ECONOMIC ANALYSIS OF THE MARINE SCALEFISH FISHERY BUYOUT

A Report to PIRSA

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ABBREVIATIONS

CBA	cost benefit analysis
FRDC	Fisheries Research and Development Corporation
fte	full-time equivalent
GSP	gross state product
GVP	gross value of production
IO	Input-output
ITE	Individual Transferrable Effort
ITQ	Individual Transferrable Quota
MSF	Marine Scalefish Fishery
NER	net economic return
PIRSA	Primary Industries and Regions South Australia
PV	present value
RISE	Regional Industry Structure and Employment
SA	South Australia
SARDI	South Australian Research and Development Institute
TACC	total allowable commercial catch
WA	Western Australia

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EXECUTIVE SUMMARY

Introduction

Along with declining volume of catch for key species, the profitability of the South Australian (SA) Marine Scalefish Fishery (MSF) has been negative for the last 20 years. The SA MSF is currently undergoing a strategic review with the principal aim of restructuring the fishery in order to ensure its long-term sustainability and economic viability.

The Government of SA is committed to delivering reform in the MSF with the Commercial Marine Scalefish Fishery Reform Advisory Committee (CMSFRAC) established by the Minister for Primary Industries and Regional Development (PIRSA). It has committed to the rationalisation of the fishery with an initial aim to remove around 100 licences.

In order to help inform the Minister, PIRSA required economic analysis of the buyout commitment addressing whether the investment option is an efficient use of government resources and what the economic impact on the state economy would be expected.

The analysis compared two options against the base case. An investment option included investing in buying out approximately 50 per cent of MSF licences and introducing individual transfer quotas (ITQs) for key species. An input control option included fisheries managers continuing to use input controls to manage the sustainability of the fishery. The base case was envisaged as the continuation of current conditions, with the MSF becoming unsustainable in the near future.

The introduction of ITQs under the investment option included a change of management regime for the four main species (King George Whiting, Snapper, Southern Garfish and Southern Calamari), from input controls (e.g. boat limits, seasonal closures, etc.) to output controls (ITQs).

The case for introduction of ITQs is usually based on a range of potential benefits including, but not limited to, better control of effective fishing effort (mortality) and improved profitability levels and economic rent from the fishery. It is acknowledged, however, that introduction of ITQs can result in negative social, economic and ecological impacts if they are not implemented and managed appropriately. It is not possible to accurately predict exactly how introduction of ITQs in the MSF will unfold, however, as well as the economic impacts, the report describes a range of likely benefits to the MSF based on experiences in other jurisdictions. It also lists a number of offsetting factors that need to be considered to ensure that the substantial anticipated benefits from ITQ management in this fishery are realised.

Method of Analysis

A key objective of this project was to undertake a modified cost benefit analysis (CBA) to determine the incremental net economic return (NER) of two management options. The two management options were compared against a base case scenario, as described below.

Base Case: No further fishery input control measures, stocks continue to decline.

Option 1: Ongoing fishery input control measures and no buyout of licences, stocks continue to decline but at a slower rate than under the base case.

Option 2: Effective catch control and stock recovery including a buyout of licences and introduction of ITQs.

The modified cost benefit analysis was conducted over a 20-year period and one standard evaluation criterion was employed: incremental NER.

Economic impact analysis was undertaken using the BDO EconSearch RISE model of South Australia in 2017/18. The model uses an extension of the conventional input-output method and was developed for use by the Government of SA in 2019. The indicators used in the impact analysis include full-time equivalent employment, gross state product and household income.

Modified Cost benefit analysis

The modified CBA shows whether the proposed investment represents an efficient use of government resources. The results of the CBA can be summarised as follows:

- Option 1 has an incremental net economic return of $2.7m
- Option 2 has an incremental net economic return of $51.4m

Both options are preferable to the Base Case of no further management input, but Option 2 will generate the largest NER. Between the two options, the most profitable is Option 2, namely effective catch control and stock recovery with a buyout of licences and introduction of ITQs.

There are a range of likely benefits to the SA MSF based on experiences in other jurisdictions from a change of management from input to output controls. These benefits would be in addition to those estimated for Option 2 above (effective catch control and stock recovery with a buyout of licences) and include:

- Recovery of stocks of primary species resulting in enhanced sustainability, profitability and employment.
- A more business focused industry resulting in higher individual operator profitability levels.
- Improved operational efficiency resulting in higher individual operator profitability levels.
- Improved price, quality and value adding resulting in higher individual operator profitability levels.
- Higher property rights resulting in higher stewardship levels and improved social licence.
- Safer fishing practices meaning less injuries and loss of life.
- Improved resource sharing framework for competing users of the marine estate resulting in reduced conflict levels.

However, realisation of net benefits from a small scale, regionally focused, high stewardship level fishery, such as the SA MSF, will depend on a number of things including the level of government funding assistance for reform to occur, getting the policy settings right, efficient enforcement and management and providing equivalent control of other extractive users.

Economic Impact Analysis

In terms of GSP, Option 1 would generate around $40m more than the Base Case over the 20-year period and around 43 additional fte jobs. The impact of Option 2 is estimated to be much greater; an additional $277m in GSP above the base case over the 20-year period and employment generation of 107 fte jobs above the base case level.

Under Option 2, the proposed fleet size reduction can be expected to reduce employment in the short term but in the longer term would be expected to increase after stocks recover, businesses become more efficient and profitable and catch increases, leading to increased downstream activity.

1. INTRODUCTION

1.1. Background

Along with declining volume of catch for key species, the profitability of the South Australian (SA) Marine Scalefish Fishery (MSF) has been negative for the last 20 years. The SA MSF is currently undergoing a strategic review with the principal aim of restructuring the fishery in order to ensure its long-term sustainability and economic viability.

The Government of SA is committed to delivering reform in the MSF with the Commercial Marine Scalefish Fishery Reform Advisory Committee (CMSFRAC) established by the Minister for Primary Industries and Regional Development (PIRSA). It has committed to the rationalisation of the fishery with an initial aim to remove around 100 licences.

In order to help inform the Minister, PIRSA required economic analysis of the buyout commitment addressing whether the investment option is an efficient use of government resources and what the economic impact on the state economy would be expected.

The analysis compared two options against the base case. An investment option included investing in buying out approximately 50 per cent of MSF licences and introducing individual transfer quotas (ITQs) for key species. An input control option included fisheries managers continuing to use input controls to manage the sustainability of the fishery. The base case was envisaged as the continuation of current conditions, with the MSF becoming unsustainable in the near future.

The introduction of ITQs under the investment option included a change of management regime for the four main species (King George Whiting, Snapper, Southern Garfish and Southern Calamari), from input controls (e.g. boat limits, seasonal closures, etc.) to output controls (ITQs).

The case for introduction of ITQs is usually based on a range of potential benefits including, but not limited to, better control of effective fishing effort (mortality) and improved profitability levels and economic rent from the fishery. It is acknowledged, however, that introduction of ITQs can result in negative social, economic and ecological impacts if they are not implemented and managed appropriately. It is not possible to accurately predict exactly how introduction of ITQs in the MSF will unfold, however, as well as the economic impacts, the report describes a range of likely benefits to the MSF based on experiences in other jurisdictions. It also lists a number of offsetting factors that need to be considered to ensure that the substantial anticipated benefits from ITQ management in this fishery are realised.

1.2. Purpose and Scope and the Economic Analysis

PIRSA engaged BDO EconSearch to undertake economic analysis including:

- Modified cost benefit analysis (CBA) to assess whether the investment option is an efficient and appropriate use of government resources (i.e. whether the project provides a positive return to the community)
- Economic impact analysis (EIA) to assess the economic impact on the state economy, using the extended input-output (I-O) RISE model.

While these questions are answered in this report, detailed quantitative modelling of the likely impacts of ITQs was out of scope.

2. METHOD OF ANALYSIS AND DATA

2.1. Modified Cost Benefit Analysis

2.1.1. Method

A key objective of the study was to estimate the net benefit of the Marine Scalefish Fishery (MSF) buyout. The proposed options were compared against a base case scenario within the framework of a cost benefit analysis (CBA). The standard CBA method involves the specification of a base case against which options are compared. The Base Case and two options for this assessment are described in Table 2-1.

Table 2-1 Modified cost benefit analysis options

Options	Description
Base case	No further fishery input control measures, stocks continue to decline.
Option 1	Ongoing fishery input control measures and no buyout of licences, stocks continue to decline but at a slower rate than under the base case.
Option 2	Effective catch control and stock recovery including a buyout of licences and introduction of ITQs.

The CBA conducted for this project conforms to South Australian and Commonwealth Government guidelines for conducting evaluations of public sector projects (Department of Treasury and Finance (2008) and Department of Finance and Administration (2006)).

The starting point for the CBA was to develop the Base Case scenario, that is, the benchmark against which the management options were compared. It is important to note that the Base Case scenario is not a 'spend nothing' or 'do nothing' scenario. Given that costs and benefits were specified in real terms (i.e. constant 2019 dollars), future values were converted to present values by applying a discount rate of 6 per cent. The choice of discount rate is consistent with the rate commonly used by the South Australian Government in this type of analysis.

The analysis was conducted over a 20-year period and results were expressed in terms of net benefits, that is, the incremental benefits and costs of the options relative to those generated by the Base Case.

The evaluation criterion employed for this analysis is the present value (PV) of net economic return (NER) estimated over a 20-year period. The NER is defined as the difference between the price of a good produced using a natural resource and the unit cost of turning that natural resource into the good. In this case the natural resource is the SA MSF and the good produced is the landed seafood. The unit costs or long term costs all need to be covered if a licence holder is to remain in the fishery. These long-term costs include direct operating costs such as fuel, labour (including the opportunity cost of a self-employed fisher's own labour), ice, bait, overheads such as administration and licences and the cost of capital invested in the boat and gear (excluding licence). Capital costs includes depreciation and the opportunity cost of the capital applied to the fishery. The opportunity cost of capital is equivalent to what fisher investment could have earned in the next best alternative use.

Determining the opportunity cost of capital involves an assessment of the degree of financial risk involved in the activity. For a risk-free operation, an appropriate opportunity cost of capital might be the long-term real rate of return on government bonds. The greater the risks involved, the greater is the necessary return on capital to justify the investment in that particular activity. For this analysis the long term (10-year) real

rate of return on government (treasury) bonds of 5 per cent has been used and a risk premium of 5 per cent has been applied. The assumed opportunity cost of capital in this analysis is, therefore, 10 per cent.

Under this decision rule, an option was considered to be potentially viable if the PV of NER was greater than zero. The NER for each option (*i*) was calculated as an incremental NER, using the formulation:

$$PV \text{ of } NER_i = (PV (Option_i \text{ income} - \text{Base Case income}) - (PV (Option_i \text{ costs} - \text{Base Case costs}))$$

2.1.2. Data and assumptions

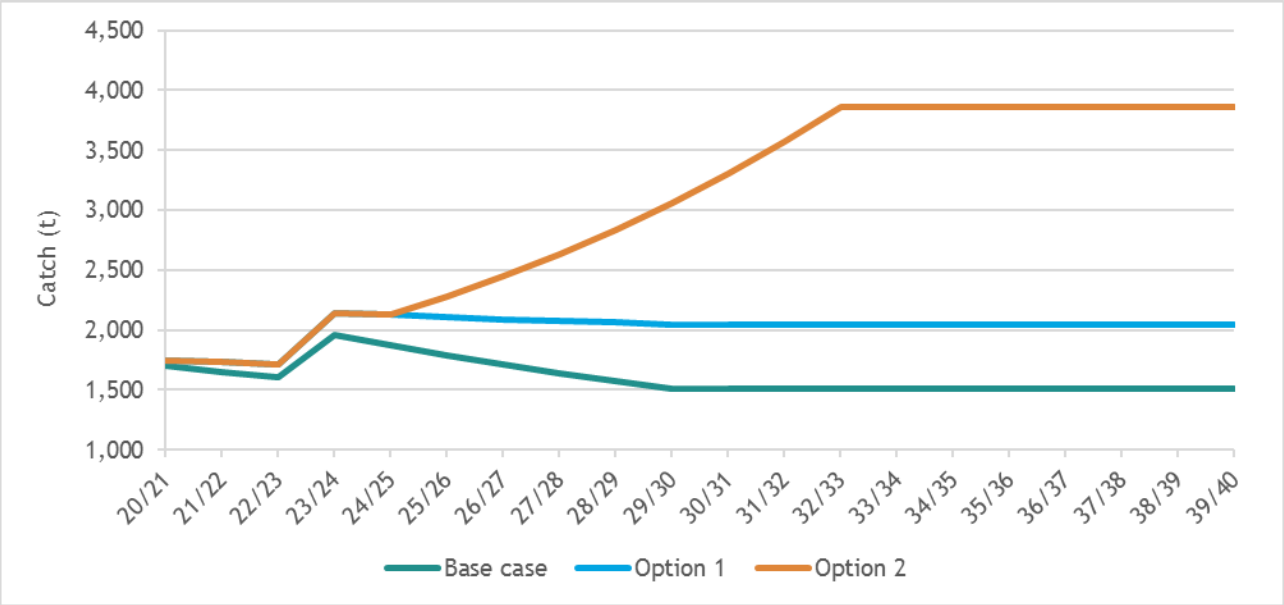
The following data and assumptions were used in the modified CBA.

Catch

The modelled level of catch, presented in Figure 2-1, was provided by SARDI and is based on the following assumptions:

- Base Case: Average annual decline from peak (0.5% average annual decline)
- Option 1: Long term average change (1.0% average annual increase)
- Option 2: Average annual increase to peak (4.4% average annual increase)

Figure 2-1 Catch under the Base Case, Option 1 and Option 2, 2020/21 to 2039/40



Price

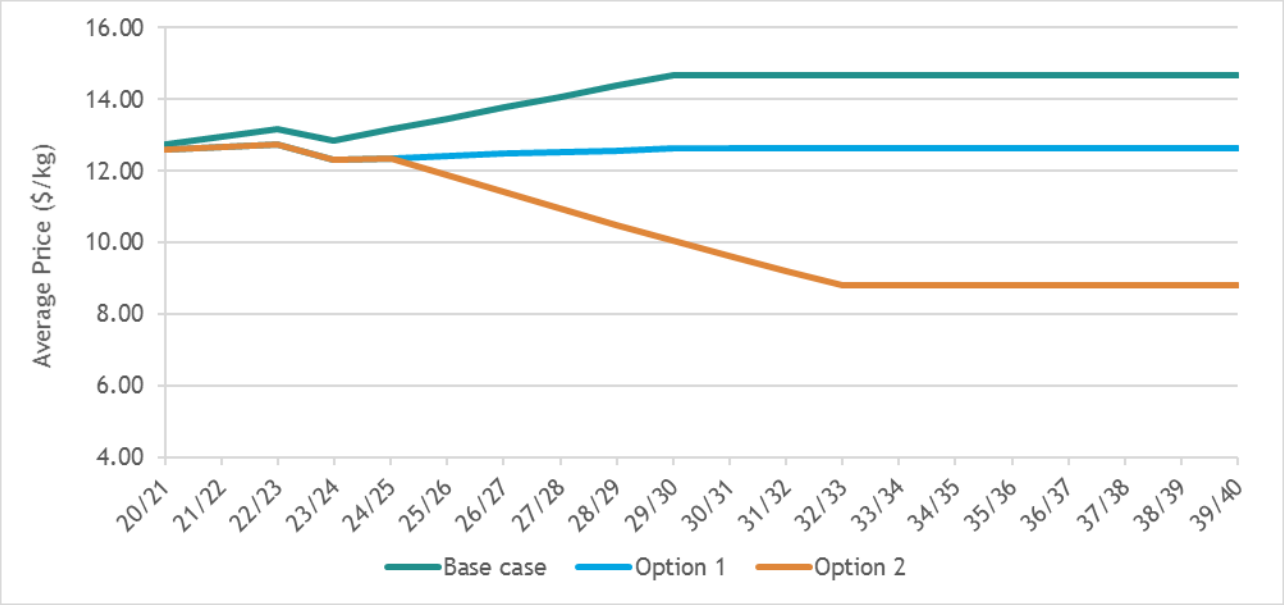
In order to calculate gross value of production (GVP) across the options, average prices by species were sourced from BDO EconSearch (2019a) for 2017/18 and inflated to 2019 dollars. However, a price flexibility assumption was built in to take account of what would happen to price if quantity supplied increased or decreased. The assumptions made for the Base Case and options were:

- Base Case: 0.5% increase in price for each 1% decrease in quantity supplied
- Option 1: 0.5% decrease in price for each 1% increase in quantity supplied

- Option 2: 0.5% decrease in price for each 1% increase in quantity supplied

The average price across all MSF species resulting from this assumption is illustrated in Figure 2-2 for the Base Case and each option.

Figure 2-2 Average price across all MSF species, 2020/21 to 2039/40



Costs

Average variable costs, fixed costs, depreciation and opportunity cost of capital were sourced from BDO EconSearch (2019a) and scaled up to the fishery level according to the number of licences and average catch for each under each option.

Other Assumptions under Option 2

Other assumptions made under Option 2 included:

- target number of licences to buyout (150) is achieved including 120 in year 1 and 30 in year 2
- 10% efficiency improvement in variable costs achieved
- total cost of buyout of $35m spread over 4 years with most of the cost being licence purchases in years 1 and 2.

2.2. Economic Impact – Method and Data

An important component of the economic analysis was to estimate the likely economic impact on SA. This was achieved through economic impact analysis using an extension of the conventional input-output method. Over the past decade BDO EconSearch has developed an extended input-output model known as the RISE model (Regional Industry Structure and Employment). The RISE model provides a comprehensive economic framework that is extremely useful in the resource planning process, particularly for regional economic

impact applications. The RISE model of South Australia in 2017/18 was used for the economic impact analysis[1].

2.2.1. Economic activity

The indicators used in economic impact analysis typically include employment, gross state product (GSP) and household income, which are described below and used to present results in this report.

Economic activity indicators: are indicators of the generation of economic activity resulting from the management options.

Economic impact: changes in economic activity are referred to as economic impacts. Generally, changes in *economic activity indicators* results from some stimulus or external shock imposed. In this analysis, the concept of economic impact includes the increase in economic contribution from the management options compared to the Base Case. This *economic impact* is measured in terms of *economic activity indicators* referred to above.

2.2.2. Indicators of economic activity

Employment units: employment numbers are usually reported in either full-time equivalent (fte) units or total job units defined as follows:

- *FTE:* is a way to measure a worker's involvement in a project or industry activity. An fte of 1.0 means that the person is equivalent to a full-time worker, while an fte of 0.5 signals that the worker is only half-time. Typically, different scales are used to calibrate this number, depending on the type of industry and copy of the analysis but the basic calculation is the total hours worked divided by average annual hours worked in full-time jobs.
- *Jobs:* is used to refer to the number of workers employed in an industry or on a project at any point in time. It typically refers to either:
    - The *maximum* number of workers required at any point over the analytical period or the duration of the project; or
    - The *average* number of workers required over the analytical period or duration of the project. This can be calculated on a daily, weekly, monthly or annual basis.

In this report employment has been reported in terms of fte units on a per annum basis.

Gross state product (GSP): is a measure of the contribution of an activity to the economy. GSP is measured as value of gross output (business revenue) less the cost of goods and services (including imports) used in producing the output. In other words, it can be measured as the sum of household income, gross operating surplus and gross mixed income net of payments to owner managers and taxes less subsidies on products and production. It represents payments to the primary inputs of production (labour, capital and land). Using GSP as a measure of economic impact avoids the problem of double counting that may arise from using value of output for this purpose.

Household Income: is a measure of the wages and drawings by owner operators generated by the economic activity. This is a component of GSP as described above.

[1] RISE models for 2017/18 have been constructed for the Government of South Australia at both a state and regional level (BDO EconSearch 2019b).

2.2.3. Data and assumptions

Some additional assumptions to those outlined in Section 2.1.2 were required to undertake the economic impact assessment. These included the standard assumptions embodied in IO analysis as well as the following:

- The impacts were measured using a model that represents the structure of the state economy for the year in which the most recent data are available (2017/18). However, over time there are likely to be improvements in primary factor productivity in these economies. To allow for the improvements as an across-the-board (all sectors) labour productivity improvement rate of 1 per cent per annum for subsequent years has been incorporated into the model.
- When new jobs are created, it should be determined where the people come from to fill those jobs. In some cases, the jobs will be taken by previously unemployed locals or by someone who is currently employed locally but whose own job is taken be a previously unemployed local. In both cases the impact of the newly created job and associated income is particularly offset by the fact that someone who was previously receiving unemployment benefits (and spending them on consumption items) is no longer doing so. To calculate this effect requires estimates of the parameter *rho*, the proportion of new jobs that are likely to be filled by previously unemployed locals. This was estimated to be 0.9 in this case as almost all jobs lost and filled are likely come from the SA pool of labour.

3. MODIFIED COST BENEFIT ANALYSIS RESULTS

3.1. Results

The results of the modified CBA, detailed in Table 3-1, show that both options are preferable to the Base Case of no further management input and that Option 2 will generate the largest NER. For an option to be viable the incremental NER needs to be greater than zero. Between the two options, the most profitable is Option 2, namely effective catch control and stock recovery with a buyout of licences and introduction of ITQs.

Table 3-1 Modified cost benefit analysis results[a]

Result	$m
Present Value of Net Economic Return	
Base Case	-30.9
Option 1	-28.2
Option 2	22.3
Incremental Present Value of Net Economic Return	
Option 1	**2.7**
Option 2	**53.1**

[a] All values are a present value over the 20-year period using a discount rate of 6 per cent.

Source: BDO EconSearch analysis

3.2. Sensitivity Analysis

The results of the CBA were re-estimated using values for key variables that reflect the uncertainty of those variables. The sensitivity analysis included the following:

- Discount rate
- Cost of buyout
- Price flexibility
- Efficiency improvements
- Management costs

The range of values used for each uncertain variable and detailed results of the sensitivity analysis are set out below with some interpretation of the results. Note that each sensitivity analysis for each variable was undertaken by holding all other variables constant at their 'expected' values. The assumptions and results of the sensitivity analysis are summarised and described in the following sections.

3.2.1. Discount rate

Costs and benefits are specified in real terms (i.e. constant 2019 dollars) and future values are converted to present values by applying a discount rate of 6 per cent. A sensitivity analysis was conducted using discount rates of 4 and 8 per cent (Table 3-2).

Table 3-2 Sensitivity of incremental prevent value of net economic return to discount rate

Discount rate	Option 1	Option 2
4%	3.3	66.7
6%[a]	2.7	53.1
8%	2.2	42.4

[a] Expected value.

Source: BDO EconSearch analysis

As expected, the incremental PVs of NER improve with the lower (4 per cent) discount rate and decrease under the higher discount rate (8 per cent). This occurs because, although the bulk of the project costs are 'up front' and are not significantly affected by the discount rate, the benefits accrue over many years and are greater, in present value terms, when the discount rate is lower. Therefore, with 25 percent increase or decrease in discount rates, the positive PVs of NER indicate that Options 1 and 2 are still preferable to the Base Case.

3.2.2. Cost of buyout

The cost of the buyout under Option 2 has the potential to vary from current estimates. Accordingly, a sensitivity analysis was undertaken to illustrate the effect of the buyout costing $20m, $40m and $50m. The results of this analysis are summarised in Table 3-3.

Table 3-3 Sensitivity of incremental prevent value of net economic return to cost of buyout

Cost of Buyout ($m)	Option 1	Option 2
20.0	2.7	68.2
35.4 [a]	2.7	53.1
40.0	2.7	48.7
50.0	2.7	39.0

[a] Expected value.

Source: BDO EconSearch analysis

The results are moderately sensitive to the cost of buyout but even with a 40 per cent increase in buyout costs (to $50m) under Option 2, the option would still be viable. Not surprisingly, any decrease in buyout costs will increase the appeal of the option.

3.2.3. Price flexibility

The price flexibility coefficient (-0.5%) used under all options has the potential to vary from current estimates. Accordingly, a sensitivity analysis was undertaken to illustrate the effect of the price flexibility coefficient. The results of the sensitivity analysis are summarised in Table 3-4

Table 3-4 Sensitivity of incremental prevent value of net economic return to price flexibility[a]

Price flexibility	Option 1	Option 2
-0.25%	15.0	94.6
-0.50%	2.7	53.1
-0.75%	-10.3	14.1

[a] -0.50% is the expected value.

Source: BDO EconSearch analysis

The results are sensitive to the price flexibility coefficient but even with an increase in the price flexibility coefficient (for a 1% increase in quantity the will be a 0.75% decline in price), Option 2 would still be viable. However, Option 1 would no longer be viable. A decrease in the price flexibility coefficient (for a 1% increase in quantity there will be a 0.25% decline in price) improves the result for both options relative to the Base Case.

3.2.4. Efficiency improvement

Under Option 2 it was assumed the remaining licences holders would be able to fish more efficiently. As such, a 10% efficiency improvement was assumed under option 2. However, this has the potential to vary from the current estimate. Accordingly, a sensitivity analysis has been undertaken to illustrate the effect of changing the efficiency improvement assumption. The results of the sensitivity analysis are summarised in Table 3-5.

Table 3-5 Sensitivity of incremental prevent value of net economic return to efficiency improvement

Efficiency improvement	Option 1	Option 2
No efficiency improvement	2.7	32.5
10% improvement [a]	2.7	53.1
20% improvement	2.7	73.8

[a] Expected value.

Source: BDO EconSearch analysis

The results for Option 2 (no change under Option 1) are sensitive to the efficiency improvement assumption but even with no efficiency improvement, Option 2 would still be viable. Not surprisingly, any increase in efficiency will increase the appeal of the Option 2.

3.2.5. Management costs

Under Option 2 it was assumed that total management costs will be 20% higher than under the current management arrangements to incorporate the cost of running a quota management system. However, management costs under Option 2 have the potential to vary from the current estimate. Accordingly, a sensitivity analysis has been undertaken to illustrate the effect of changing the management cost assumption. The results of the sensitivity analysis are summarised in Table 3-6.

Table 3-6 Sensitivity of incremental prevent value of net economic return to management costs

Management costs	Option 1	Option 2
20% increase [a]	2.7	51.4
50% increase	2.7	46.3
100% increase	2.7	31.1

[a] Expected value.

Source: BDO EconSearch analysis

The results for Option 2 (no change under Option 1) are moderately sensitive to management costs and even with a 100% increase in management costs Option 2 would still be viable.

3.3. Non-Priced Benefits

Described in this section of the report are a range of likely benefits to the SA MSF based on experiences in other jurisdictions from a change of management from input to output controls. These benefits would be in addition to those estimated in Section 3.1 for Option 2 (effective catch control and stock recovery with a buyout of licences).

Recovery of stocks of primary species = enhanced sustainability, profitability and employment

One of the key benefits from direct control on the total catch of primary species is the expected recovery of stocks and subsequent increases in catch rates and volumes to market. Higher volumes will impact on overall profitability, operational efficiency and employment.

However, an important caveat around benefits being captured through the SA reform is that total allowable commercial catches (TACCs) are not set too high. In addition, all extractive users including the recreational sector in particular will need to be subject to equivalent control of effective catch. If this this does not occur, it is reasonable to expect that improvements in fish stocks will not occur as predicted and the benefits outlined are likely to dissipate.

A more business focused industry = higher individual operator profitability levels

It is widely accepted that moving from input controls (the current management approach) to output controls (ITQ's) will change fishing operational focus from applying more effort to catch more fish, to maximising profitability per kilogram of quota species. This is likely to result in benefits in improved market prices, innovative marketing and value adding and operating efficiency gains.

A relevant recent positive example of benefits from ITQ management is the Danish demersal inshore fleet which in less than a two year period reduced effective capacity by more than 30% and increased vessel profitability (average across all fleet segments) by 77% compared to the average in the previous three years. Government funds which had previously been allocated for scrapping of vessels were instead used for innovation and investment in quality and new products. The effect was that the amount of fish caught not only required less capital input, but also yielded higher prices (MRAG et al. 2009).

The SA MSF proposal is for only key species to be subject to a catch quota, hence a second driver can be expected with a greater focus on non-quota and less targeted species, as a strategy for operators to increase incomes.

Improved operational efficiency = higher individual operator profitability levels

The expected shift to maximising profit on key quota species is likely to reduce the "race to fish" enabling greater operational economic efficiency. For example, when the Western Australian (WA) Rock Lobster fishery moved to ITQs in 2010/11, operating costs (e.g. fuel, bait) fell as fishers were able to optimise their operations and were no longer competing to maximise their share of the catch (Caputi et al. 2015).

The proposed reduction in vessel numbers in the SA MSF through a government sponsored buyout of 50% of licences is also likely to result in an increased catch of primary species per unit of effort as standing stock levels recover above the current depleted levels. A 2009 study of European Union ITQ managed fisheries identified positive efficiency gains in the Netherlands, Spain and Denmark brought about by up to a 50% reduction in the number of vessels (MRAG et al. 2009).

Importantly in the SA MSF, introduction of ITQs in-conjunction with a buy out can be expected to prevent the ongoing over-investment in boats and gear that has occurred over decades in this fishery with effort control management.

Price, quality and value adding = higher individual operator profitability levels

The profit maximising driver of ITQs can be expected to see a change to "fishing to market". This avoids supply gluts and capitalises on higher market prices. Evidence of these benefits come from specific fisheries (WA Rock Lobster, SA Pipis) as well as regional or national studies. In both the WA Rock Lobster and SA Pipi fisheries, patterns of fishing changed with the focus shifting from the peak catch periods to a more even spread of catch throughout the year and an extension of the season to 12-months. This has allowed for market price optimisation and targeting of higher value product.

In WA Rock Lobster Fishery this resulted in an additional increase in beach price of about US$8/kg adding an extra US$48 million to the GVP of the fishery (Caputi et al. 2015). In the SA Pipi Fishery, prices have increased by over 150% since the introduction of ITQs and a range of value added products has been developed, importantly against a backdrop of higher volumes from stock recovery (pers. comm. Goolwa Pipi Co.)

In a 2015 Fisheries Research and Development Corporation study (FRDC Project No 2017-159), over half of the fishers responding to the survey believed that both prices and quality of the product improved as a result of ITQ and ITE management (Pascoe et al. 2019).

Higher property rights = higher stewardship levels and improved social licence

The allocation of ITQs establishes a higher level of individual property right for quota holders allocated a share of the productive capacity of a fishery than is the case in a purely input controlled fishery. The removal of the "race to fish" is likely to result in operators taking greater care of the resource and a long term approach to sustaining stocks.

The higher stewardship level and prescribed limit on catch may enhance the perception of the SA MSF by the general public and recreational fishers and may lead to greater social licence to operate than has historically been the case in this fishery.

Safer Fishing = less injuries and loss of life

A further benefit of no longer having to "race to fish" is the reduction in health and safety risks (as the incentive to fish in all weathers before someone else catches "my fish" is removed). A US study found that after ITQs were implemented in an economically important US West Coast fishery, a fisher's probability of taking a fishing trip in high wind conditions decreased by 82% compared with only 31% in the former "race to fish" fishery. Overall, ITQs caused the average annual rate of fishing on high wind days to decrease by 79% (Pfeiffer and Gratz 2016).

Improved resource sharing framework for competing users of the marine estate = reduced conflict levels

ITQs provide a stronger negotiating position and a simplified mechanism for compensation with other marine users. For example, under the Queensland Fisheries Reallocation Policy, the proponent (e.g. a recreational fishing group wishing to close an area to commercial fishing) has to prepare a cost benefit analysis (CBA) and a proposal as to how compensation will be paid to the Minister. All preparation costs are borne by the proponent (Queensland Government 2017). Not only do ITQs provide commercial fishers with a right in which a market value can be easily ascertained, and thus inputted into any benefit cost proposal, they also provide

a simple mechanism for compensation should a proponent be able to demonstrate a positive benefit cost ratio and fund the compensation.

A word of caution = factors to be considered to realise benefits

There are a range of potential negative impacts that need to be considered from the introduction of ITQs in the SA MSF including:

- The initial allocation of ITQs may result in some redistribution of income and/or licence values between licence holders although an allocation panel will aim to minimise this as much as possible.
- The proposed fleet size reduction can be expected to reduce employment in the short term but in the longer term would be expected to increase after stocks recover and operations become more efficient and profitable over time.
- The costs of management and compliance may be higher in the early stages of the introduction of ITQs, but comparative economic research suggests that the longer term economic benefits may outweigh the short term costs (Mangin et al. 2018).
- Concentration of quota ownership and higher prices of quota over time are a possibility and can be viewed both positively and negatively. The outcome in the SA MSF will be determined by the quota ownership arrangements put in place at implementation and many of the concerns about increased concentration of quota ownership can, to some extent be managed through appropriate policy settings such as retention of owner operator provisions and maximum quota holdings.

In summary, realisation of net benefits from a small scale, regionally focused, high stewardship level fishery, such as the SA MSF, will depend on a number of things including the level of government funding assistance for reform to occur, getting the policy settings right, efficient enforcement and management and providing equivalent control of other extractive users.

4. ECONOMIC IMPACT RESULTS

The results of the impact analysis for options 1 and 2 are presented in Table 4-1. These are the incremental impacts compared to the level of economic activity attributable to the base case. It is important to note that the GSP and household impact estimates are present values calculated over the 20-year period whereas employment impacts are an average annual value over the same period.

In terms of GSP, Option 1 would generate around $40m more than the Base Case over the 20-year period and around 43 additional fte jobs. The impact of Option 2 is estimated to be much greater; an additional $277m in GSP above the base case over the 20-year period and employment generation of 107 fte jobs above the base case level.

Under Option 2, the proposed fleet size reduction can be expected to reduce employment in the short term but in the longer term would be expected to increase after stocks recover, businesses become more efficient and profitable and catch increases, leading to increased downstream activity.

Table 4-1 Economic impact results[a]

Indicator	Option 1	Option 2
GSP ($m) - 20 Year Present Value		
Direct	19.1	225.5
Indirect		
Production	*5.6*	0.1
Consumption	*15.5*	51.2
Total Indirect	21.2	51.3
Total	**40.3**	**276.8**
Household Income ($m) - 20 Year Present Value		
Direct	15.1	62.6
Indirect		
Production	*3.9*	0.2
Consumption	*7.8*	25.9
Total Indirect	11.8	26.1
Total	**26.9**	**88.7**
Employment (fte) - 20 Year Average		
Direct	29	77
Indirect		
Production	*5*	*8*
Consumption	*9*	*21*
Total Indirect	14	30
Total	**43**	**107**

[a] GSP and household impact results are total present values over the 20-year period and employment impacts are an average values over the same period.

Source: BDO EconSearch analysis

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Disclaimer

The assignment is a consulting engagement as outlined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 17. Consulting engagements employ an assurance practitioner's technical skills, education, observations, experiences and knowledge of the consulting process. The consulting process is an analytical process that typically involves some combination of activities relating to: objective-setting, fact-finding, definition of problems or opportunities, evaluation of alternatives, development of recommendations including actions, communication of results, and sometimes implementation and follow-up.

The nature and scope of work has been determined by agreement between BDO and the Client. This consulting engagement does not meet the definition of an assurance engagement as defined in the 'Framework for Assurance Engagements', issued by the Auditing and Assurances Standards Board, Section 10.

Except as otherwise noted in this report, we have not performed any testing on the information provided to confirm its completeness and accuracy. Accordingly, we do not express such an audit opinion and readers of the report should draw their own conclusions from the results of the review, based on the scope, agreed-upon procedures carried out and findings.