PROJECT HIGHLIGHTS

GOYDER INSTITUTE
FOR WATER RESEARCH

Socio-ecological assessment of the Spencer Gulf

This research conducted the first integrated assessment of the Spencer Gulf's socio-ecological status. It also consolidated many types of regional information into a single interactive software platform and outlined a path toward an integrated multi-sector management plan.

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Department for Environment and Water

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SGEDI
Spencer Gulf Ecosystem Development Initiative

Spencer Gulf is home to many important marine ecosystems, a thriving ecotourism sector, and is the gateway for South Australia's (SA) agriculture, mining and energy sectors. It also produces about half of South Australia's seafood. Marine activities in the gulf are managed on a sector-by-sector basis and there is often conflict between sectors with little or no consideration to how different activities or users will interact or their cumulative impacts. New developments have been delayed and new policies have not been implemented because of these sector-based management challenges. This project has laid the foundation for a multi-sector management plan that can consider the overall social, economic and ecological status of the region.

KEY FINDINGS

- Preparation of an integrated ecosystem assessment of the Spencer Gulf following international best practice.

- Creation of a snapshot of the region's social, economic and environmental health. Based on 170 time series data sets collected from the region, 13 key indicators were developed including weather patterns, climate indices, communities, ecological assets, ecotourism, pollution and the status of marine, aquaculture and fishery industries.

- Development of *Gulfview*, an interactive mapping software tool that industry can use to access all available social, economic and environmental information in one place.

IMPACT

- The integrated ecosystem assessment is the first step towards developing an integrated multi-sector approach for Spencer Gulf management.

- *Gulfview* has helped fill a decision-making capability gap estimated to cost the state hundreds of millions of dollars in missed economic opportunities every year.

RESOLVING CONFLICTS AND IMPROVING DECISION-MAKING FOR MARINE DEVELOPMENTS

The Spencer Gulf is managed under at least 15 different South Australian Government Acts, with limited connections between the different legislation even though many share similar objectives. Management decisions are often made by a single sector without fully considering the overall social, economic and ecological status of the region, at least in part because of the time consuming task of trying to track down all the relevant data from different agencies and organisations. Sector-based management has many limitations and within Spencer Gulf it has delayed decisions about new developments (e.g. Olympic Dam Expansion Desalination Plant) and government policy implementation (e.g. establishing marine parks).

Internationally, regional multi-sector management plans are providing a framework to evaluate trade-offs between sectors and balance the social, economic and ecological benefits of different management scenarios. This approach to marine system management is informed by integrated ecosystem assessments (IEAs), which are now performed routinely on large marine ecosystems throughout North America and western Europe.

IEAs follow a series of iterative steps:
1. Define goals and targets (social, economic and ecological)

2. Develop indicators
3. Assess ecosystem
4. Analyse uncertainty and risk
5. Evaluate strategies
6. Implement management actions; monitor indicators; evaluate outcomes
7. Redefine goals and targets (begin process again)

This approach (steps 1–3) was followed by the project and forms the first step toward conducting a formal IEA and developing an integrated multi-sector approach to Spencer Gulf management. Work within the NSW Marine Estate Management Authority (MEMA) also provides a model of how South Australia could address the structural problems of the traditional sector-based management. MEMA was established to help resolve conflicts over the impacts of marine parks on recreational and commercial fishers – a challenge SA has also grappled with over the last decade. MEMA established a structured and transparent processes for evaluating interactions and trade-offs between marine activities and users, and demonstrated that integrated management can be achieved with only limited changes to the existing legislative and administrative framework. Adopting a more integrated approach to management of marine ecosystems is an option that should be evaluated for all coastal waters under the jurisdiction of the South Australian Government.

SOCIO-ECOLOGICAL STATUS OF SPENCER GULF

The project collated existing information on the threats to the ecosystems of Spencer Gulf and its industries and communities. There were 170 time series data sets collected from the region used to develop indicators for 13 of its key features:

- Climate (Indian Ocean Dipole, El Niño–Southern Oscillation, Southern Annular Mode)
- Weather patterns (rainfall, air temperature)
- Oceanographic (sea level height, sea surface temperature)
- Communities (human, social, financial, physical and natural capital)
- Marine industries (aquaculture, fishing and tourism)
- Shipping (number of ship movements, volume of exports)

- Fisheries (status, catch, value)
- Aquaculture (production, value)
- Ecotourism (shark cage diving)
- Ecological assets (cuttlefish, Australian sea lions, long-nosed fur seals, seagrass)
- Pollution (nutrients from wastewater treatment plants and finfish aquaculture)
- Habitat degradation (prawn trawling)
- Conservation (marine parks)

Ecological Assets
- **Cuttlefish**: abundance has fluctuated over last decade: 114,596 individuals in 2019. Sporadic surveys.
- **Seagrass:** recent declines in northern (up to 58%) and southern (up to 35%) gulf. Recovery (19%) near Whyalla steel plant. Limited time-series and number of sites.
- **Australian Sealion**: pup abundance declined from ~1,200 in 2006 to ~800 pups in 2015. (No recent data.)
- **Long-nosed Fur Seal**: pup abundance stable between 2005 and 2014 at ~10,000 pups. (No recent data.)

Sea Level Height (SLH) and Sea Surface Temperature (SST)
- Mean annual SLH increased by ~2.4 cm per decade.
- SST anomalies increased by ~0.7°C per decade.

Marine Industries Value 2015/16 $510M
- Aquaculture $182M.
- Commercial Fishing $117M.
- Marine Tourism $103M
- Recreational Fishing $67M
- Other $40M

Fishery Status and Value 2018/19
- **Sustainable:** Prawns $41M, Sardine $22M, Abalone $5.3M, Blue Crabs $4.1M.
- **Recovering:** Garfish.
- **Depleted:** Snapper.
- Marine Scalefish Fishery $7.4M

Ecotourism
- White Shark cage-diving ~$5.9M per year.

Aquaculture Value 2018/19
- Southern Bluefin Tuna $129M.
- Yellowtail Kingfish $39.5M.
- Mussels $3.8M.

Pollution
- Nutrients from wastewater treatment plants reduced by >80% from 2002/03 to 2016/17.
- Nutrients from Whyalla steel plant are 10 times higher than from treatment plants
- Largest nutrient input into gulf is from finfish aquaculture (tuna and kingfish): 1,956 t in 2018. 10 times higher than Whyalla steel plant.

Climate Indices 2019
- Neutral *Southern Oscillation Index* since El Niño event in 2015/16. *Predicts moderate upwelling*
- *Dipole Mode Index* sixth highest annual value since 1900. *Likely low rainfall*
- *Southern Annular Mode* negative for the first time this decade. *Weak westerly winds in Southern Ocean*

Weather Patterns 2019
- Second warmest year on record.
- Annual rainfall lowest on record.

Shipping 2011-17
- Highest ship movements and volume of exports in 2011 (234 movements and 4.7Mt).
- Stable during 2012-2017 (194-214 movements and 3.5-3.9Mt).

Communities
- Largest population centres are Whyalla and Port Pirie.
- Population size stable in majority of communities between 2012 and 2017.
- Median age higher whilst working age and unemployment rates are lower than average for South Australia.
- Median house prices are lower and outright ownership is higher than elsewhere in South Australia.

REMAINING KNOWLEDGE GAPS

While project was able to prepare the first integrated ecosystem assessment of Spencer Gulf, there are still significant knowledge gaps. Many data sets were collected at spatial scales that don't translate well for the gulf region (e.g. statewide) and many indicators are infrequently monitored. Unlocking the power of data will be an important next step to help improve monitoring and decision making in the future. The project recommended:

- establishing a consolidated database(s) to support future monitoring and reporting on the status of the SA marine systems
- ensuring that data collected using government funds or to improve our understanding marine ecosystems for community benefit (including from environmental impact statements) should be publicly available in digital form (where legally possible and appropriate)
- ensuring that data collected is FAIR: findable, accessible, interoperable, and reusable
- establishing an integrated monitoring program (objectives, indicators, reporting, review, etc) to inform State of the Environment reporting
- establishing marine monitoring regions
- refining reporting approaches and time frames including:
    - ecological, economic and social indicators (noting census every five years)
    - consolidating DEW/EPA/PIRSA efforts
    - aligning regional, state and national State of the Environment reporting.

GULFVIEW – A SOFTWARE PLATFORM TO GUIDE DEVELOPMENT DECISIONS

The data collated during the project was used to develop interactive maps of environmental characteristics, ecological assets, human activities, management arrangements and the socioeconomic values of Spencer Gulf. The resulting software platform, *Gulfview*, allows stakeholders in the seafood industry to access spatially-explicit information about the environmental characteristics, ecological assets, human activities, management arrangements and socio-economic values of Spencer Gulf all in one place and easily guide their development planning and decision-making process.
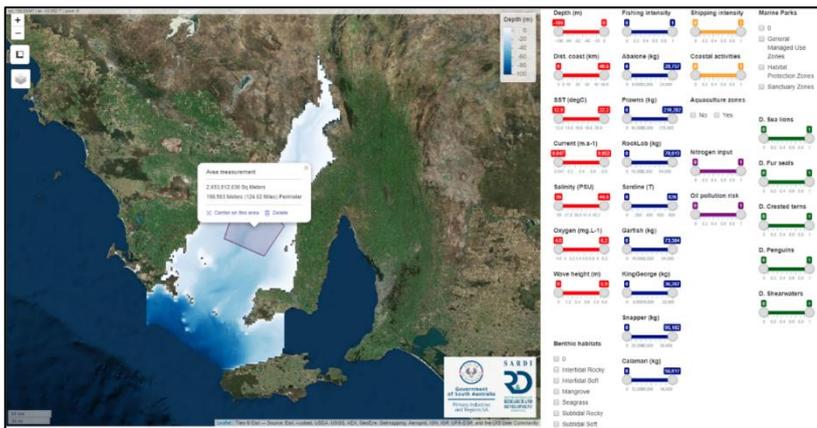
The software, similar to *AgInsight* South Australia, has helped fill a decision-making capability gap estimated to cost the state hundreds of millions of dollars in missed economic opportunities every year, including delays in major projects such as mines, ports, and dredging. It has already been used by the finfish and algal aquaculture sectors to help identify suitable locations for new production sites in the gulf and could be made available to other marine stakeholders. A new platform "Oceanview South Australia" could be established to cover all State and Commonwealth waters off South Australia. This would complement *AgInsight* South Australia and help drive sustainable investment within the State.

NEXT STEPS

The Spencer Gulf time series and spatial data, and the application of the IEA approach in the project work has been shared with SA government agencies and stakeholders. Applying IEA for effective management of oceanic resources is consistent with key actions in Australia's National Marine Science Plan, which is currently being refreshed. Spencer Gulf is one of four national IEA case studies selected for this national update. *Gulfview* is already being used by several aquaculture sectors and its adoption is expected to increase as it is more widely promoted.
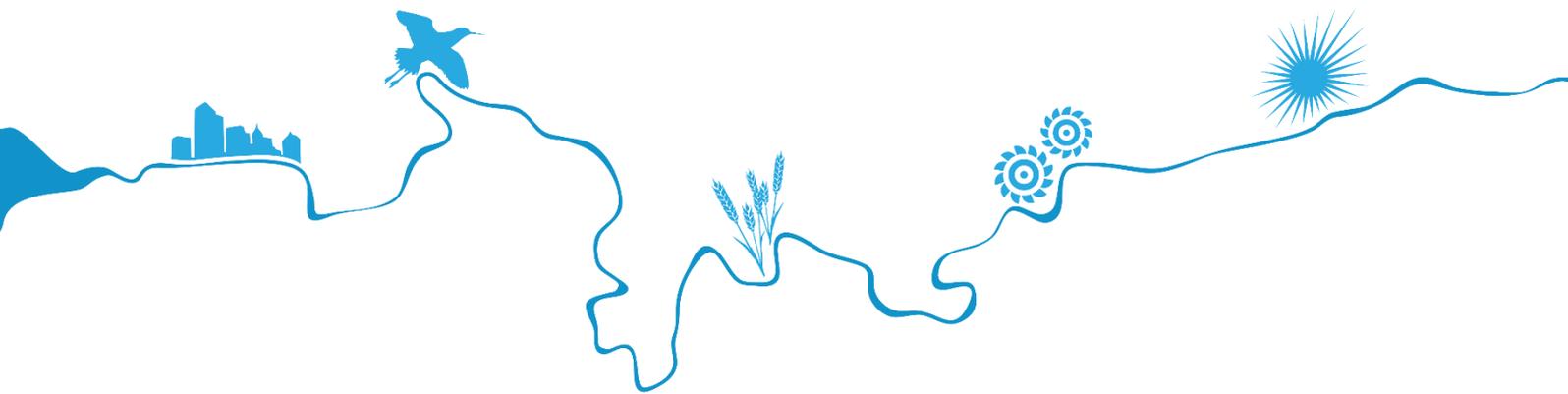
MORE INFORMATION

The following technical reports associated with the research program are located at www.goyderinstitute.org/publications/technical-reports/:

- Bailleul, F. and Ward, T.M. (2019) Socio-ecological assessment of the ecosystems, industries and communities of Spencer Gulf: 'Gulfview' interactive platform. Goyder Institute for Water Research Technical Report Series No. 19/02, Adelaide, South Australia. ISSN: 1839-2725
- Tanner, J.E., Bailleul, F., Bryars, S., Doubell, M., Foster, N., Gaylard, S., Gillanders, B.M., Goldsworthy, S., Huveneers, C., James, C., Jones, A.R., Maher, J., Nursey-Bray, M. ,van Ruth, P. and Ward, T.M. (2019) Potential social, economic and ecological indicators for integrated ecosystem assessment of Spencer Gulf. Goyder Institute for Water Research Technical Report Series No. 19/32, Adelaide, South Australia. ISSN: 1839-2725

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