderate to High	Depth of the euphotic zone will be influenced by rising sea levels, which is likely to influence where sea grass grows in the Gulf.	9	2	Some natural adaptive capacity may result in changes in species composition, changes seen in other locations around Australia	17	
Environment	Coast, marine and aquatic	Condition of benthic habitat (e.g. sea grass, pests)	Seagrass	Rainfall intensity increase	5	3 - Moderate	Resulting sediment and nutrient plumes into coastal waters may decrease light availability for photosynthesis	8	3	Stormwater management plans, stormwater treatment infrastructure (WSUD, wetlands, etc), catchment management upstream, infrastructure design decisions re capacity and sizing, planning policy (area of impervious, on-site capture and storage), WQIP, Waterproofing the West	15	
Environment	Coast, marine and aquatic	Condition of benthic habitat (e.g. sea grass, pests)	Seagrass	Ocean acidity increase	3	1 - Low	No reports of changes to seagrass growth relating to increase in CO_2 in Australia or elsewhere. Ocean acidification may be buffered by photosynthetic activity. Productivity may actually increase with increased CO_2 concentrations although consequential changes in daily pH levels may impact species living in seagrass	4	1	Unknown impacts of acidity on marine environment	13	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Barker Inlet/Lipson Reach	Sea level rise	5	3 - Moderate	SLR induced coastal inundation could result in pollutants being washed out and water quality impact, impact on underground assets, could also change salinity	8	1	Groundwater impacts Water Allocation Plan EPA pollution clean up requirements PASS issues	17	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Barker Inlet/Lipson Reach	Sea surface temperature increase	5	3 - Moderate	Changes to nutrient cycling and primary productivity, less mixing / dilution effect than in Gulf waters so more sensitive	8	1	Limited by lack of knowledge about potential for action	17	

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Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Barker Inlet/Lipson Reach	Ocean acidity increase	3	3 - Moderate	Change pH and CO2, less mixing / dilution effect than in Gulf waters so more sensitive	6	1	Very low confidence as limited knowledge	15	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Barker Inlet/Lipson Reach	Rainfall intensity increase	5	3 - Moderate	Short term impacts from discharge of polluted stormwater, much greater catchment areas than Gulf waters and Port River so likely higher pollutant load.	8	3	Gillman wetlands provide water quality improvement Stormwater management plans **Question about future of Gillman wetlands if future development occurs PR WQIP Catchment management plans	15	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Gulf waters	Sea surface temperature increase	5	2 - Low to Moderate	Changes to nutrient cycling and primary productivity, greater mixing / dilution effect in Gulf waters	7	1		16	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Gulf waters	Ocean acidity increase	3	3 - Moderate	Change pH and CO2	6	1	Very low confidence as limited knowledge	15	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Gulf waters	Rainfall intensity increase	5	4 - Moderate to High	Short term impacts from discharge of polluted stormwater (large Torrens catchment) as well as coastal erosion impacts	9	4	Torrens discharge, sediment Reduced discharge from Glenelg WWTP and no releases from Port WWTP Waterproofing the West	15	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Gulf waters	Sea level rise	5	1 - Low	Erosion that may occur as result of SLR not likely to have major impact on water quality	6	1		15	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Port River	Sea level rise	5	4 - Moderate to High	SLR induced coastal inundation could result in pollutants being washed out and water quality impact, impact on underground assets, could also change salinity	9	1	Limited action currently	18	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Port River	Sea surface temperature increase	5	3 - Moderate	Changes to nutrient cycling and primary productivity, less mixing / dilution effect than in Gulf waters so more sensitive	8	1		17	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Port River	Rainfall intensity increase	5	3 - Moderate	Short term impacts from discharge of polluted stormwater	8	2	Fewer SMPs	16	
Environment	Coast, marine and aquatic	Quality of water – coastal/estuaries	Port River	Ocean acidity increase	3	3 - Moderate	Change pH and CO2, less mixing / dilution effect and potential concentration with high evaporation than in Gulf waters so more sensitive	6	1	Very low confidence as limited knowledge	15	
Environment	Coast, marine and aquatic	Quality of water - inland waters	Other watercourses	Temperature increase	5	4 - Moderate to High	Increased evaporation and concentration of nutrients, eutrophication and water temperature potential for algal blooms	9	2		17	
Environment	Coast, marine and aquatic	Quality of water - inland waters	Other watercourses	Rainfall intensity increase	5	3 - Moderate	Increase in pollutant load from highly developed catchments	8	4	Stormwater management plans, stormwater treatment infrastructure (WSUD, wetlands, etc), infrastructure design decisions re capacity and sizing, planning policy (area of impervious, on-site capture and storage Dry Creek potential increase flows from high intensity events	14	
Environment	Coast, marine and aquatic	Quality of water - inland waters	River Torrens	Temperature increase	5	4 - Moderate to High	Increased evaporation and concentration of nutrients, eutrophication and water temperature potential for algal blooms	9	2	Releases for environmental flows prevent algal blooms, Lack of e-flows has more risk of fish kills Reduced impervious areas due to higher density of development may result in higher water temperature of runoff	17	
Environment	Coast, marine and aquatic	Quality of water - inland waters	River Torrens	Sea Level Rise	5	2 - Low to Moderate	Saltwater intrusion may increase salinity	7	2	High tide events likely to cause water to back up further upstream Large requirements for pumping stormwater and sea water	15	
Environment	Coast, marine and aquatic	Quality of water - inland waters	River Torrens	Rainfall intensity increase	5	4 - Moderate to High	Increase in pollutant load from highly developed large catchment, more environmental values associated with watercourse	9	6	Stormwater management plans, stormwater treatment infrastructure (WSUD, wetlands, etc), catchment management upstream, infrastructure design decisions re capacity and sizing, planning policy (area of impervious, on-site capture and storage), WQIP, Waterproofing the West Environmental flow as releases from algal management at Torrens Lake, Breakout Creek wetlands	13	
Environment	Coast, marine and aquatic	Quality of water - inland waters	West Lakes	Sea Level Rise	5	5 - High	Pumping problems to enable flushing of water	10	1		19	Pump upgrades, remove or limit all function and uses, do recreation activities need to be relocated, ban fishing, current uses no longer viable, sea wall, prevent stormwater inflows