

An Integrated Approach to Climate Change Adaptation in Estuaries


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A Consultative Process to Develop Climate Change Adaptation Strategies: SW Estuarine and Inland Fisheries Pilot.



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DoF initiative “Climate Change in SW
Inland and Estuarine Fisheries: What are
the Potential Impacts and are we Ready for
them?”

a. Objectives

b. Methods

c. Results

d. Next Steps



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Objectives

- Raise understanding of how climate change will impact on the communities associated with South West estuarine and inland fisheries.
- Develop a set of agreed and collaborative strategies on how best to respond to these potential impacts.
- Report these strategies to relevant agencies/funding bodies/stakeholders
- Develop a generic consultative methodology, which can be transferred to other primary production/regional sectors



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Methods

(based on National Greenhouse Office guide “Climate Change: Impacts and Risk Management: A Guide for Business and Government, and for Health Impact Assessment and DOHWA initiative: Health Impacts of Climate Change: Adaptation Strategies for WA).

1. Workshop 1: Impact assessment, coping capacity, vulnerabilities.
2. Risk assessment (internal)
3. Workshop 2: Validation of risk assessment, development of adaptation strategies



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Workshop 1: Impact assessment, vulnerabilities and coping capacity

Climate Change Impacts for Consideration by Interest Groups

- SEA LEVEL RISE
- DECREASED RAINFALL
- TEMPERATURE INCREASE
- INCREASE IN EXTREME EVENTS (eg heat events, drought, storms, bushfires, floods,)



Workshop 1: Impact assessment, vulnerabilities and coping capacity

Climate Change Impacts

- a. Biodiversity
- b. Fishing/aquaculture
- c. Social/economic
- d. Infrastructure.



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Methods 2: Risk Assessment (internal and then validation at Workshop 2)

- To carry out a **qualitative** risk assessment of the potential impacts identified in Workshop 1.
- To provide a comparison of the risks of impacts to assist in prioritizing adaptation measures.



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Consequence Scale

Consequence	Examples
Catastrophic	Large numbers of serious injuries, illnesses or loss of life. Severe and widespread disruption to communities. Long term inability to deliver essential goods and services. Severe long-term reductions in quality of life. Huge economic costs.
Major	Small numbers of serious injuries, illnesses or loss of life. Significant, widespread disruption to communities Significant decline in delivery of essential goods and services Significant long-term decline in quality of life.
Moderate	Small number of minor injuries or illnesses. Significant disruption to some communities. Significant decline in delivery of essential goods and services Significant short-term or minor long-term reduction in quality of life.
Minor	Serious near misses or minor injuries Isolated short-term disruption to some communities. Isolated but significant reductions in essential goods and services. Minor reductions in quality of life
Insignificant	Appearance of a threat but no actual harm Very minor disruption to small section of community. Isolated, minor reduction in delivery of essential goods and services. Insignificant impacts on quality of life.

Likelihood Scale

Likelihood	Description
Almost certain	Is expected to occur in most circumstances
Likely	Will probably occur in most circumstances
Possible	Might occur at some time
Unlikely	Could occur at some time
Rare	May occur only in exceptional circumstances.



Consequence x Likelihood = Risk Priority Level

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	Medium
Rare	Low	Low	Low	Low	Medium



Methods 3: Development of adaptation strategies (Workshop 2)

- Legislative / regulatory
- Surveillance and monitoring
- Technological or engineering
- Research
- Public education and communication
- Ecosystem intervention
- Infrastructure development



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Results : Assessment of Impacts

- a. Workshop 1: 50 participants (govt agencies groups, unis, local shires, conservation groups, insurance companies etc).
- b. Multitudes of Impacts identified under biodiversity, fishing/aquaculture, social/economic, infrastructure



Results 2: Impacts (High Risk in Bold)

BIODIVERSITY

- a. alteration of food web balance
- b. **increase in saline habitats leads to change in species diversity (more marine/estuarine)**
- c. Change in community structure (less freshwater, warmer water species predominate, impacts on reproductive processes)
- d. Erosion leads to loss of protected juvenile habitat
- e. Change in fish habitats and water quality (increase in non-nutrient contamination, fish stressed and more vulnerable to disease, more invasive species, **increased phytoplankton blooms and fish kills**).

FISHING AND AQUACULTURE

- a. Reduction in select target species but not necessarily total catch
- b. Reduced freshwater fishing opportunities, more pressure on remote stocks
- c. Toxic events leads to decreased confidence in catch/experience
- d. Decline in aquaculture (if less water) but new aquaculture opportunities may arise.



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Results 2: Impacts (High Risk in Bold)

SOCIAL/ECONOMIC

- a. costs of clean up, conservation and recovery projects
- b. detrimental impact on tourism**
- c. loss of social value due to decline in recreational fishing**
- d. health risks due to mosquitoes.**
- e. User conflict between fishing/agriculture
- g. Property damage**

INFRASTRUCTURE

- a. replacement of facilities (cost)
- b. costs of building protective structures.**
- c. increased need for artificial opening, pumping and dredging**



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Results 3: Development of Adaptation Strategies

Workshop 2: 30 participants (govt agencies, unis, local shires, conservation groups)

General Strategies

- a. Climate change is a cross-government issue, which requires a coordinated response through an adequately resourced lead agency.
- b. Modelling is required to identify local risks and impacts for each individual SW estuarine or inland system. This will enable local understanding of impacts and development of local adaptation strategies. This will also assist in prioritising risk specific to individual systems.
- c. Develop agreed climate change education and communication strategies that are reliable to offset sensationalist media reporting.
- d. Investigate aquacultural options for climate change mitigation strategies in SW estuarine/freshwater systems (carbon sequestration, regional employment, food source, uptake of nutrients etc).
- e. Development of Freshwater Fish Strategy



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Results 3: Development of Adaptation Strategies (cont)

Legislative or Regulatory

- a. Water allocation accountability strategy – develop policy framework, develop a legislative structure to provide effective management of estuaries and adjoining lands/systems.
- b. Development of (local/regional/state) integrated water use management groups with DOW, DEC, DoF, OCC, irrigation groups, appropriate shires, irrigation groups, Water Corporation etc. The focus of these management groups should be on the examination of unmanaged water allocation and regulation of river infrastructure.
- c. Legislative control/limitations in use of agricultural fertilisers/chemicals
- d. Modification of planning/building laws to integrate researched risks from sea level rise.
- e. Informed/regulated “bar opening” procedures.



Results 3: Development of Adaptation Strategies (cont)

Public Education and Communication

- a. Public education/communication/school based programs of importance for ecosystems and threats from climate change and why habitat use may need to change to offset threats .
- b. Greater landholder education of current fertiliser/alternative water use/source options.

Surveillance and Monitoring

- a. Need coordination (between university, government departments, catchment groups etc.) and integration of current databases to facilitate common access by all researchers. Ensure (where possible) data collection consistency.
- b. There is a need to identify appropriate indicator species (which is likely to require more information on non-commercial/recreational species that are sensitive to climate change).
- c. Inland fish monitoring improvements required by government departments.



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Results 3: Development of Adaptation Strategies (cont)

Ecosystem Intervention

- a. Study to direct or provide a framework to guide ecosystem intervention strategies (e.g. effectiveness/appropriateness of replacement of riparian vegetation, installation of reoxygenation devices, installation of fishways etc).
- b. Implement best practice management in catchment areas to reduce nutrient input.
- c. Development/protection of “refuges” to maintain biodiversity, genetic variation etc.

Infrastructure Development

- a. Development of clear guidelines for separation of sewage infrastructure and water drainage.
- b. Review of strategies for more effective water use (e.g. investigate off stream storage to capture high flow events, recycling etc).
- c. Investigate barrages on the Swan River



Results 3: Development of Adaptation Strategies (cont)

Research

- a. Risk tables for endangered species, greater understanding of temperature and salinity thresholds for endangered species.
- b. Assessment of potentially emergent pest species due to climate change.
- c. Development of capacity to respond to serious pest infestations.



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Next Steps

- a. Finish final report and develop executive summary (with recommendations) for circulation to stakeholders.
- b. Input results into climate change action plans (eg FRDC, NCCARF)
- c. Forward the recommendations
 - i. Holistic multi sector/agency funding applications
 - ii. Estuary/ecosystem specific pilot (Peel Harvey)
- d. Apply consultative process to other sectors/regional areas**



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Thank you



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