Value of South Australia's national parks and reserves

Study 1: Economic value of nature-based tourism

Part 2. Secondary economic value

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Foreword

The Department for Environment and Water (DEW) is responsible for the management of the State's natural resources, ranging from policy leadership to on-ground delivery in consultation with government, industry and communities.

High-quality science and effective monitoring provides the foundation for the successful management of our environment and natural resources. This is achieved through undertaking appropriate research, investigations, assessments, monitoring and evaluation.

DEW's strong partnerships with educational and research institutions, industries, government agencies, Landscape Boards and the community ensures that there is continual capacity building across the sector, and that the best skills and expertise are used to inform decision making.

John Schutz
CHIEF EXECUTIVE
DEPARTMENT FOR ENVIRONMENT AND WATER

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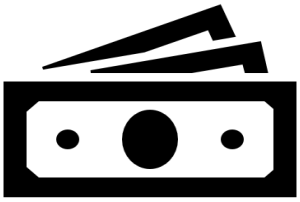
Highlights

The total secondary contribution to regional economies in South Australia from the conservation reserve network in 2018-19 was $358.8 million. This amount comprises approximately $242.5 million in secondary travel expense contributions from use of the conservation reserve network. A further $116.3 million was contributed to regional economies from initial and flow-on multiplier impacts to gross regional product (GRP) as a consequence of economic activity in sectors associated with tourism (e.g., accommodation and food and beverage services). Across the state, this visitor activity supported around 1,211 full-time jobs (or equivalent) in those associated sectors of the economy at regional levels.



$242.5 million from regional secondary economic benefits

$116.3 million in GRP multiplier impacts from tourism

1,211 FTEs supported in metro and regional areas by nature tourism

23:1 ratio of secondary to primary economic effects from parks

Nature tourism equivalent to 10% of tourism total in 2018-19

$10 extra in the economy for every $1 spent on opex/capex

Primary income to South Australia's parks was around $15 million in 2018-19: meaning that for every $1 earned directly from the use of parks, another $23 dollars flows into the economy through these secondary and multiplier effects[1]. These positive impacts are experienced mainly in regional areas of South Australia, where travel is necessary to visit the sites. South Australians clearly engage with their regional National Parks, and are happy to pay for the opportunity. These economic flows are important for South Australia's economy as a whole, and the contributions estimated in this study are equivalent to around 10% of the total tourism component of gross state product in 2018-19 (i.e., $3.4 billion). Further, for every $1 invested in operating and maintaining a regional park, a further $10.40 is generated in secondary and multiplier impacts for the economy.

[1] Note these ratios are not easily compared to one another. For example, the ratio of primary to secondary economic impacts at state level for the Kangaroo Island Wilderness Trail case study was 1:5 highlighting the smaller scale of impacts incurred, differences between the regional models and their assumptions, and differences between the main drivers of secondary impacts; that is, travel costs. As such, we should expect to see differences across these ratios.

Summary

The South Australian Department for Environment and Water (DEW) requested a study of the secondary economic benefits associated with the state's parks and conservation sites. Secondary economic benefits to the state accrue from expenditure incurred for the purpose of visiting these sites above entry fees or other charges (primary economic benefits) associated with a site. These are categorized as travel costs. Studies of these travel costs are often based on an application of the Travel Cost Approach (TCA), which aims to calculate the economic values of environmental goods and services associated with targeted activities. TCA is used particularly when records of market transactions are not available.

In this study, TCA was undertaken by applying a set of principles to utilize available market data relating to park visitation. The approach involved: 1) liaison with DEW staff about data availability, access and gap-filling, 2) using established analysis methods/models and parsimonious approaches to data gap-filling, 3) constructing assumptions to produce conservative estimates and 4) maximizing the use of data and methods to produce a baseline point which can be built on with future work.

Regional sites – excluding the commercial sites located in regional areas - contributed about 34% of primary economic benefit contribution to the state economy but they contributed 66% of the secondary economic benefit; making the smaller parks more significant in the total mix than may be appreciated. Any assessment of the economic value of park tourism needs to take account of this difference in considering where value in the conservation reserve system is generated, as assessments of primary benefits alone leads to a skewed perception.

Estimates of the value of natural capital are challenging. There are use values from those visitors that interact with natural capital (e.g., National Parks) and non-use values for those that do not visit, and yet still assign a worth to the fact that a National Park exists. In this study we are interested in estimating the use values of South Australia's conservation reserve system. As there is no market for these use goods, we estimate our primary use values from tourism expenditure as a proxy for establishing the economic benefits to the state of maintaining the reserve system. The use values represent the sum of primary (e.g., park entry fees) and secondary benefits to DEW (from tourism expenditure on travel costs less fees) plus the flow-on benefits to regional economies—that in aggregate benefit the whole of South Australia.

We should stress that these values are both an underestimate and potential overestimate of the true use values for the South Australian conservation park network. As we cannot accurately place a value on the replacement costs of National Parks, and have not incorporated any non-use values or co-benefit values (e.g. wellbeing or avoided health costs) in our study, the figures provided here are an underestimate of the true total worth. Equally, as we cannot categorically state that all of the travel incurred was associated only with a visit to the park sites the values reported may offer an overestimate of the true use significance to visitors. That said, we are at least able to provide a baseline—not final—economic contribution estimate for DEW.

Further, while we have estimated a conservative value for secondary benefits we remain uncertain as to the drivers of that activity. Visitors are obviously attracted to the state's parks and conservation sites but more work is needed to understand what amenity benefits or site-specific utility motivate the spending reported here. Further analysis will add longer-term clarity to the picture emerging from this report for management purposes and prioritizing conservation works.

As a result of this study both DEW and the research team are confident that parks visitor data availability and quality is moderate and improving. General weaknesses in the data available for this type of analysis

include 1) internal rigour issues (e.g. accommodation bookings with no associated visitor numbers, lack of error checking at data entry stage, itineraries spanning multiple years e.g. 2017-2019), 2) absence of data from high visitation / non-commercial sites in the Adelaide and Mount Lofty Ranges (e.g. Morialta Conservation Park), 3) incomplete data from key commercial sites (e.g. Naracoorte Caves), 4) lack of data for validating assumptions about behaviour of international travellers and 5) lack of breakdown of visitation behaviours of holders of *Parks Passes*.

The entire National Parks network in South Australia contains 362 parks, of which we collected data for 57 key revenue-generating parks. While small in number, these key parks attract >95% of total visitors to regional parks; not including the Adelaide Metro Parks network for which available data was far less—and where Cleland Wildlife Park would add another ~140,000 visitors. For the Adelaide Metros parks where we have data the total secondary contribution in 2018-19 was $8.7 million.

The aggregate secondary contribution and stimulus flow-on impacts from regional area park and conservation site tourism to South Australia in 2018-19 was estimated at $367.5 million or approximately 10% of the total primary tourism activity for that year. This is an overestimate of the consumer surplus, but used as it accrues to the gross value added. This impact mainly relates to economic sectors associated with tourism and recreation through park visitation, such as accommodation and food and beverage services. Figure 1 breaks down the secondary impacts from expenditure solely on travel expenditure by South Australian, all domestic visitors, all international visitors and total visitor contributions.

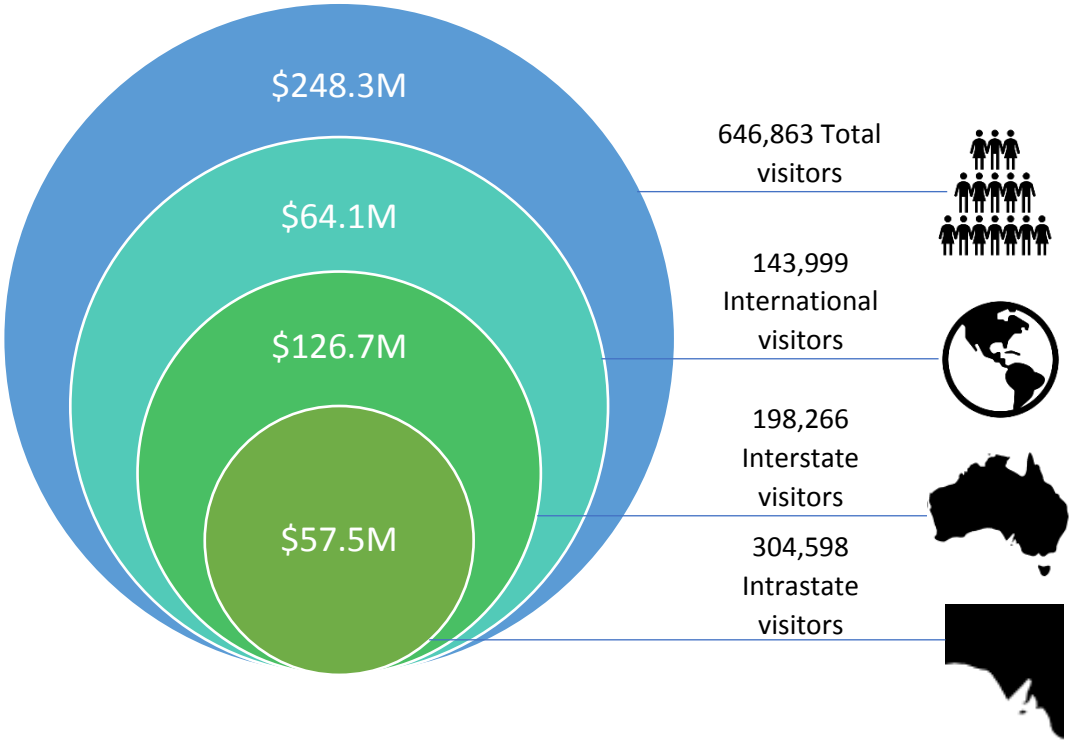


Figure 1: Breakdown of travel cost economic contribution by visitor type

In aggregate, the secondary contribution stimulus from regional parks (i.e., $248.3 million) resulted in a multiplier benefit of $119.2 million to the regional economies from initial and flow-on impacts to gross regional product (GRP), and supported 1,211 full-time employees (FTEs) across sectors associated with tourism. This is a clear indication of the contribution to regional areas by the state's natural attractions and their flow-on effects across the wider state economy. Finally, at the national level economic activities associated with South Australia's parks and conservation sites would have contributed $68.4 million to other states in terms of visitor expenditures and their flow-on impacts in 2018-19.

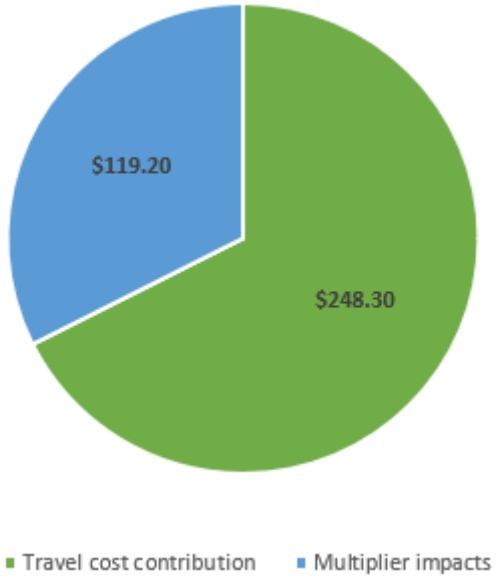


Figure 2: Total economic contributions: travel cost and multiplier impacts 2018-19

The findings of this study clearly indicate that regional communities benefit from supported jobs and business sales created by park visitation, while park visitors benefit from the recreation and leisure opportunities provided by nature-based tourism. This is because accounting/budgetary methods will tend to underestimate the worth of park sites and therefore provide a less relevant set of inputs to policy and management decisions.

A more complete estimate of economic contributions provided by this study positions DEW/NPWS to better advocate for its mission through evidence-based arguments of total economic value. In particular, we have estimated the ratio of primary to secondary economic benefits (1:23) as well as the ratio of tax-dollars spent on operating/capital expenditure and secondary impacts (1:10). Both of these ratios allow a deeper consideration of resource allocation decisions in national parks, where trade-offs associated with competing park investments or benefit-cost assessment outcomes can be enhanced. Importantly, as the public are generally thought to value parks whether they visit them or not, increased government allocations from general budgets toward park operation/capital investments may have greater economic benefit than targeted fee increases. However, it would also be useful to consider a wider set of value estimates again (i.e., ecosystem and conservation benefit estimates) to best inform those choices.

Background

The economic contribution from South Australia's component of the conservation reserve system (i.e. National Parks system) to the state/regional economy is an important input to planning for the Department for Environment and Water (DEW). The 362 parks in South Australia's conservation reserve network are an important component of efforts to conserve South Australia's natural and biological heritage and to make it accessible to people for use and non-use values. Use values, in part, comprise direct consumption of an environmental good or service (e.g., a National Park) for commercial or recreational purposes. Non-use values derive from the knowledge that the environmental good or service exists for future personal or descendent use. Together, use and non-use values can provide an economic measure of changes in societies' well-being resulting from a change in the quality or availability of an environmental asset (Damigos et al., 2016).

The economic influence of tourism and use of the reserve system is felt through both primary and secondary contributions. Primary contributions arise from visitor spending on park entry fees, campsite rentals, within-park accommodation, and retail sales at kiosks etc.—that is, any expenditure that are incurred by a visitor as part of their direct access to and within a park. These contributions provide income directly to the state through the National Park and Wildlife Service (NPWS). Secondary contributions are the expenditures that a visitor makes to travel to the park site so that they can enjoy the amenity benefits. This expenditure includes vehicle expenses (i.e., fuel, vehicle wear and tear), the opportunity cost of labour, accommodation along the way depending on the travel time involved, and incidental meals or other expenditure. Secondary contributions thus stimulate the economy as a consequence of use of the conservation reserve system, but where the income stimulus passes through cash registers other than those of the NPWS – that is, via payments to other businesses and entities in the economy. Estimates of secondary economic contributions can be approximated based on the findings of systematic studies of revealed preferences employing, for example, travel cost methods (for example, Heagney et al., 2019). They may also be approximated by using Australian Tax Office (ATO) travel cost determinations to estimate travel expenditure for various states and regional cities.

Both primary and secondary economic expenditure contributes more broadly to regional, state and national economies because the benefits of the expenditure flow through the economy at different scales, creating multiplier effects; that is, the gains in total economic output are greater than the initial amount incurred for the travel inputs. Economic multipliers can be derived from utility travel cost studies and state/regional economic activity multipliers developed for a range of sectors in the economy. In this report, we focus on the contribution of regional parks, leaving contributions from the Adelaide Metro parks to one side for the most part.

For example, the vehicle, fuel and associated payments for accommodation and meals expended to visit a regional park or conservation site characterize a consumer's preferences for the tourism or recreation options available, and as such an assessment of the regional sites' significance to the consumer. This expenditure provides a proxy (tourism and recreation use only[2]) value in the economy for the site in question. Multipliers can then be used to estimate the total economic contribution from tourism activity to other sectors which support or interact with tourism (e.g., retail trade, food services, manufacturing, construction etc.) where products from one industry (e.g., labour in regional centres) are used as inputs to produce products or outputs for another industry (e.g., regional attractions). It is the interaction between these inputs/outputs—then scaled across other affected sectors of the economy—which

[2] Other contributions of the conservation reserve system are not included here, such as: species and habitat protection, conservation of cultural values, flood control, water quality improvement, education, and wellbeing and avoided health costs.

enables an estimation of the larger economic benefit of tourism and recreation in the conservation reserve system. Quantifying the primary and secondary economic benefits to regional South Australia (SA) of parks and conservation sites is an important mechanism for securing local and political support for funding the effective management of the regional conservation reserve system (Heagney et al., 2018).

Importantly, this study has moved away from the typical (and reasonable) practice of identifying and focusing on high-profile/high-visitation parks and the on-site collection of visitor data via surveys (see for example Driml et al., 2019). These approaches have utility but can result in analysis problems due to variability in quality of survey data, particularly where levels of zero-response data are high (where many survey respondents miss or avoid answering certain questions). To improve on these methods, we attempt to obtain data and secondary economic proxy values for as wide a range of South Australian parks and conservation sites as possible, in order to estimate the aggregate contribution of the reserve system (and its components) to state and regional economies without the need for benefit transfer methods[3] or potentially biased and/or skewed valuation approaches. We therefore seek to make best value of the highest quality data and build an approach which can be added to and improved in future with minor additional effort.

To that end, of the entire National Parks network in South Australia (362 parks) we collected data for 57 key revenue-generating parks. While small in number, these key parks represent >95% of visits to regional parks providing us with a relatively unique and comprehensive basis for estimating the use value associated with South Australia's regional parks network.

The data available is not all fit-for-purpose, and many assumptions have been made to construct the value estimates. However, the *Bookeasy* site data provided by DEW is an emerging dataset with high utility that offers a better range and quality of data than derived surrogates from estimates based on tourism sector data (e.g., the National Visitor Survey (tourism)) or self-nomination or reporting after the fact by tourists (see Driml et al., 2019 for examples of such limitations). Despite some data gaps we are confident that the values reported herein provide a conservative baseline estimate of the secondary economic benefits of tourism and recreation provided by parks and conservation sites in the conservation reserve system in South Australia.

Methods, data and inputs

In this study we broadly follow the approach of Driml et al. (2019), excluding the use of direct interviews or survey instruments to collect data from visitors. Like the Driml et al. (2019) study we are interested in using estimates of the money that visitors spend travelling to parks and conservation sites in South Australia, staying in accommodation both along the way and at parks and recreation sites, consuming food and beverages, engaging with commercial services (where available) and spending on other related items such as souvenirs, firewood, camping supplies etc. These are secondary expenses as opposed to primary park visitor expenditure (e.g., entry fees, campsite fees, retail purchases within parks etc.).

The secondary expenditure data provides an approximate measure of the economic contribution of South Australia's parks and conservation sites as tourism and recreational attractions for the 2018-19 baseline period. It should be noted that we are highly likely to under- and/or overestimate the true use values for the South Australian conservation park network. This is because as we cannot

[3] Benefit transfer methods are approaches to calculating economic benefits by taking the estimates of economic impact (or values in general) gathered from one site and applying them to another similar site.

accurately place a value on the replacement costs of National Parks, and have not incorporated any non-use values in our study, the figures provided here are an underestimate of the true total worth. Equally, as we cannot categorically state that all of the travel incurred was associated only with a visit to the park sites the values reported may offer an overestimate of the true use significance to visitors. That said, we are at least able to provide a baseline—not final—economic contribution estimate for DEW.

The calculation of visitor travel expenditure and subsequent secondary economic contribution analysis involves five basic steps:

1. Source all data for the origin and destination sites for each visitor, followed by data cleaning, transfer and loading into a single database (see *Primary Contribution Estimation Report - Methodology* section for additional detail).
2. Assign an individual x-y location parameter to each visit and account for distance travelled and any remoteness factors.
3. Assign the time class and apply the TCA algorithm to the integrated database and update values.
4. Calculate final aggregate contributions (based on mileage and accommodation) for national and South Australian value to then stratify by park/region/visitor origin/year.
5. Calculate contributions to Gross Regional/State Product and supported employment using appropriate economic models.

These steps are detailed further below.

Methods

Two main methods are applied to calculate the secondary economic contribution of parks and conservation sites in this study: the travel cost approach (TCA) to estimate secondary travel costs, and input-output (I-O) modelling for state and regional economic multiplier benefits.

This analysis is the first of its kind to be undertaken for these tourism assets using the emerging digital datasets in place for managing visitors and commercial operations. For each method employed at each scale, data acquisition and preparation were undertaken using a set of principles aimed at producing the most rigorous estimates possible with any bias being towards conservative estimations (i.e. less economic benefit estimated, not more). The principles guiding data selection and preparation were:

- Prioritize data completeness for the present study over data comprehensiveness for understanding wider tourism preferences
- Liaise with DEW staff about data availability, appropriateness, access and gap filling processes
- Select and apply methods for gap filling and extrapolation only where necessary and using the most parsimonious methods of transformation and extrapolation
- Apply assumptions to result in conservative estimates of economic benefit where there is uncertainty. For example, for visitors that attended multiple parks on a single trip care was needed to avoid double-counting for that itinerary
- Separate the analysis for the regional parks network from that of the Adelaide Metro network due to significant differences in the approaches needed to assess economic benefit from visits in these two distinct networks
- Use established methods and models where possible to build a more comprehensive analysis system

- Maintain all necessary data confidence and confidentiality of corporate and third-party datasets
- Maximize the use of datasets which have highest likelihood of being maintained and expanded in the future.

The travel cost approach

Travel cost approaches (TCA) are widely used to value recreational and other (e.g. amenity) services provided by parks and conservation sites. TCA was first proposed by Hotelling in 1947 for estimating the value from protected areas (Heagney et al., 2019). The basic premise is that a proxy for a person's value of the site can be revealed from the maximum travel expenditure incurred by them to visit. The revealed preference methods elicit value estimates from the actual behaviour of individuals based on market information. TCA is commonly used to measure the demand for recreational activities and can be interpreted as a special case of the household production function methods, which is based on the rationale that recreational experiences are associated with direct payments and opportunity costs of time (Damigos et al., 2016).

TCA estimates have been used to justify government expenditure on conservation areas (Sohrabi Saraj et al., 2009), provide insights into visitor preferences for amenities (Benson et al., 2013), and/or to estimate the impact of new or increased entry fees (Pascoe et al., 2014). Studies that report aggregate values for a whole protected area network (e.g., a larger sample of a state's parks or conservation areas) remain rare in the literature (Bestard and Font, 2010; Heagney et al., 2019). As such, secondary economic values are often reported in a piecemeal fashion. Further, scaled-up value estimates remain challenging where on-site surveys are used to collect single-site value observations (Heagney et al., 2019).

To address this, it is advisable to use simultaneous valuation of all alternate sites within a park and conservation site network. It is also advisable to avoid any sampling bias which may arise from on-site surveying techniques by using stratified random sampling methods and direct interview techniques (ibid.).

While we do not follow the above recommendations exactly, our study does collect revealed use data for a large proportion of the South Australia's conservation reserve network—as stated, >95% of all visitors to the conservation reserve network in South Australia—via a central database of bookings, postcode and credit card origin identifiers held by DEW (i.e., the *Bookeasy* system) and other sources of visitor data (e.g., Point of Sale [POS], SA Tourism, Commercial Tour Operators).

The main information missing from our analysis is data on visitor values for most metropolitan parks and conservation sites (e.g., Cleland Wildlife Park, the Mt Lofty Summit and Belair National Park). However, the distances associated with these sites are relatively small for most visitors as they are close to Adelaide city. Thus, while they contribute a significant portion of primary revenue to the NPWS, we take a conservative approach to their secondary economic contributions and assume for this study that they do not generate significant TCA values compared to the more remote park sites in the reserve system (e.g., the Desert Parks). That said, we have been able to estimate partial values for the Metro Parks, which we include and discuss briefly here.

The centralized booking database also avoids a requirement to survey visitors on-site to collect data about individual trips—albeit at the cost of additional insights into amenity or other values. The revealed (as opposed to stated) travel origin data allows us to more rigorously estimate vehicle distances and expenditure, accommodation expenses over multiple days, and incidental meal or other expenses during a trip as a baseline assessment for DEW. In aggregate, these values form the basis of our TCA estimates, and later input-output modelling multiplier assessments.

The I-O model

Spending by overseas and interstate visitors to South Australia during trips to parks and conservation sites supports a contribution to the state and regional Gross Product and supported employment (Driml et al. 2019). This economic contribution is represented by analyzing the primary economic impact of expenditure on park fees and retail sales and/or estimating secondary spending on accommodation, transport, food and beverages etc. (see Figure 3).

Contributions and impacts from such expenditure will differ by region; metropolitan Adelaide will support more jobs per million dollars of consumption than smaller and more remote regions. These differences must be taken into account by the economic models employed and then reflected in the reported results to minimize inflation at the margin.

Some important initial assumptions needed to be taken into account when using this methodology. Firstly, we need to factor in any significant changes to the economy. For 2018-19 there was a broad reduction of -0.4% in multifactor productivity impact (Productivity Commission, 2020) which can be accounted for in the model. Secondly, unemployment in regions will vary, and so this also needs to be taken into account. This is achieved by variation of the rho value (a parameter representing employment mobility) within each input/output (I-O) model. Finally, there is a well recognised potential for I-O models to double-count impacts to sectors of an economy (Ewings, 1985), and therefore any estimates produced must be interpreted with such potential overestimation in mind.

Figure 3: Illustrative concept for economic multiplier effects across sectors (source)

Estimates of primary economic contribution are effects in industries or economic sectors where tourists directly spend their money (e.g., campsite fees). Estimates of secondary effects account for contributions to economic sectors that support tourism outside primary expenditure on DEW-provided goods and services (e.g., fuel, food and beverage sales in local towns, accommodation etc.). The combination of primary and secondary economic benefits is termed total effects on regional/state economies.

In this study we employ the Regional Industry Structure and Employment (RISE version 6.04) models developed by BDO EconSearch for the Department of Premier and Cabinet. In total there are twelve models, each representing a different government region in South Australia (Figure 4). This is due to the fact that each region has distinct characteristics and GRP/FTE differentials that must be taken into account. An overarching RISE model for South Australia is also available if the cumulative impacts of all economic activity need to be taken into account.

Data

Bookeasy dashboard/credit card data

DEW's online booking platform (*Bookeasy*) provided the main source of postcode data for domestic and international visitors to the state's parks and conservation sites in 2018-19. This enabled us to designate a starting location for each trip. Where postcode data for a trip was not available, credit card data (de-identified and fully sanitized of card numbers, expiry and CVV details) was provided as an alternative source of traveller origin data. Identity-blinded credit card data was particularly useful for getting a clear picture of international visitor origins, as this segment of the tourism market is of high interest. This was achieved using a series of online and public domain Bank Identification Number (BIN) services to identify country of origin for each record. Overall, the complete constructed dataset contained records 646,863 visitors from intra-state, interstate and international origins in the 2018-19 period.

Australian Postcodes

The postcode data for each visitor was then fed into a series of online and public domain Australia Postcode databases so that an origin (x-y) centroid point could be established for each record. While incomplete with respect to total distances travelled, this origin point provides an average value from each postcode location-equivalent across all of the relevant observations for conservative estimation of the secondary economic values. Postcode centroids/location data also enabled identification of State or Territory of origin to be integrated in the master database.

CAPAD database

The Collaborative Australian Protected Area Database (CAPAD) was used to create a final destination (x-y) point for each trip. The CAPAD records provide useful data on all national park and conservation sites, and in this case averaged destination points since actual final destinations (e.g. within a park) are generally not available or need to be inferred. Again, this allows conservative estimates of the secondary values for the TCA approach.

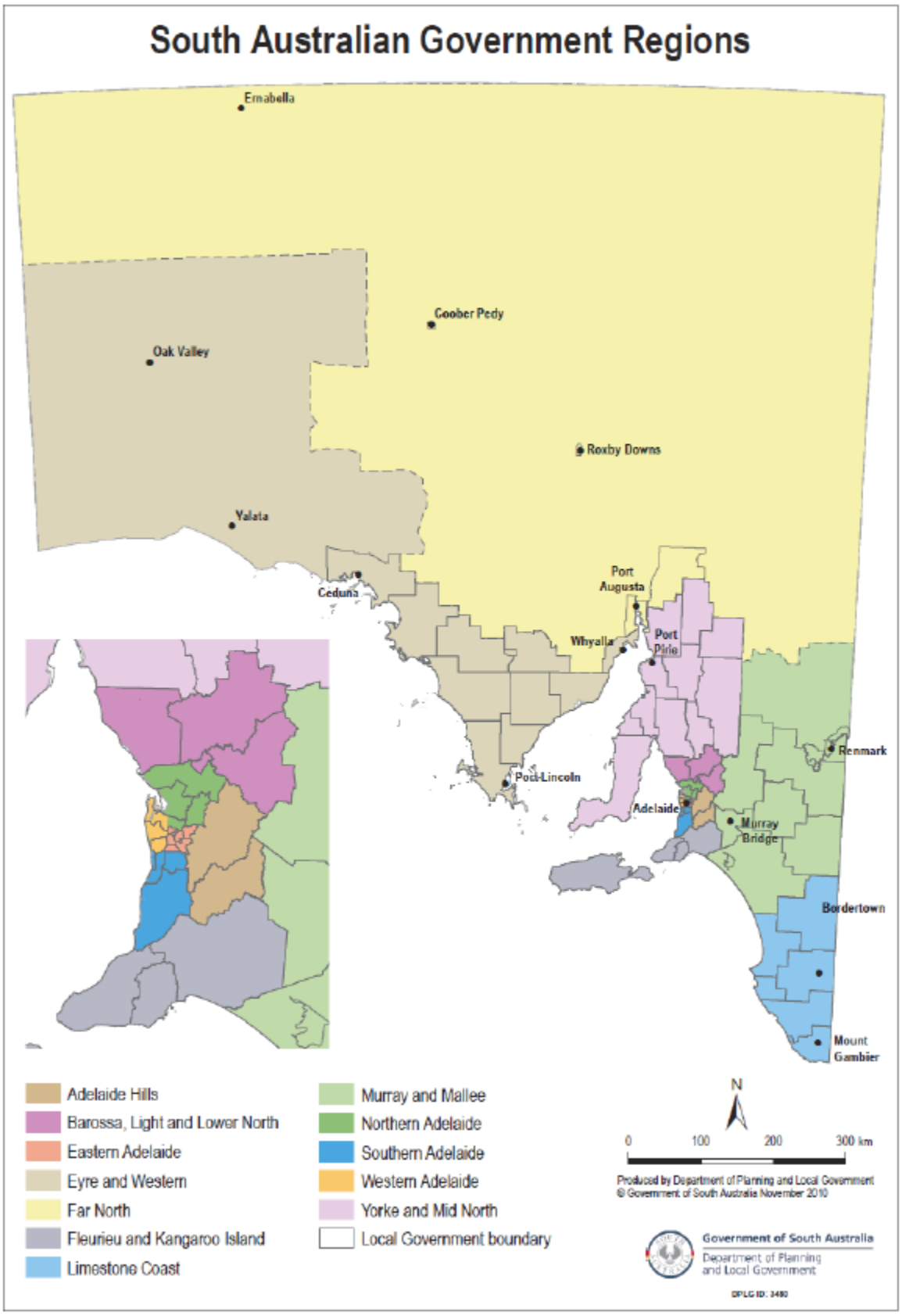


Figure 4: Map of SA government regions for the RISE modelling (Department of Planning Transport and Infrstructure, 2015)

Bing mapping tool

With the origin and destination geometry established we then used the Bing Maps web-based distance matrix mapping tool (and customized web-map service requests for each visitor record) to estimate a travel distance in Kilometres/time in minutes value for each trip through batched calls and subsequent web scraping routines to extract relevant information from xml files returned from the web map service. See Appendix A for more detail. A comparison with Google Maps web services was also undertaken, where we found strong similarities in the results.

Remoteness index

Finally, we applied the national remoteness index for Australia (Figure 5) to enable stratification of the final results for visitor origin state/location, DEW Region, park/conservation site, domestic versus international visitor, and year to enable finer interrogation of the database outcomes. This is important for future marketing strategies or assessments of investment priorities. Many South Australian parks and conservation sites are in very remote parts of the state, resulting in high relative TCA values which must be taken into account when interpreting the final results.

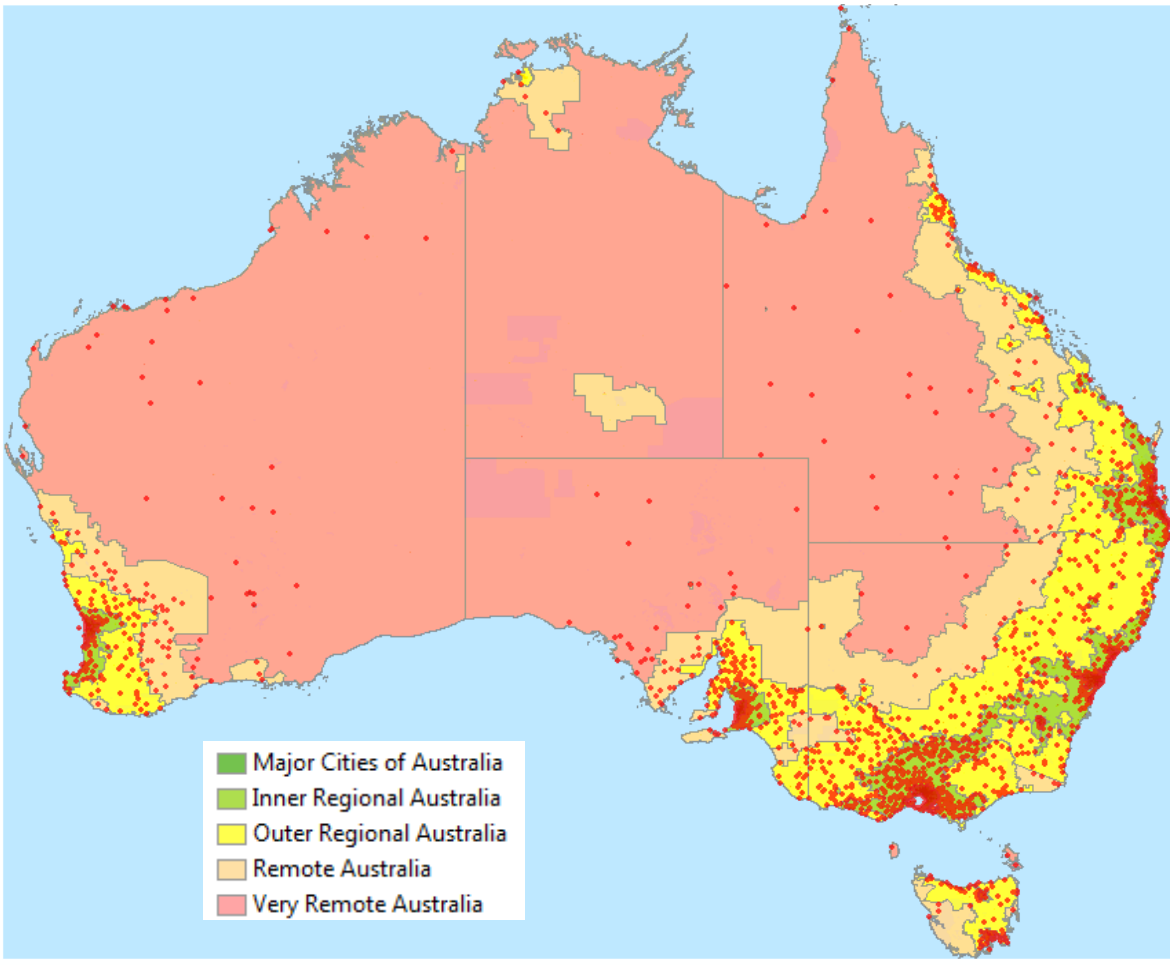


Figure 5: Map of Australian remoteness index regions

Commercial Tour Operator (CTO) data

Some of the South Australian parks and conservation sites are operated by Commercial Tour Operators (CTO). CTO's either have a lease that gives them a site for exclusionary use or a licence which gives them

access to parks for business purposes (non-exclusionary). Currently there are very limited data share agreements set up (i.e., only one CTO provided data on postcode origins for visitors to the Kangaroo Island Wilderness Trail), but DEW can access some data for visitor tours at its commercial sites if they are recorded on the NPWS Point of sale system (POS, for example the Seal Bay Conservation Park and Naracoorte Caves National Park sites). However, in such cases data is not necessarily been fully entered into the system, or kept separate from the *Bookeasy* site for commercial reasons. An issue for our analysis is that in some cases these CTO-managed parks/sites represent a significant proportion of the total economic activity of the site or region, and therefore it was desirable to include them in our estimates.

As stated, DEW was able to collect and then provide partial postcode data (as a basis for representative postcode estimation) from the relevant CTOs for several key sites: Seal Bay, Flinders Chase, Tantanoola Caves, Naracoorte Caves, and the Kangaroo Island Small Parks using CTO or additional data from DEW, plus additional estimates for Ikara-Flinders based on separate DEW data. This data was used to complement the *Bookeasy* records, and then to extrapolate proportional values for other key sites where data was missing (e.g., Naracoorte Caves National Park values [37% postcode data] and Tantanoola Caves [28% postcode] were used to estimate representative TCA values for missing values to then extrapolate across other parks).

Data limitations and gaps

As discussed above, the Adelaide Metro Parks are largely absent from this analysis.

For the regional parks, most missing data problems were addressed by backfilling origin postcodes. However, the original data included a reasonably full set of observations, which meant backfilling was limited overall (detailed further below). More important were issues related to Parks Passes and the potential for double-counting of distances where multiple sites were visited in a single trip (~22,000 of total records), and the uncertainty around international travellers' exact origin and distances (~5-10% of total records). Unique booking numbers allowed some control for calculating maximum distances for multiple trips where highest distance divided by the total number of park or conservation sites visited formed the basis of the final contribution. This approach again produces conservative estimates where exact or more precise data is unavailable.

Finally, international visitors presented a unique challenge with respect to uncertainty about their origin point. To maintain a conservative estimate, we treated all international visitors as having arrived in South Australia by aeroplane into Adelaide. It was then assumed they would stay one night either side of their trip to a park or conservation site and be charged at the Adelaide Capital City rate. International visitor park visit secondary expenditure was then be estimated by the standard method.

Workflow

An overview of the workflow for our analysis is shown in Figure 6. Ultimately, four databases were created to account separately for the i) *Bookeasy,* ii) DEW credit card, iii) Seal Bay POS and iv) Naracoorte Caves POS data sources, and later integrated into a single database. Total TCA estimates are thus derived by combining the contributions in each database into a single set of observations.

This approach is needed because of the way each data source was set up, and the nature of the postcode observations available. Put simply, if no postcode data was available in the *Bookeasy* database we would turn to the credit card BIN data to fill as many gaps as possible. Where an origin was now revealed, the visitor was then categorized as either international (OS) or domestic (OZ)—see *Part 1. Primary Economic Value* methods section for additional detail. If international, a standard algorithm was applied (e.g.,

assume one night either side for OS visitor at Adelaide city rates, and add to the TCA estimates) to calculate the relevant secondary economic contribution. As discussed above, in some instances domestic visitor's postcode data/final destination point had to be inferred and extrapolated across missing observations.

For example, available postcode data for visitors to the Naracoorte Caves site (~40%) was extrapolated over the missing observations based on correlation estimates of similarity across all parks in the region. This provides some assurance that we could extrapolate the data as planned and, thus, controlled estimates of the associated travel expenditure. Similar extrapolation was applied to missing values in the credit card data although there were relative few missing observations.

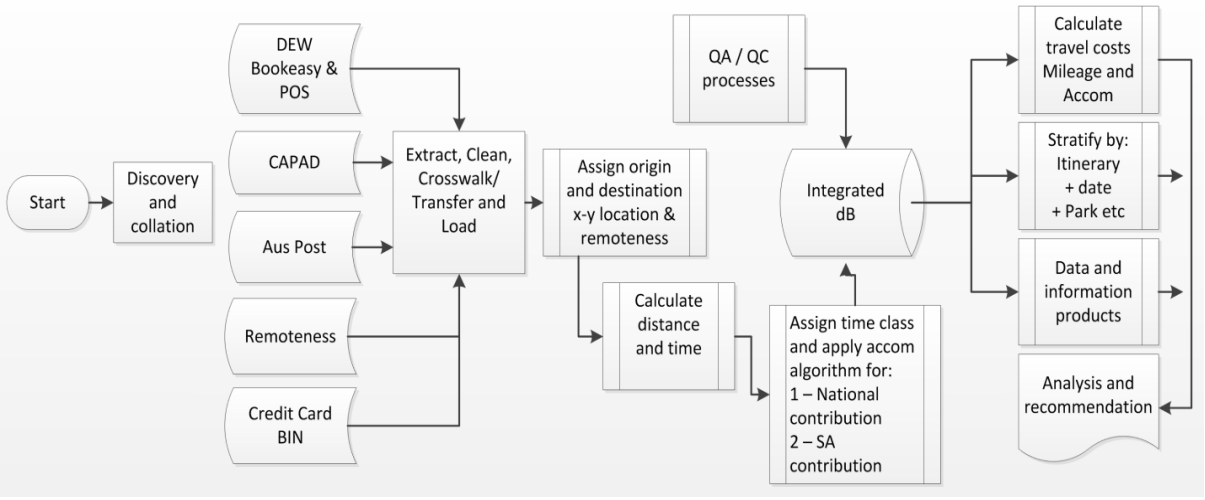


Figure 6: Outline of the TCA data collation, analysis and outputs workflow

Finally, to create a set of observations to isolate the secondary economic contribution solely to South Australia—which is particularly important for the I-O modelling—we calculated a series of distance cutoffs across Australia to determine the time/distance at which visitors would cross the border from their origin point. Using this calculation, a separate algorithm was applied to then determine the within/without South Australia travel expenditure. Since travelers also returned home, we took these values into account either side of the South Australia visit to ensure a reasonable, yet still conservative, estimate of their travel expenditure.

The detail available from the *Bookeasy* database for the regional parks and conservation sites in South Australia provided a relatively unique set of revealed preferences. Much of the potential bias associated with high-zero value observations collected through visitor surveys was reduced in this study, and more rigorous contributions from individual parks/regions were also possible due to the availability of individual park data. Consequently, we do not have to infer or transfer values from one representative park to other parks across the network. For the most part, a robust revealed set of secondary economic contribution values comprising separate mileage and accommodation estimates was thus made available at individual regional park or conservation site level.

Inputs to the models

Economic activity captured in this study arises at four levels: park, region, state and national. We also stratified the conservation network by remoteness—although that is not reported in detail here. As such, the databases are designed for stratification and reporting at all relevant levels. Secondary economic

contributions can therefore be calculated and reported by individual park (e.g., Mount Remarkable National Park), relevant regional area (e.g., Yorke and Mid-North), for the South Australian economy, and finally for the Australian economy.

Activities relevant to the TCA and I-O modelling include distances travelled by car, vehicle expenses, accommodation expenses (where necessary on longer trips), and meals and incidentals per visitor. All of these values are derived from the Australian Tax Office's (ATO) 2019/11 travel determination data for 2018-19, available on the ATO website[4]. All inputs, their sources and the range used to estimate additional travel cost activity (visitors and nights stayed) are detailed in Table 1. In some instances where origin was not on the mainland, and Bing Maps failed to return a distance or time (e.g. Christmas Island), it was assumed these visitors flew to ADL but we didn't include additional accommodation expenditure either side of their trip.

Table 1: Activity estimate - parameters and assumptions

Parameter	Source	Assumptions
Visitors	*Bookeasy*/POS data as provided by DEW	Good data available for nights stayed and so no further assumptions needed.
Distance visitors traveled	Bing distance metrics as calculated by the University of Adelaide research team and CAPAD park location data	Postcode data either directly available or extrapolated from POS data (at limited sites, e.g., Seal Bay) for missing values based on correlation checks across sites and informed by allocation shares / proportions based on known state behaviour to any missing postcodes over the sample. This provides a rough approximation of the origin site for each visitor (or group of visitors travelling on the same booking). All other visitors had travel distance in kilometers calculated between origin and destination sites. CAPAD data used to estimate final destination point for each trip.
Visitors staying at least one night or two or more nights	*Bookeasy* data as provided by DEW	Initial data supplied from *Bookeasy* enabled application of an algorithm designed by the researchers to inform a final set of visitor classes to then apply nights/room to for the dataset.
Accommodation, incidental or direct economic expenses	*Bookeasy* data as provided by DEW and ATO TD 2019/11 Taxation Determination data	Assumed that up to two visitors would utilize one room each night, and multiplied by number of nights recorded for the trip. One additional room added for each additional two visitors in the total party. All Victorian visitors with greater than 4 hours travel assumed to stay in a Tier-Two town overnight, but beyond that first night Other Country Centre rates applied. All other origins assumed to stay overnight at a Country Centre town for travel duration. International visitors assumed to land in Adelaide, stay minimum one night in the city before undertaking their park or conservation site trip. Another night in Adelaide at city ATO rate assumed before leaving the state at conclusion of trip.

All values used to estimate primary and secondary expenditure were based on 2018-19 rates where possible. An example set of data used appears below in Table 2. Although the opportunity costs of time at the Australian minimum wage rate was evaluated as an additional expenditure item, consistent with some other studies, it was decided not to include that expense in the final estimates.

[4] Australian Tax Office's (ATO) 2019/11 travel determination data for 2018-19 https://www.ato.gov.au/law/view/document?docid=TXD/TD201911/NAT/ATO/00001

Table 2: Expenditure estimates – Secondary contributions (source: Australian Taxation Office, 2021)

Example secondary expenditure	Rate applied
Vehicle travel costs (ATO)	$0.68 cents/kilometer
Adelaide accommodation	$157/night
Adelaide meals & incidentals	$133.75/day
Adelaide City full rate	**$290.75**
Tier Two town rate	$152/night
Tier Two meals & incidentals	$138.80/day
ATO Tier Two full rate:	**$290.80**
Other Country Centre rate	$110/night
CC meals & incidentals	$121.15/day
ATO CC full rate:	**$231.15**

Economic impact

The economic contribution multiplier impact was estimated using the RISE model version 6.04. Additional parameters were selected and/or set as presented in Table 1.

Table 3: Additional parameters in the RISE model

Item	Selection
Indicators used for RISE model output	Used: value added as GRP and employment as FTE. Not used: Household income impacts, population impacts, employment (total) and output (total).
Regional migration co-efficient	The estimated proportion of jobs that are filled by previously unemployed local residents of the area.[5] Selected values differ based on relevant estimates of jobs filled by local residents.
Proportion of expenditure excluded	Leakages are considered 'imports' and 'taxes less subsidies'[6] and are excluded from the impact on the regional economy.
Industry model	To allocate expenditure into industry sectors, two choices were available, the 'Tourism Industry' within the RISE model or a manual estimate based on reasonable assumptions for items visitors might purchase. The 'Tourism Industry' was considered the more appropriate choice.
Treatment of induced consumption	Induced consumption effects were excluded as they are considered too indirect for reporting purposes.[7]

[5] RISE Model Version 6.04, Glossary of Terminology.

[6] This means taxes less subsidies (TLS) on production and imports.

[7] Department of Treasury and Finance, 'Guidelines for the evaluation of public sector initiatives, Part B: investment Evaluation Process' 2014 page 68.

2018-19 Baseline Results

Total secondary economic impacts

Our analysis of the total secondary economic contributions from South Australian parks ranged from very high (e.g., national focus) to more granular (e.g. individual park case studies – see Appendix E) levels. This is useful to DEW/NPWS as it enables some assessment of local community and job support created by park tourism, better positions these agencies for discussions around how parks create benefits at different levels for the Australian public, and informs management actions based on economic efficiency grounds—among other assessment criteria where accounting/budgetary methods underestimate the worth of park sites (Haefele et al., 2016a; Richardson et al., 2018).

In total, there were 646,863 visitors[8] to regional South Australian parks and conservation sites in 2018-19, indirectly contributing a total of $358.8 million to regional economies. Five of the six regional areas enjoyed significant contributions above $30 million with only the Riverland and Murray Lands experiencing smaller relative secondary TCA and multiplier I-O contributions.

The main reason for this pattern of regional economic contribution is the distances (i.e. expenditure) involved in visiting parks and conservation sites that are more distant from the Adelaide metropolitan area as a common travel origin within South Australia. The distribution and type of attractions in the conservation reserve system may also play a part in drawing visitors to some regions where high secondary contributions are generated. Visitor data is also poor for some highly accessed parks and conservation sites in the Adelaide and Mount Lofty Ranges and the Limestone Coast regions because no bookings/entry fees are required for access (e.g. Morialta Conservation Park). As we are exploring these contributions via TCA, the more distant the site the higher the cost/secondary economic benefits that emerge from the analysis.

Table 4: Secondary contributions by region

SA Regional use values	TCA contribution ($)	I-O multiplier	Total Secondary Impacts
Eyre and Far West	$37.6M	$17.4M	$55.0 M
Flinders and Outback	$34.4 M	$14.3 M	$48.7 M
Kangaroo Island	$109.7 M	$56.3 M	$166.0 M
Limestone Coast	$23.8 M	$11.6 M	$35.4 M
Riverland and Murray Lands	$3.8 M	$1.8 M	$5.6 M
Yorke and Mid North	$33.4 M	$14.8 M	$48.2 M
Total Regions	**$242.5 M**	**$116.3 M**	**$358.8 M**
Adelaide and Mount Lofty Ranges	$5.8 M	$2.9 M	$8.7 M
Whole indicative SA contribution	**$248.3 M**	**$119.2 M**	**$367.5 M**

8 To clarify, visitors refer to the total number of people present in parks per day totalled for the year. They do not represent discrete individuals.

The majority of the TCA expenditure was incurred on accommodation and incidentals such as food and beverages. Within South Australia, a total of $181.6 million was spent on accommodation and meals associated with visits to sites in the conservation reserve system, while associated travel expenditure contributed $66.7 to the state economy.

This travel also contributed to the national economy, adding $68.4 million in secondary TCA economic contributions to the states and territories outside South Australia as visitors travelled through them to get to South Australian regional parks and conservation sites of interest. In total, the secondary economic travel expenditure contribution generated by South Australian sites to the Australian economy was $248.3 million highlighting their value to Australian and overseas visitors.

Origins of the contribution

As shown in Figure 7 the main secondary contributions came from South Australian ($57.5 million) and international visitors ($64.0 million). The willingness of South Australians to engage with their regional parks and conservation sites is positive, as is the significant value they place on those sites for recreational and other purposes. Closer neighbouring states such as Victoria (VIC) and New South Wales (NSW) contributed the next highest values, followed by visitors from Queensland (QLD) and Western Australia (WA). The lowest contributions were derived from Australian Capital Territory (ACT), Tasmanian (TAS) and Northern Territory (NT) visitors which appear to be relatively negligible but combined amount to $7.17 million—or approximately 5.6% of the interstate contribution ($126.8 million).

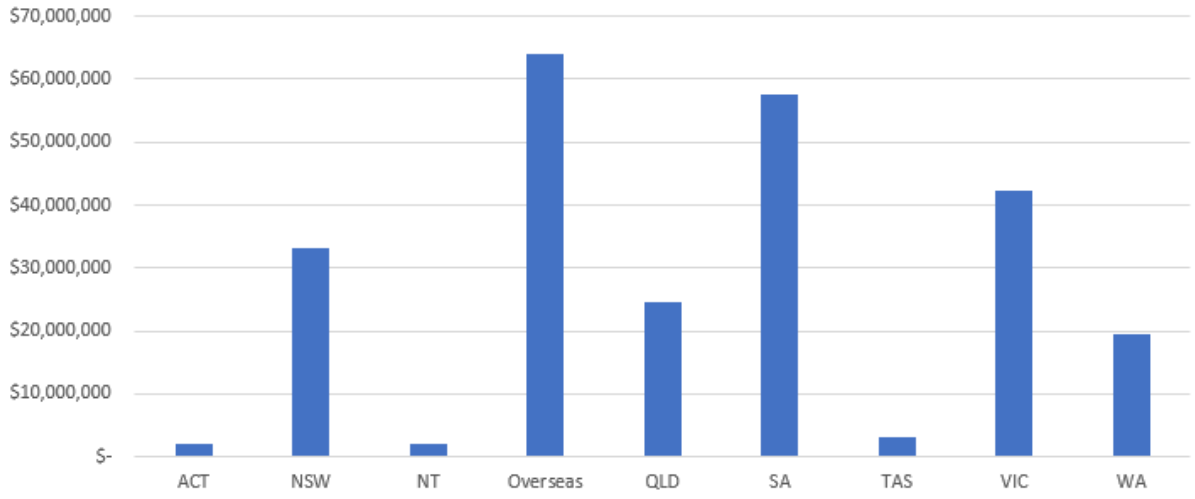


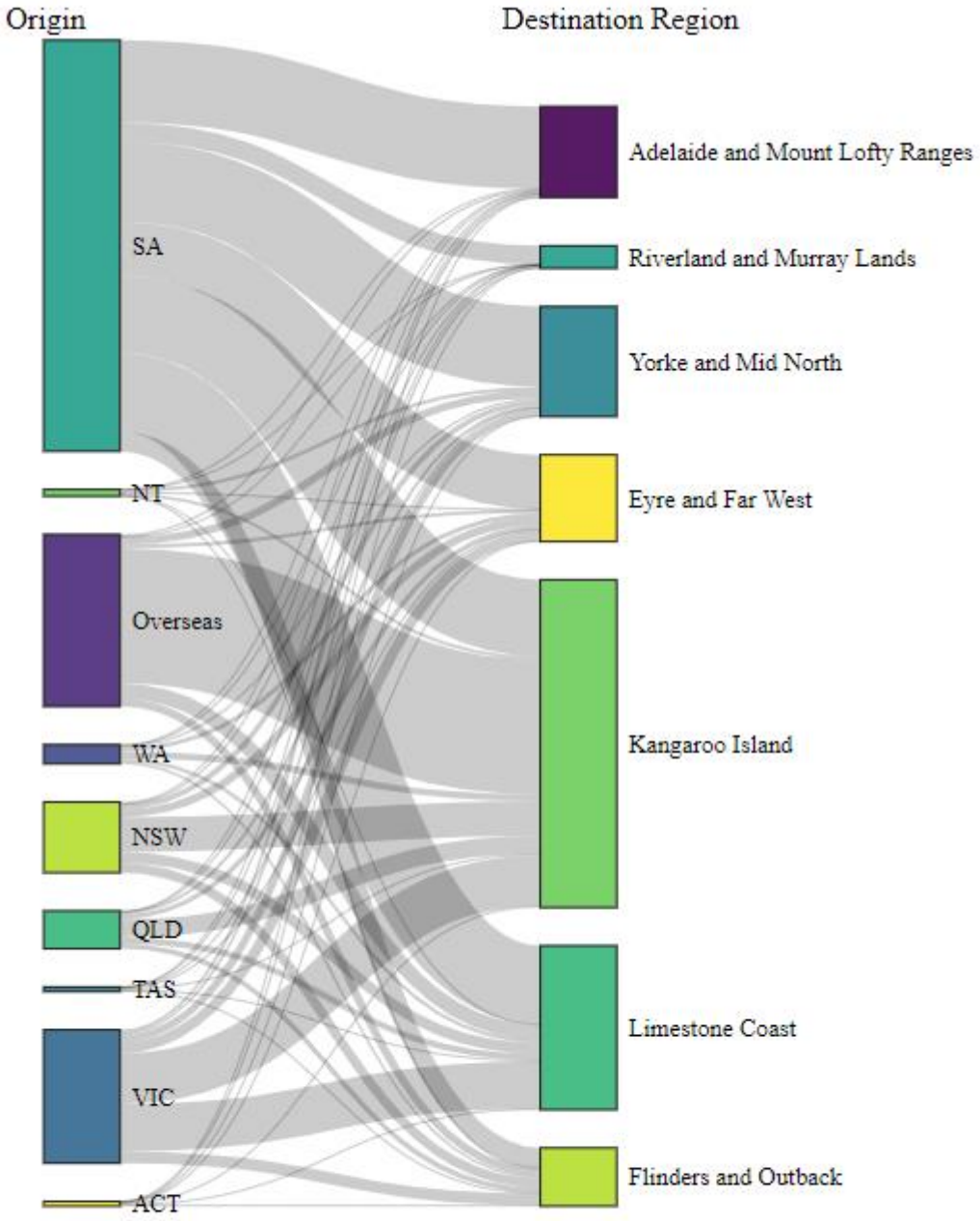
Figure 7: Main sources of secondary contribution by visitor origin

The main parks and conservation sites of interest (below, not ranked) to visitors include:

- Coffin Bay National Park
- Coorong National Park
- Deep Creek Conservation Park
- Dhilba Guuranda-Innes National Park
- Flinders Chase National Park
- Ikara-Flinders Ranges National Park
- Lincoln National Park
- Mt Remarkable National Park
- The Naracoorte Caves and Tantanoola Caves National Park

- Witjira National Park
- Seal Bay Conservation Park
- The Kangaroo Island Small Parks collective

We offer some further analysis of these key regional parks in the sections below. However, Figure 8 provides an indication of movements of visitors by origin, and their respective major regional destinations. In this case, some indicative results for the Adelaide and Mount Lofty parks are also included where the majority of visitors included in the data originate from South Australia.



Datasource: DEW Parks databases

Credit: Auricht Projects & University of Adelaide

Figure 8: Visitor flows between origin and destination points 2018-19

Share of travel expenditure by vistitor origin and type

By examining how visitors apportioned their travel expenditure (see Figure 9) we can see that South Australians tend to spend roughly equal amounts on travel expenditure and accommodation/meals for their trips. This is similar for visitors from the ACT and Tasmania. By contrast, international visitors have a much larger proportion attributed to accommodation. This in part reflects the assumptions made in our algorithms.

All international visitors were assumed to have arrived by plane into Adelaide, and thus much of their travel expenditure was absorbed outside the state economy. Further, it is apparent that most international visitors travel to the Kangaroo Island region (see Figure 10), also reducing their total travel expenditure relative to the longer drive distances and requirement for accommodation associated with remote park sites in other parts of the network.

NSW travelers appear to spend roughly twice as much on accommodation as on travel, while visitors from QLD and VIC tend to spend around 33% of their estimated budget on travelling to SA.

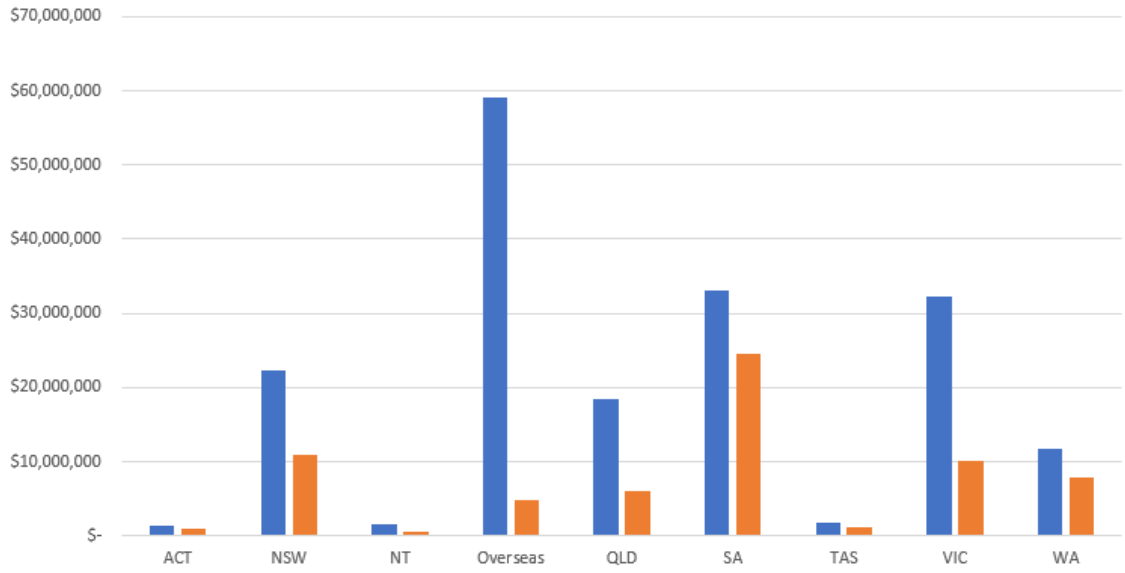


Figure 9: Visitor share of travel expenditure by origin, as part of Total_Trav_SA

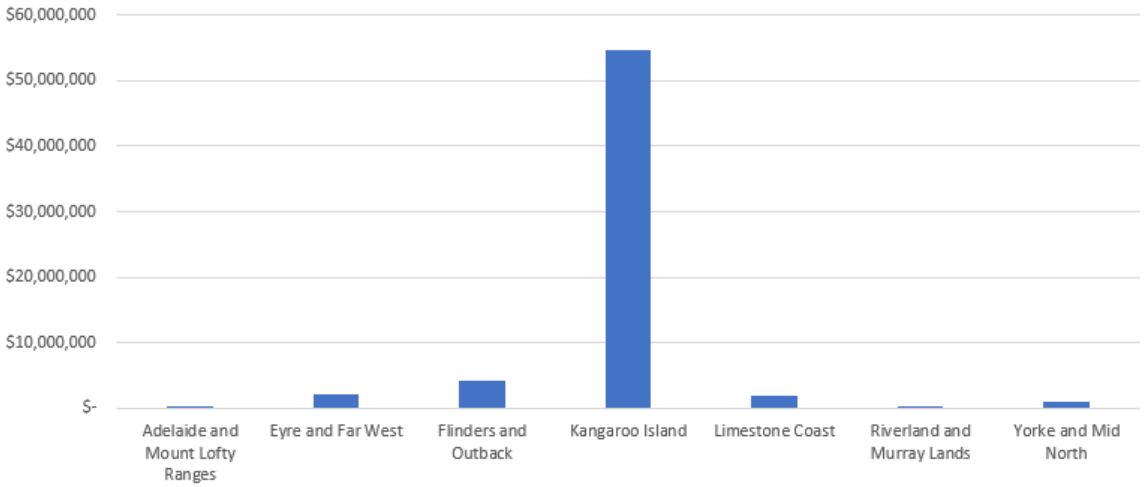


Figure 10: Main locations travelled to by international visitors

Key secondary contribution sites

There are a number of key regional commercial park and conservation sites that contribute significantly to the South Australian economy, and high use of these sites is evident in the secondary contribution value estimates. The available data did not allow us to derive any secondary value estimates for the Mt Lofty Summit site, but in all other cases we were able to derive some estimate of the secondary contribution from high use sites, called 'commercial sites' within DEW. These are shown in Figure 11.

The total contribution from the top six commercial sites where data was available was $123.0 million with Flinders Chase Conservation Park making up the majority of that value ($58.1 million). One point of difference between the primary and secondary values of the economic contributions relates to our weighted (and assumption-based) estimates for the Cleland Wildlife Park which falls to very low economic contribution levels—by contrast with the primary economic contribution figures.

While it is easily the most significant driver of the primary economic contributions, it falls away in our estimates to the lowest contribution level for secondary contribution values. This is again because of the relatively short distances involved in visiting Cleland Wildlife Park which is close to Adelaide. As a consequence, our algorithm heavily discounted the associated expenditure of visiting Cleland Wildlife Park, and the economic contribution reflected the low travel expenditure.

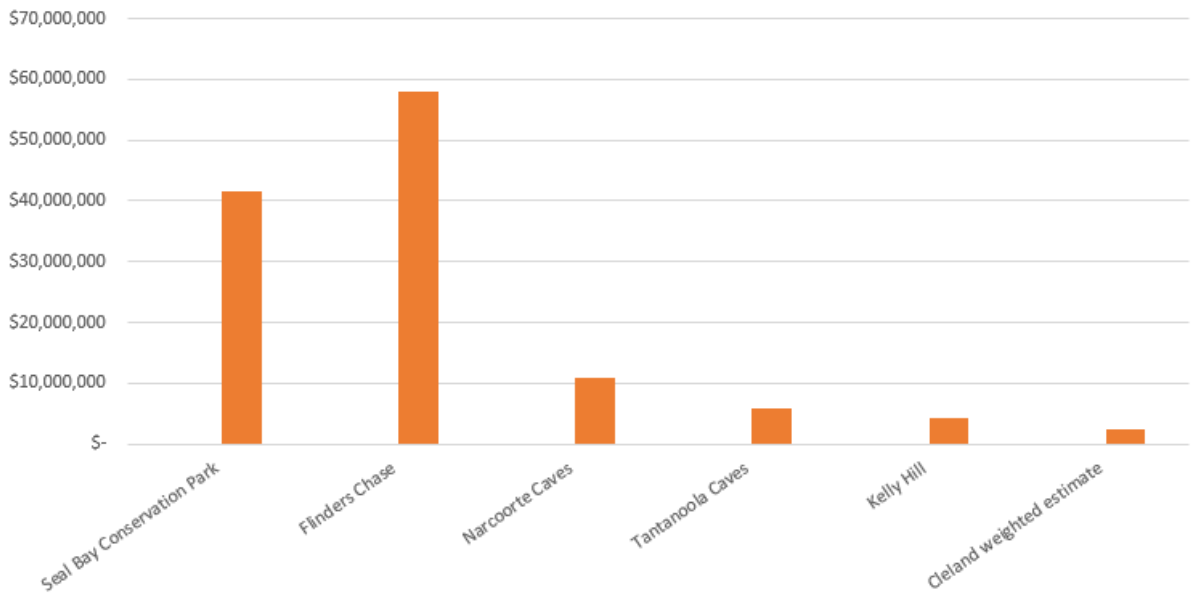


Figure 11: Main sources of secondary economic contribution by Region or Park

These six commercial sites therefore contributed around 34% of the total secondary economic benefits attributed to NPWS regional and commercial sites in the 2018-19 period (i.e., $367.5 million). Once again, this is important to reflect on as any assessment of the economic value of South Australian park and recreational tourism needs to take account of this difference in considering where value in the conservation reserve system is generated, as assessments of primary benefits alone may lead to a skewed perception.

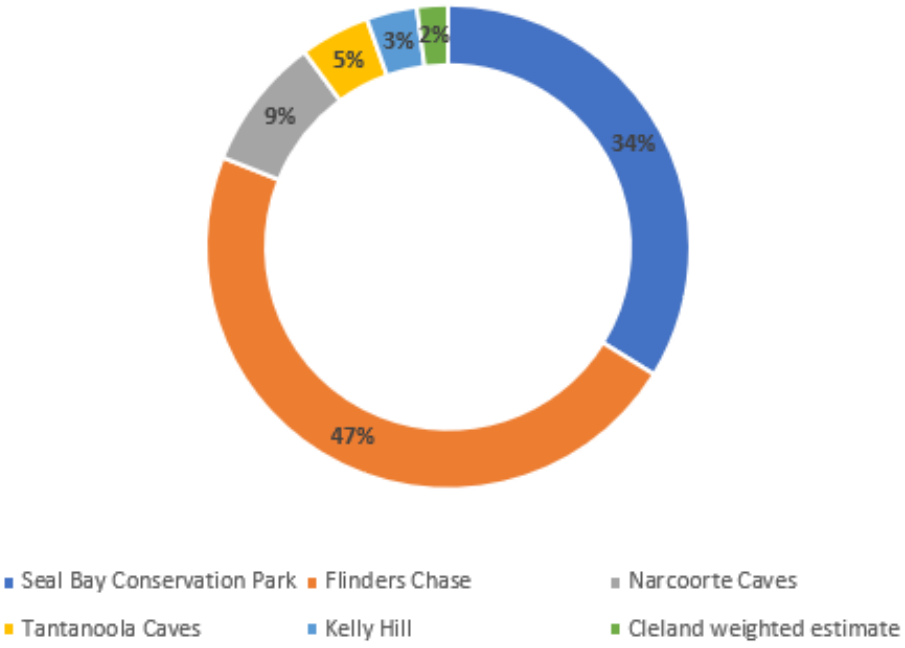


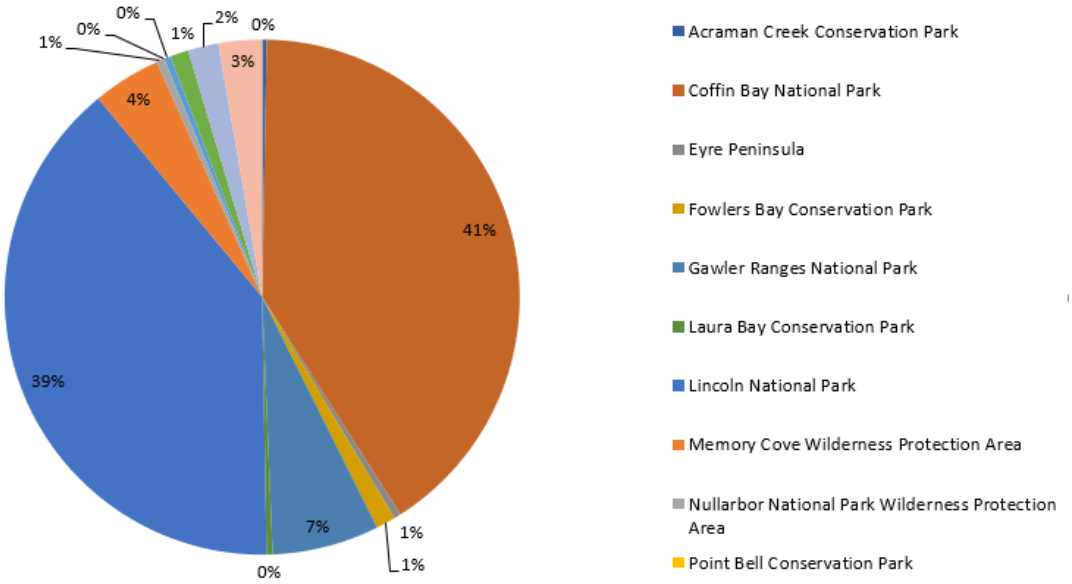
Figure 12: Main sources of secondary economic contribution by Region or Park

Key regional park and conservation sites, 2018-19

We now turn to a more detailed breakdown by regional area to discuss key parks and estimates. The percentages referred to are relevant for the pie-chart diagrams:

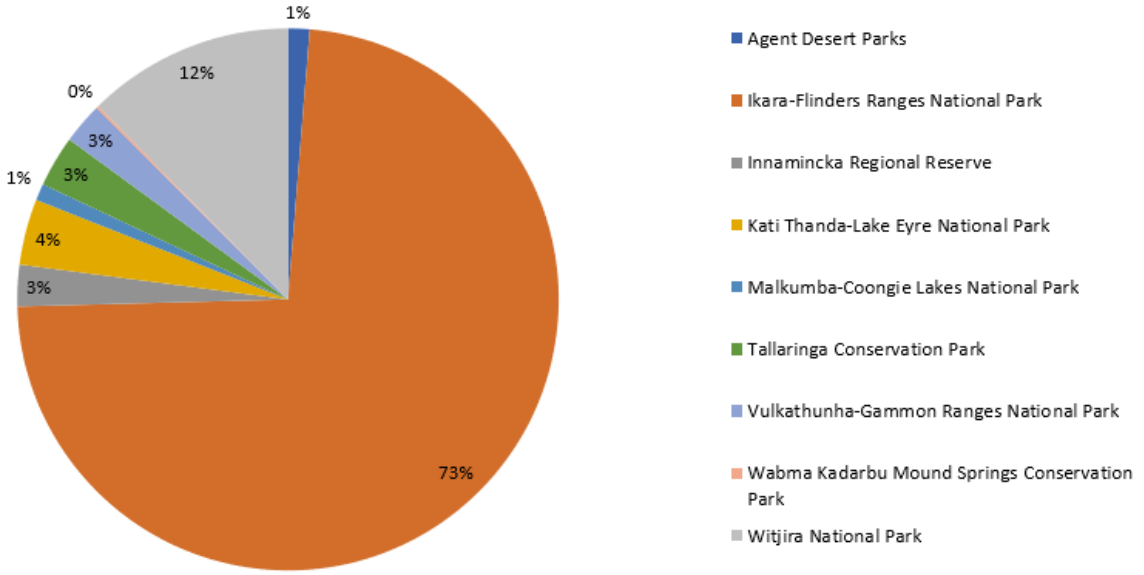
Eyre & Far West

The main contributors in this region were Coffin Bay National Park (41%) and Lincoln National Park (39%). Together, these two parks account for 80% of the total secondary contributions to the state from this region and $37.6 million to the regional economy.



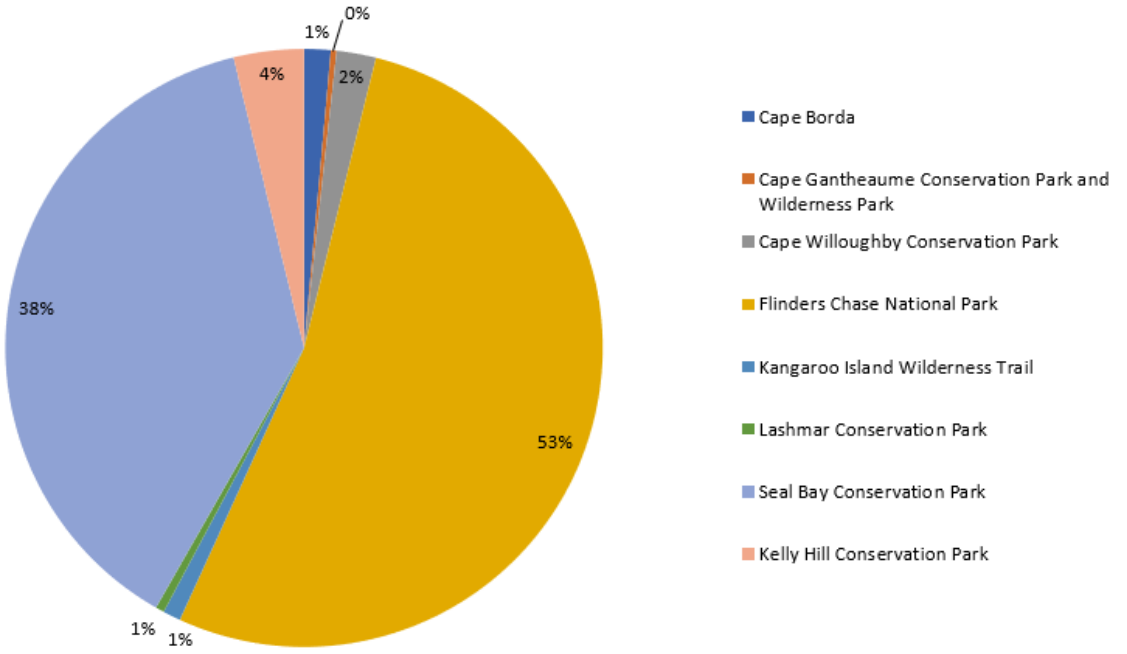
Flinders & Outback

The Ikara-Flinders Ranges National Park contributed 73% of total value, from secondary economic activity in this region. The next closest contribution is from Witjira National Park making a contribution of 12% regional and subsequently state economy ($34.3 million). These figures are a mix of *Bookeasy* and Desert Parks pass data (see Appendix B).



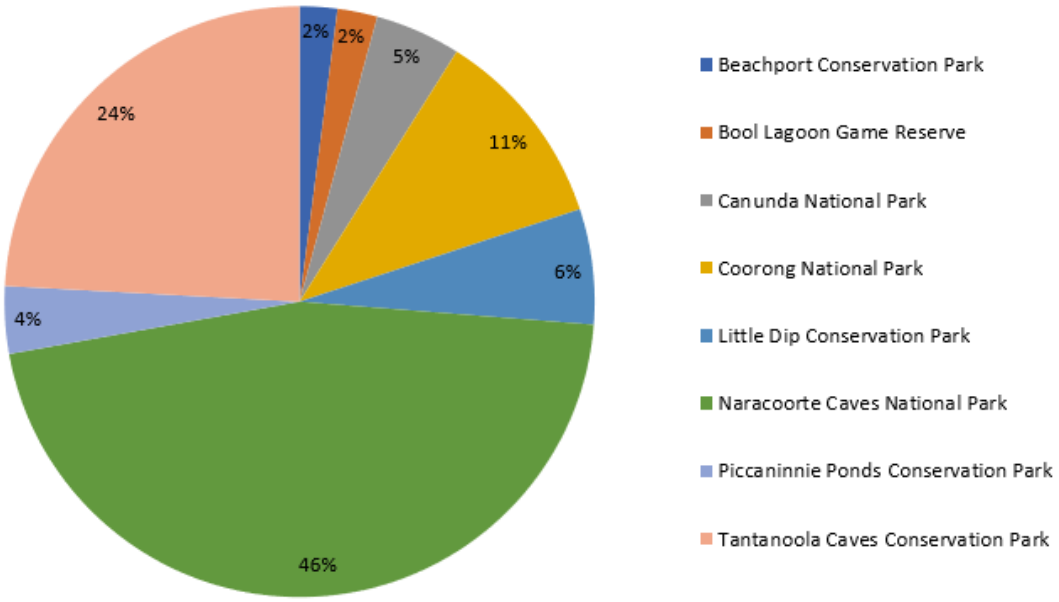
Kangaroo Island

Flinders Chase National Park contributes the majority of secondary economic value for Kangaroo Island at 53% of total, while Seal Bay Conservation Park contributes 38% of the total for the island ($109.7 million). The combined contributions from other Kangaroo Island parks (i.e., Cape Borda, Cape Gantheaume Conservation Park, Lashmar Conservation Park and Cape Willoughby Conservation Park) are also significant.



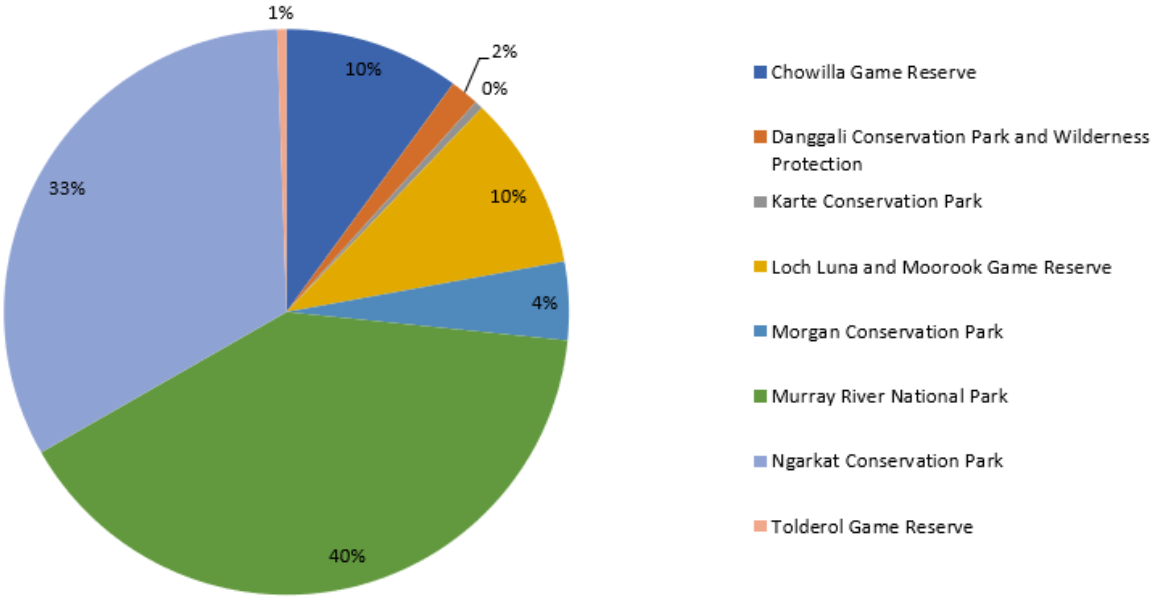
Limestone Coast

The Naracoorte Caves National Park (46%) and the Tantanoola Caves Conservation Park (24%) are the highest contributors to secondary economic value from visitation in the conservation reserve system in the region. The Coorong National Park also makes a significant contribution (11%). Total secondary economic contribution from visitation to the parks system in this region for 2018-19 was $23.7 million.



Riverland & Murray Lands

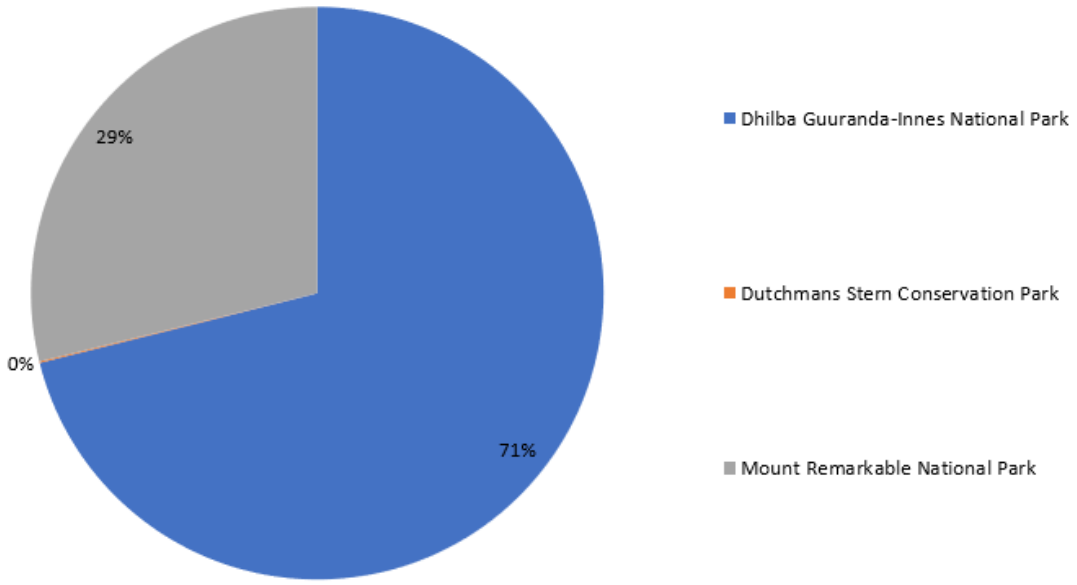
The Murray River National Park contributed 40% of secondary value to the region, while Ngarkat Conservation Park was the next biggest contributor at 33%. This was one of the lower contributing regions, but it still managed to contribute $3.7 million to the regional and state economies.



Yorke & Mid-North

In the Yorke & Mid-North region two parks stand out: Dhilba Guuranda-Innes National Park (71%) and Mount Remarkable National Park (29%). Dutchman's Stern Conservation Park contributed only

$29,846 (0.09%) and thus does not make it into the chart. The total contribution to regional and state economies was $33.3 million.



Regional contributions to GRP and employment, 2018-19

We next examine the multiplier impact of these secondary contributions to each of the regions of South Australia through the application of regional I-O models as outlined above.

The multiplier effect of secondary economic contributions to Eyre & Far West region from visitation to the conservation reserve system are shown in Table 5. The initial and flow-on impacts of visitors to the region are $17.3 million with much of the surplus retained in the region due to its distance from Adelaide and relative remoteness. The secondary economic impact also supports quite a high number of positions in the region (170) where the main contributions from additional tourism flow to accommodation, food and beverage, and retail sectors of the economy.

Table 5: Eyre & Far West Region I-O Impact Results

	Secondary economic impact
Additional expenditure	$37.6M
Impact on Gross Regional Product	
Initial	$14.4M
Flow-on	$3.01M
Total	**$17.4M**
Impact on Employment (FTE)	
Initial	143.86
Flow-on	26.85
Total	**170.71**

For the Far North or Flinders and Outback region the secondary contributions are again quite high, primarily due to the travel distances involved. The secondary economic stimulus results in initial and flow-on boosts to the regional economy of $14.3 million and this in turn supports around 146 FTE positions in the region; in this case mostly retail industry related (Table 6). Accommodation and dwelling

ownership are most impacted by GRP growth in the region. See Appendix C for an example of the 20 sectors reported in the RISE models. There is some likelihood that these figures are an underrepresentation of total contributions due to remoteness of location, and lower compliance with bookings.

Table 6: Flinders & Outback Region I-O Impact Results

	Secondary economic impact
Additional expenditure	$34.4M
Impact on Gross Regional Product	
Initial	$10.5M
Flow-on	$3.8M
Total	**$14.3M**
Impact on Employment (FTE)	
Initial	121.38
Flow-on	25.01
Total	**146.45**

The Kangaroo Island and Fleurieu region is the dominant area for secondary contributions to the economy in South Australia from parks and conservation sites. It is home to many of the key sites of interest to travelers, and as discussed above contains the premiere attractions for international visitors. Although closer to Adelaide and thus associated with lower potential travel expenditure, the size of the visitor numbers drives the highest secondary values for any region. In 2018-19 sites in this region generated initial and flow-on economic impacts of $56.3 million and supported 616 FTEs across the range of sectors of the economy (Table 7). The main impacts were felt in the retail trade, accommodation and new industry sectors, while supported employment was mostly associated with retail trade and food and beverage services.

Table 7: Kangaroo Island & Fleurieu Region I-O Impact Results

	Secondary economic impact
Additional expenditure	$109.7 M
Impact on Gross Regional Product	
Initial	$41.9 M
Flow-on	$14.4 M
Total	**$56.3 M**
Impact on Employment (FTE)	
Initial	474.88
Flow-on	141.24
Total	**616.12**

The Limestone Coast region is home to another key set of parks and conservation sites for primary economic contributions, and where the secondary economic benefits are also significant. The stimulus from indirect tourism spending generates a further total GRP impact of $11.59 million and supports around 117 FTEs within the region (Table 8). These impacts are mainly experienced in the retail trade,

food and beverage services and accommodation sectors. New industry and dwelling ownership benefits also feature in the GRP impacts. It should be noted that this will likely be underestimated as the parks do not charge an entry fee, and we only have data on day entry and camping fee charges in the system.

Table 8: Limestone Coast Region I-O Impact Results

	Secondary economic impact
Additional expenditure	$23.7M
Impact on Gross Regional Product	
Initial	$9.01M
Flow-on	$2.5M
Total	**$11.6M**
Impact on Employment (FTE)	
Initial	93.61
Flow-on	23.55
Total	**117.16**

The Murray and Mallee or Riverland and Murray Lands region is one of the smaller secondary value contributors, but it still experiences a positive impact from nature-based tourism associated with the conservation reserve system. As a result of the approximately $3.7 million in contributions from visitors a further $1.85 million is added to GRP in initial and flow-on impacts. This also supports around 18 FTEs in the region in the retail trade, accommodation and food and beverage services sectors (Table 9). Once again, new industry and the ownership of dwellings are significant benefactors from the GRP impacts.

Table 9: Riverland & Murray Lands Region I-O Impact Results

	Secondary economic impact
Additional expenditure	$3.7M
Impact on Gross Regional Product	
Initial	$1.4M
Flow-on	$452,000
Total	**$1.85M**
Impact on Employment (FTE)	
Initial	13.97
Flow-on	4.06
Total	**18.03**

Finally, the Yorke and Mid-North region is another significant contributor to the secondary values from conservation reserve related tourism due to the distances involved in travelling to visit popular parks and conservation sites (Table 10). In 2018-19 a total of $14.8 million was added to GRP and around 143 FTEs were associated with tourism activity in the region. Like many other regions, employment was mainly associated with accommodation, retail trade and food and beverage services, while new industry and dwelling ownership was positively impacted by GRP growth.

Table 10: Yorke & Mid-North Region I-O Impact Results

	Secondary economic impact
Additional expenditure	$33.3M
Impact on Gross Regional Product	
Initial	$11.6M
Flow-on	$3.2M
Total	**$14.8M**
Impact on Employment (FTE)	
Initial	116.84
Flow-on	26.23
Total	**143.07**

In aggregate, the regional parks and conservation sites contributed $119.2 million to the state economy from initial and flow-on impacts to GRP, and supported 1,211 FTE jobs across sectors associated with tourism. This is a clear indication of the value of the state's natural attractions and their contribution to the economy through tourism and flow-on effects to other sectors.

Implications of the research

At nearly a quarter of a billion dollars in secondary economic benefits, South Australia's conservation reserve network is a significant asset for the state's economy—with year-on-year benefits if visitor contributions are maintained. In particular, it is the state's regional areas that benefit the most from conservation park and attraction tourism in terms of GRP growth and supported employment opportunities.

The remoteness from major population centres of many of South Australia's parks and conservation sites clearly appeals to visitors and contributes significant multiplier benefits to the economy. Further, in our current COVID restricted travel context, the remoteness and opportunity for socially distanced recreation is likely a significant attraction to South Australians as they enjoy the benefits that the state's parks provide.

This study is also somewhat of a first. Other TCA studies commonly use survey data collection methods from a random sample of the total population, which can result in difficult to analyse data from high zero-inflated responses because only a portion of respondents will have accessed a conservation park. In the case of our study, all of the baseline observations are positive, avoiding zero-inflated responses, and providing more rigorous—if not completely accurate—revealed preferences for the use values for South Australian parks and conservation sites.

Second, the data has high coverage from across all key regional park and conservation sites in South Australia (not including the Adelaide Metro Parks). This avoids the use of methods which estimate economic contribution and multiplier benefits from a few data rich sites and the need to use 'benefit transfer' methods to estimate values from unstudied sites. Benefit transfer approaches are also commonly adopted due to cost/time pressures on data collection, but can lead to inflated value estimates which may only become apparent after repeated studies in the same location.

In our study, we have been able to collect, analyse and interpret data for every key visitor regional park and conservation site in the DEW/NPWS-managed conservation reserve system in South Australia,

thereby avoiding the need to transfer values on the basis of assumptions about the similarity of sites. The results presented here should represent appropriately conservative contribution estimations based on the methods used, data included, and assumptions made explicit in the methods.

How do these results help the NPWS?

The majority of economic value associated with parks are ex-market, requiring techniques that do not rely on market values to estimate. Regional communities benefit from supported jobs and business sales created by park visitation, while park visitors benefit from the recreation and leisure opportunities provided by nature-based tourism (Richardson et al., 2018). Accounting/budgetary methods will tend to underestimate the worth of park sites and therefore provide a less relevant set of inputs to policy and management decisions. A more complete estimate of economic contributions positions DEW/NPWS to better advocate for its mission through evidence-based support for the significant value created by parks for South Australians (among others), as well as the positive economic activity generated from national park visitation and operations.

In this case, we were able to compare both the primary economic contributions of park revenue (e.g., campsite fees) to the total secondary economic contributions (i.e., the sum of travel cost and multiplier impacts) to derive a $1:$23 ratio between the two categories at a whole-of-regional-area level. Further, data provided by NPWS for their operating expenditure (opex) and capital expenditure (capex) in the 2018-19 period enabled us to also determine the ratio between those expenditure levels and total secondary economic benefits to the regions: a $1:$10.40 difference. In scale, this ratio is consistent with values reported in earlier studies of Queensland National Parks (Driml et al., 2019) and the United States' National Park System (Haefele et al., 2016b).

A deeper consideration of such ratios can inform resource allocation decisions in national parks (Richardson et al., 2018), where trade-offs associated with competing park investments or benefit-cost assessment outcomes can be enhanced by the net economic values reported in this study. For example, decisions about increases to park entry fees—or whether to apply fees at new sites—can be informed by the results, as well as how the revenue collected by various agencies might be affected by different prices (ibid.). However, since the public are generally thought to value parks whether they visit them or not, government allocations from general budgets toward park opex/capex investments may have greater economic benefit than targeted fee increases (Haefele et al., 2016b).

That said, economic estimates of value are a single tool in the wider array of value estimates needed to inform final management and investment choices. The value of ecosystem services and conservation benefits are also important, requiring additional analysis.

Key findings

A key finding from this study is the significance to regional economies of contributions from visitors to parks and conservation sites in the DEW-managed conservation reserve system—both at secondary and multiplier levels. While the focus of DEW and NPWS may be on commercial sites as a key driver of primary benefits, in fact the regional parks contribute at far higher rates where we take the secondary and multiplier impacts into account.

Regions clearly rely on the conservation reserve system to attract primary and secondary economic benefits from tourism, with some regions deriving greater benefit than others. Regions with sites remote from population centres, including Eyre & Far West, Flinders & Outback and Yorke and Mid-North regions received $105.3 million worth of secondary economic benefits (estimated from first-round TCA), and a further $46.5 million from initial and flow-on economic multiplier effects through tourism-

associated sectors (i.e., accommodation, food and beverage services, retail trade etc.) in 2018-19. As stated above, this is likely an overestimate of the true use values, as some of this expenditure was also undertaken in regions outside of these areas, and we cannot assume that all monies were solely spent in relation to park visitation.

Regions closer to Adelaide which contain the majority of commercial tour sites also derive significant economic contribution benefits from tourism, amounting to $143.1 million through secondary contributions, and a further $72.6 million from the initial and flow-on impacts to the greater economy. Of these assets, Kangaroo Island parks and conservation sites are the most important, providing 77% of the total value in this category. Flinders Chase National Park is the standout performer, especially for international visitors who are the biggest proportion by visitor origin—but only slightly ahead of South Australians enjoying their own backyard.

The aggregate secondary and stimulus flow-on impacts from park and conservation site tourism to South Australia in 2018-19 was estimated at $367.5 million; or approximately 10% of the estimated total tourism contribution to South Australia's economy (Department of Treasury and Finance, 2019). This impact mainly relates to economic sectors associated with tourism and recreation associated with park visitation, such as accommodation and food and beverage services.

These results indicate the positive economic impacts of conservation and recreation reserves and nature tourism, where other benefits (e.g., improved fitness and wellbeing having a cost reduction impact in the healthcare sector) could also be explored.

Appendix A – Distance calculation codes

Available at: https://www.microsoft.com/en-us/maps/choose-your-bing-maps-api

1. Bing Maps (226 km)


```
−<TraceId>
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 </TraceId>
−<ResourceSets>
  −<ResourceSet>
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2. Google Maps (226 km)


```
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    <destination_address>Pondalowie Bay Rd, Inneston SA 5577, Australia</destination_address>
  −<row>
    −<element>
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          <text>2 hours 40 mins</text>
       </duration>
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          <text>226 km</text>
       </distance>
     </element>
   </row>
 </DistanceMatrixResponse>
```

Appendix B – Parks Pass details

Desert Parks Pass entitles 12 months of unlimited vehicle entry and camping fees The Desert Parks Pass includes vehicle entry and camping within the following parks:

- Innamincka Regional Reserve
- Kati Thanda-Lake Eyre National Park
- Malkumba-Coongie Lakes National Park
- Munga-Thirri–Simpson Desert Conservation Park and Regional Reserve (mandatory)
- Tallaringa Conservation Park
- Wabma Kadarbu Mound Springs Conservation Park
- Witjira National Park (mandatory for travel east of Dalhousie Springs)

It does not include entry to Ikara Flinders. Bookings are required for camping and need to be made in advance of travel through the online booking system asked to enter your Desert Park Pass number. More information is available at: https://www.parks.sa.gov.au/book-and-pay/frequently-asked-questions#park-pass-faqs

Appendix C – Example 20 sector outputs, Yorke & Mid-North

Change in Final Demand ($m): Yorke & Mid North										
Enter the expected annual change in final demand (growth or decline) by sector by year. Press the F9 key to calculate the results of your "shock". Wait for the calculation to be 100% complete before making any further changes or using any other model functions. For price model impacts, press the solve buttons (at the bottom of the page), please note that Excel may become unresponsive.										
Sector	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Agriculture, forestry & fishing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Mining	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Manufacturing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Electricity, gas, water & waste services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Construction	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Wholesale trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Retail trade	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Accommodation & food services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Transport, postal & warehousing	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Information media & telecommunications	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Financial & insurance services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rental hiring & real estate services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Professional, scientific & technical services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Administrative & support services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Public administration & safety	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Education & training	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Health care & social assistance	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Arts & recreation services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Other services	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ownership of Dwellings	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Intermediate	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Appendix D – Peer Review of Final Report

Economic contributions to South Australian parks and conservation assets: review comments

I was pleased to read this work from the Centre for Global Food and Resources, School of Economics and Public Policy, University of Adelaide.

This report has been prepared at the request of The South Australian Department of the Environment and Water (DEW) to provide estimates of secondary economic benefits associated with the State's parks and conservation sites. These benefits were treated as secondary because the primary source of (financial) benefits to DEW of managing these assets accrued from visitor fees and other access fees levied by the Department.

The most popular approach to estimate these recreational benefits associated with natural environmental assets is to develop a Travel Cost Model, that relies on data captured through visitor interviews, to assess participants' revealed preferences, based on recall.

In this report, the authors have resorted to a more pragmatic approach, which, on closer inspection pretty much reflects what would be derived from a Travel Cost Model. That has been possible as much of the 'revealed preference' information has been recorded in visitor booking systems, and data gaps have been met using simple algorithms that capture what would have been captured in a TCM survey, but to a higher degree of reliability because there is no need for recall.

As the authors have noted, these estimates are just what they are and cannot be considered precise estimates of 'economic value' associated with park visitation. Assessment of full economic value involves rather tedious approaches to capture different components such as use value, non-use value, existence value and option value. It is sufficient to say that what has been produced by the authors is a reasonable reflection of financial benefits to The South Australian Treasury that can be reasonably associated with the State's national parks and the reserve system.

Furthermore, the method can be equally reliably used, as it has been in this report, to compare benefits from assets situated in different geographic locations, thus helping the State in prioritising management expenditure, for instance.

I was also impressed with the way in which the estimates derived have been presented. It would have been nice if these estimates were compared to other known income streams.

I am satisfied that the estimates provided are based on a sound analytical approach and can be regarded as fit for purpose.

Dr Thilak Mallawaarachchi

Resource Economist,
Honorary Associate Professor,
School of Economics, University of Queensland

23 June 2021

Appendix E: Case study results

Background

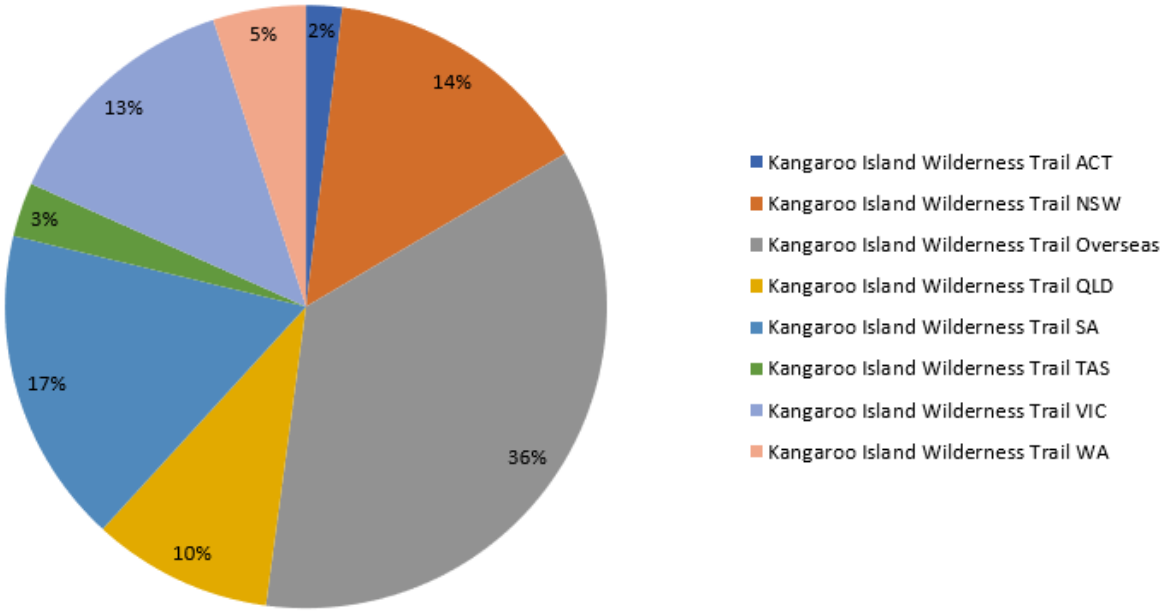
The South Australian Department of Environment and Water (DEW) also commissioned the University of Adelaide (UoA) to undertake an assessment of the secondary economic benefits in 2018-19 for several key case study sites. The objective in these case studies was to examine economic contributions at a granular level as a basis for exploring how useful such analysis might be to future planning and decision-making by DEW/NPWS. The six case studies selected were:

- The Kangaroo Island Wilderness Trail
- Seal Bay Conservation Park
- The Kangaroo Island region as a whole
- Flinders Ranges - Ikara- Flinders Ranges
- Flinders Ranges - Mt Remarkable
- Naracoorte Caves National Park

The following tables present the summary results for each of these case study sites/regions. Where relevant, some additional information is also provided.

Kangaroo Island Wilderness Trail

A total of 2,023 visitors were recorded in the database for 2018-19, with a mix of origin points as shown below:



These visitors contributed secondary economic benefits to the areas that they passed through on their way to the KIWT, both inside and outside South Australia. The ratio of spending was around 3 dollars in South Australia for every dollar spent outside the state border.

Table 11: Secondary contributions by region

Kangaroo Island Wilderness Trail	Secondary contribution ($)
SA accommodation contribution	$744,439
SA travel contribution	$307,366
Total SA secondary	$1.05 M
Total additional Australia secondary	$348,450
Ratio SA:AUS contributions	3:1

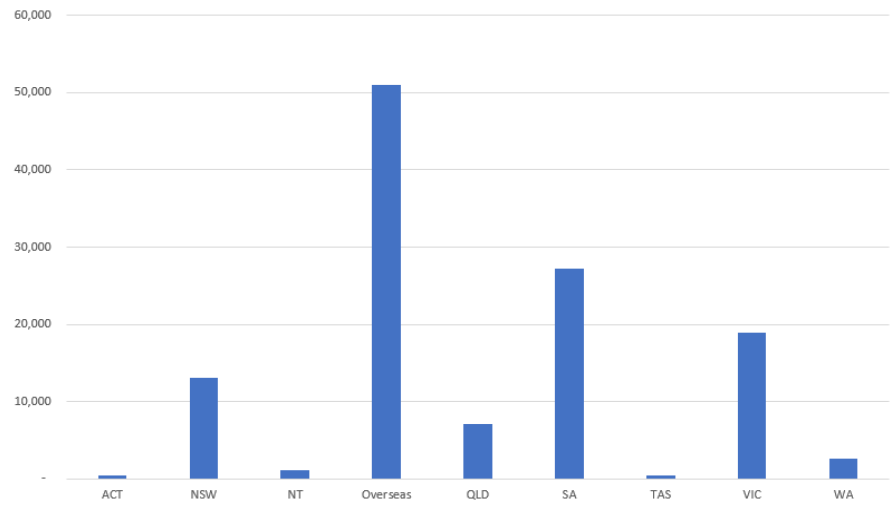
The KIWT also had a multiplier impact on the regional economy specifically, as outlined below. This includes both gross regional product (GRP) impacts and the supporting of full time employees (FTEs) in the region.

Table 12: Kangaroo Island Wilderness Trail Economic Multiplier Impact Results

	Secondary economic multiplier impact
Additional expenditure	$1.05 M
Less leakages (imports and taxes)	$464,781
Net stimulus	$587,025
Impact on Gross Regional Product	
Initial	$402,381
Flow-on	$137,478
Total	**$539,859**
Impact on Employment (FTE)	
Initial	4.55
Flow-on	1.36
Total	**5.91**

Seal Bay Conservation Park

Also in the Kangaroo Island conservation park network, the Seal Bay Conservation Park plays an important role in region. In 2018-19 a total of 121,818 visitors attended the park which makes it a clear hero site in the area. The majority of visitors come from overseas, as shown below:



These visitors contributed secondary economic benefits to the areas that they passed through on their way to Seal Bay, both inside and outside South Australia. The ratio of spending was around 7.6 dollars in South Australia for every dollar spent outside the state border.

Table 13: Secondary contributions by region

Seal Bay Conservation Park	Secondary contribution ($)
SA accommodation contribution	$40.3 M
SA travel contribution	$1.2 M
Total SA secondary	$41.6 M
Total additional Australia secondary	$5.4 M
Ratio SA:AUS contributions	7.6:1

The Seal Bay multiplier impact on the regional economy specifically is outlined below:

Table 14: Seal Bay Economic Multiplier Impact Results

	Secondary economic multiplier impact
Additional expenditure	$41.6 M
Less leakages (imports and taxes)	$7.3 M
Net stimulus	$34.3 M
Impact on Gross Regional Product	
Initial	$15.9 M
Flow-on	$5.4 M
Total	**$21.3 M**
Impact on Employment (FTE)	
Initial	180.20
Flow-on	53.60
Total	**233.80**

Kangaroo Island Region Conservation Parks

For the whole Kangaroo Island (KI) region a total of 275,601 visitors travelled to the area in 2018-19 making it the most popular set of sites in South Australia. The half of all visitors come from overseas, as shown below, and contribute the largest share of secondary/multiplier impacts:

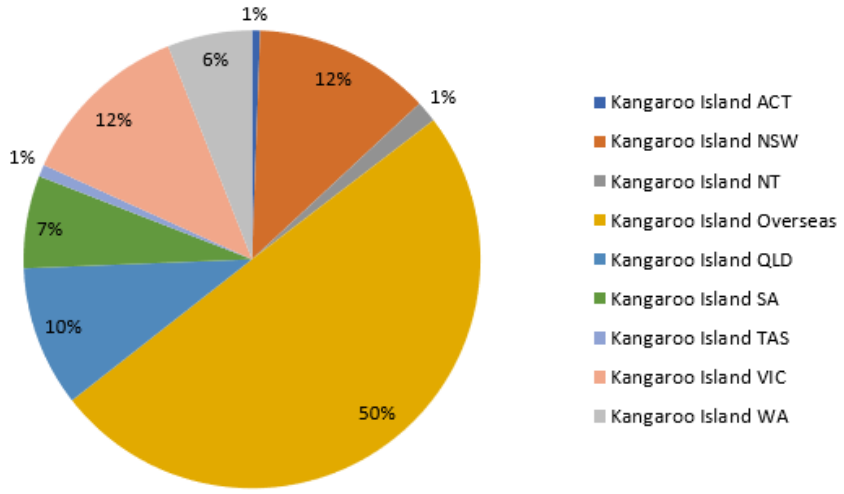


Table 15: Secondary contributions by region

Kangaroo Island Regional Parks	Secondary contribution ($)
SA accommodation contribution	$97.3 M
SA travel contribution	$12.4 M
Total SA secondary	$109.7 M
Total additional Australia secondary	$16.5 M
Ratio SA:AUS contributions	6.6:1

Table 16: Kangaroo Island Region Economic Multiplier Impact Results

	Secondary economic multiplier impact
Additional expenditure	$109.7 M
Less leakages (imports and taxes)	$42.3 M
Net stimulus	$67.4 M
Impact on Gross Regional Product	
Initial	$42.0 M
Flow-on	$14.3 M
Total	**$56.3 M**
Impact on Employment (FTE)	
Initial	474.88
Flow-on	141.24
Total	**616.12**

Ikara – Flinders Ranges National Park

A total of 31,105 visitors attended the Ikara-Flinders Ranges National Park in 2018-19. The majority were still from within South Australia, with similar interstate and overseas origin numbers.

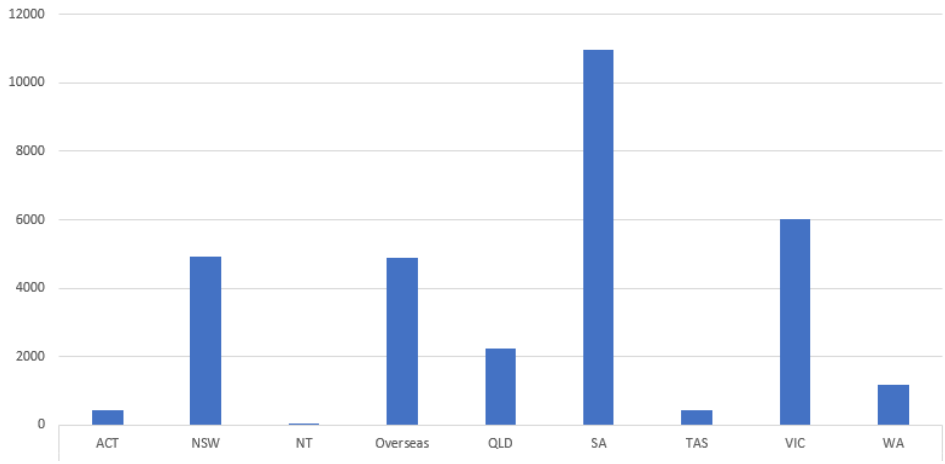


Table 17: Secondary contributions by region

Ikara - Flinders Ranges National Park	Secondary contribution ($)
SA accommodation contribution	$14.3 M
SA travel contribution	$10.8 M
Total SA secondary	$25.2 M
Total additional Australia secondary	$10.2 M
Ratio SA:AUS contributions	2.5:1

The multiplier impacts were nearly half the net stimulus providing significant economic benefit.

Table 18: Ikara – Flinders Ranges Economic Multiplier Impact Results

	Secondary economic multiplier impact
Additional expenditure	$25.2 M
Less leakages (imports and taxes)	$2.7 M
Net stimulus	$22.6 M
Impact on Gross Regional Product	
Initial	$9.5 M
Flow-on	$3.2 M
Total	**$12.7 M**
Impact on Employment (FTE)	
Initial	97.07
Flow-on	21.49
Total	**118.56**

Flinders Ranges – Mt Remarkable National Park

Still in the Flinders Ranges, the Mount Remarkable National Park also attracted a total of 20,181 in 2018-19. In this case, mostly from South Australia, with smaller numbers from elsewhere.

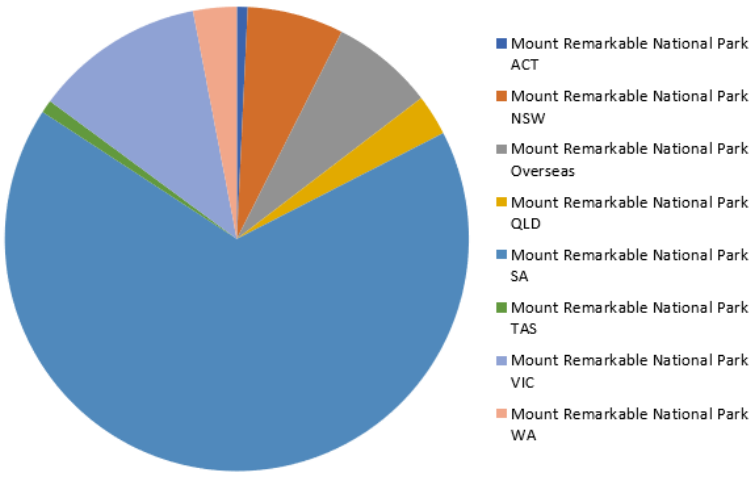


Table 19: Secondary contributions by region

Mt Remarkable National Park	Secondary contribution ($)
SA accommodation contribution	$5.8 M
SA travel contribution	$3.7 M
Total SA secondary	$9.6 M
Total additional Australia secondary	$3.3 M
Ratio SA:AUS contributions	2.9:1

This means that more of the multiplier benefit to the economy is felt in South Australia.

Table 20: Mt Remarkable Economic Multiplier Impact Results

	Secondary economic multiplier impact
Additional expenditure	$9.6 M
Less leakages (imports and taxes)	$388,371
Net stimulus	$9.2 M
Impact on Gross Regional Product	
Initial	$3.6 M
Flow-on	$1.2 M
Total	**$4.8 M**
Impact on Employment (FTE)	
Initial	37.06
Flow-on	8.20
Total	**45.26**

Naracoorte Caves National Park

For the Naracoorte Caves, another popular site for South Australians, the 2018-19 period saw 55,312 people travel to the park. Its close proximity to Victoria also meant that many arrived from there.

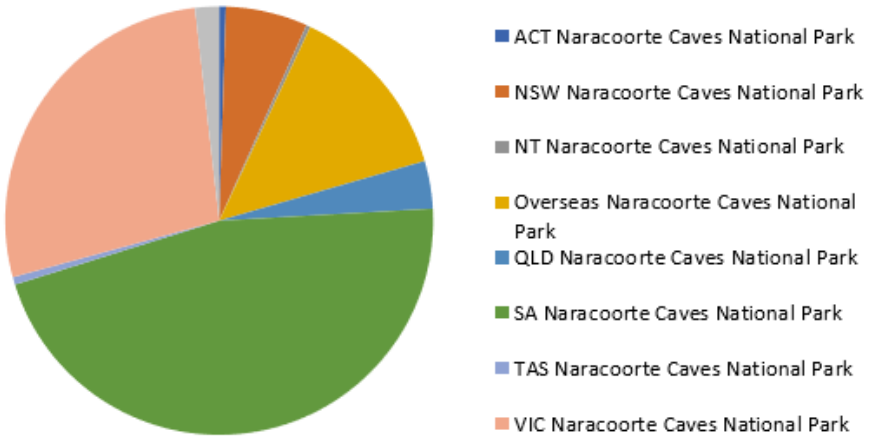


Table 21: Secondary contributions by region

Naracoorte Caves National Park	Secondary contribution ($)
SA accommodation contribution	$8.3 M
SA travel contribution	$2.7 M
Total SA secondary	$10.9 M
Total additional Australia secondary	$6.8 M
Ratio SA:AUS contributions	1.6:1

This results in one of the lower ratios of within/without South Australia contribution ratios, but some still highly positive multiplier impacts for the regional economy.

Table 22: Naracoorte Caves Economic Multiplier Impact Results

	Secondary economic multiplier impact
Additional expenditure	$10.9 M
Less leakages (imports and taxes)	$500,431
Net stimulus	$10.4 M
Impact on Gross Regional Product	
Initial	$4.1 M
Flow-on	$1.3 M
Total	**$5.4 M**
Impact on Employment (FTE)	
Initial	45.12
Flow-on	11.95
Total	**57.07**

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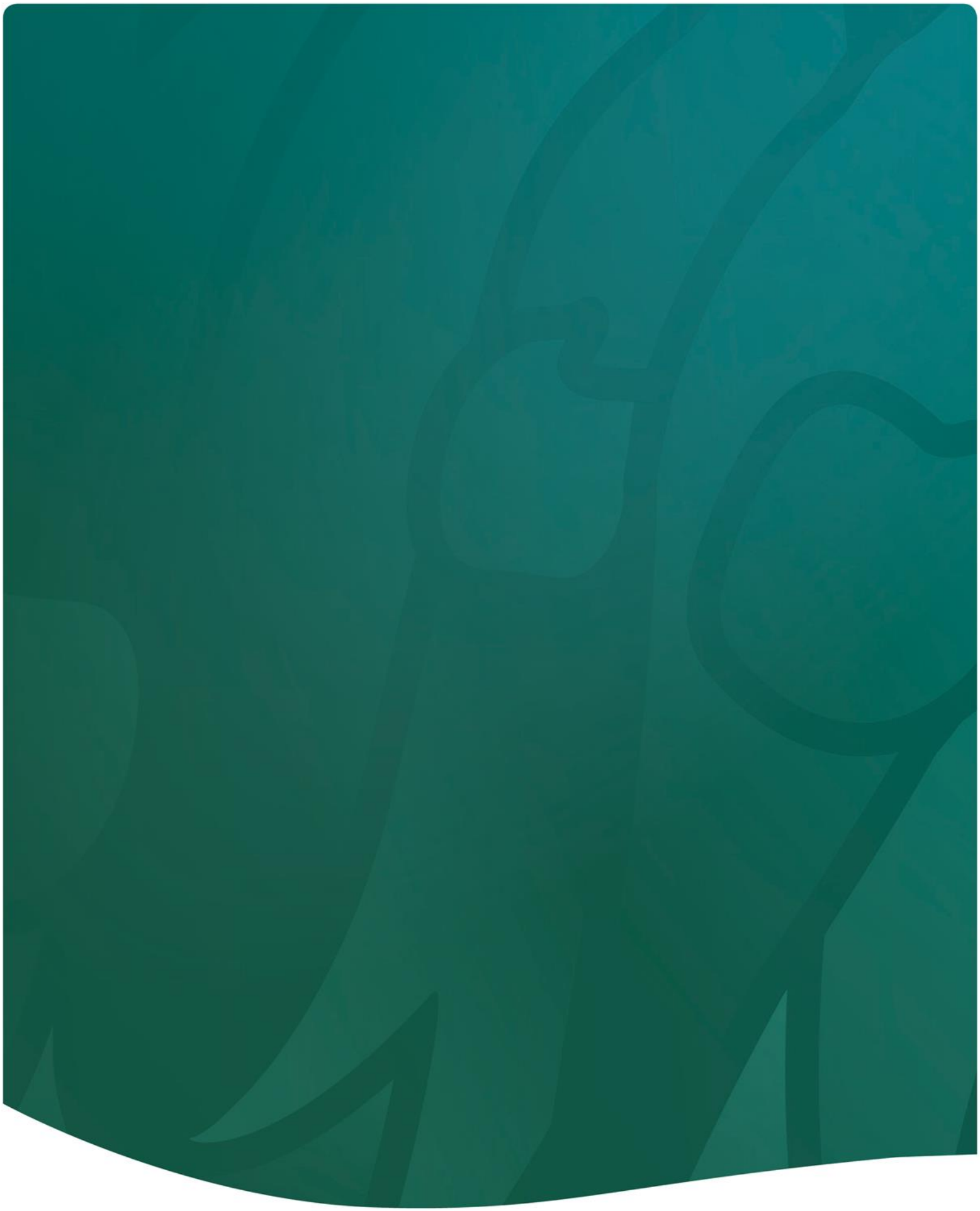

Government
of South Australia

Department for
Environment and Water