

Peel-Harvey Estuary ARC Linkage Research Findings (2019)



Overarching goal

Develop a predictive decision-support framework for exploring trade-offs between regional catchment development (economic resilience) and the health of the receiving estuarine waterways (ecological resilience).

We analysed up to 50 years of Peel-Harvey environmental and ecological data and more recent economic data to build a holistic picture of the drivers of change. A unique suite of models were developed (catchment, estuary and econometric) to allow assessment of 'what-if' scenarios for 2050, defined by Peel stakeholders.

Why?

- Balancing these trade-offs is essential for achieving sustainable coastal development.
- Forecasting alternative futures in terms of economic decisions and future climate is a powerful way to demonstrate the impacts of different development or management choices, and the scale of action needed to adapt to future challenges.
- A key motivator for developing this framework was the proposed SAPPR. However, the framework is adaptable to many other strategic planning scenarios across the Peel at both the ecosystem scale (whole catchment and estuary) and localised scales (e.g. individual developments).

Key findings

1. Current condition of the estuary (relative to trends monitored from the 1970s onwards)

- ***The estuary has reduced flushing due to declining river flows.*** Whilst the Dawesville Cut was successful in improving water quality in the main basins, it has made the system more marine, leading to hyper-salinity further inland during summer. Water quality in the rivers has been declining, despite the Cut.
- ***Ecologically, the estuary is showing signs of trouble.*** Multiple lines of ecological evidence (i.e. trends in small bottom-dwelling invertebrates and fish faunas) show that the current health of the estuary is often poor. While there is generally less nuisance macroalgae and more seagrass in the estuary than in the past (positive health trends), some poorly flushed areas of the basins now have the highest macroalgal growths on record.
- ***Several 'trouble hot-spots' have emerged across the estuary.*** The deeper parts of the Murray River, southern Harvey Estuary and shallows of south-eastern Peel Inlet most often have the poorest ecological health (as reflected by their plant, invertebrate and/or fish communities). These environments are characterised by highly enriched sediments (nutrients and organic matter), poor flushing and/or low dissolved oxygen levels.

2. Future (2050) predictions for estuarine health

- ***The projected future drying climate is expected to have an overwhelming influence on water flows to the estuary, concentrating poor water quality and ecological problems in the rivers.*** The drying climate projected for 2050 is forecast to reduce water flows to the estuary by ~50%. In particular, this is expected to further exacerbate problems with hypoxia and harmful algal blooms in the rivers.
- ***Implementing extensive catchment management actions can significantly reduce nutrient flows to the estuary.*** Large-scale implementation of catchment management actions (e.g. improving fertiliser management, applying soil amendments, riparian zone rehabilitation etc) under environmentally-sensitive development of the catchment is expected to significantly reduce nitrogen and especially phosphorous flows to the estuary compared to current conditions. Nutrient reduction has been identified as a potential strategy to help adapt to the drying climate.
- ***Allowing a ‘business as usual’ approach to catchment management, as well as agricultural and urban development beyond that proposed in the SAPPR, is forecast to intensify problems with hypoxia in the rivers and increase nutrient flows to the rivers and parts of the basins.***

Key recommendations

- ***The time for adaptation to growing development and climate stressors is now***
 - In general, future climate and development projections pose risks to estuary health that require adaptive management.
 - Estuary water requirements (environmental flows) to maintain estuary health need to be defined and actioned ASAP.
 - With concerted catchment management efforts and environmentally-sensitive development, major reductions in nutrient delivery to the estuary can be achieved.
- ***Monitoring estuarine ecology is fundamental to managing estuary health***
 - Currently, there are no monitoring programs in the Peel-Harvey Estuary for key aspects of its ecology (e.g. seagrass, invertebrates and fish) and/or supporting environmental elements except for water quality.
 - Given the current state and trajectories of estuarine ecological health, and the value placed on the system by the local and State communities, it is crucial that these ecosystem components are monitored consistently and regularly into the future.
 - Consistent ecological data streams will allow real ecosystem impacts of any new management interventions to be understood. They will also support the ongoing improvement of the predictive framework.
- ***Investment in novel farm and environmental technologies can support estuary restoration***
 - Doing nothing will lead to continued decline of the rivers and basins.
 - Adopting smart farm technology can promote positive environmental outcomes whilst improving the clean-green brand of WA agriculture.
 - Large-scale nature-based restoration efforts that can help support local fishery and ecotourism opportunities need to be explored to allow adaptation to future pressures.
- ***A risk-based decision-support framework can provide transparency in decision-making***
 - The scale of the decline (‘tragedy of the commons’) means current governance and environmental protection instruments need improvement to protect this iconic natural asset.
 - As for any important project, risk-management procedures and appropriate governance should be put in place to prevent further decline.
 - The current project has created a blueprint for a risk-management framework able to support future decision making, and foster collaboration and transparency in assessing risks between various stakeholder groups.