

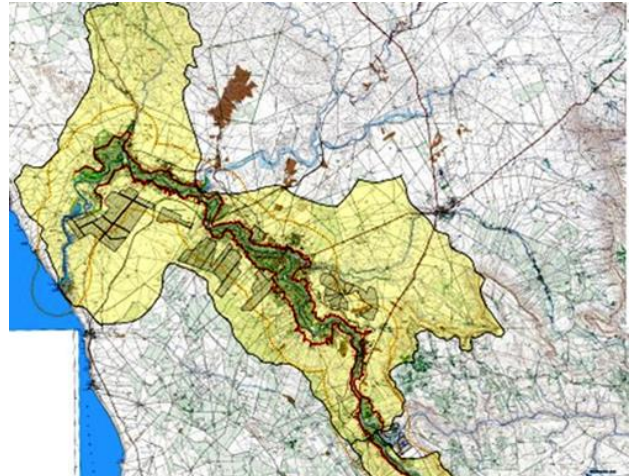


water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the
Raised Clanwilliam Dam (WP0485)

Socio-Economic Impact Analysis Sub-Report



Department of Water and Sanitation
Directorate: Options Analysis

**POST FEASIBILITY BRIDGING STUDY FOR THE PROPOSED BULK CONVEYANCE
INFRASTRUCTURE FROM THE RAISED CLANWILLIAM DAM**

APPROVAL

Title : Socio-Economic Impact Analysis Sub-Report
Consultants : Aurecon South Africa (Pty) Ltd
Report status : Final
Date : December 2019


STUDY TEAM


Approved for Aurecon South Africa (Pty) Ltd:

.....
E VAN DER BERG
Technical Director

DEPARTMENT OF WATER AND SANITATION
Directorate Options Analysis

Approved for Department of Water and Sanitation:


M MUGIMO
CHIEF ENGINEER: OA (South)


C FOURIE
DIRECTOR: OPTIONS ANALYSIS

Document control record

Document prepared by:

**Mosaka Economic Consultant cc. t/a
Conningarth Economists**
2000/058454/23
Meiring Naudé Avenue
CSIR, Building 4E
Brummeria, Pretoria
0184
South Africa

T +27 83 448 2882/+27 12 349 1915
E Williamm@conningarth.co.za
W conningarth.co.za



Document verified and approved by:

Aurecon South Africa (Pty) Ltd
1977/003711/07
Aurecon Centre
1 Century City Drive
Waterford Precinct
Century City
Cape Town
7441
PO Box 494
Cape Town
8000
South Africa

T +27 21 526 9400
F +27 21 526 9500
E capetown@aurecongroup.com
W aurecongroup.com

A person using Aurecon documents or data accepts the risk of:

- Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.
- Using the documents or data for any purpose not agreed to in writing by Aurecon.

Document control						aurecon	
Report title		Socio-Economic Impact Analysis Sub-Report					
Document ID		None		Project number		113834	
File path		\\Aurecon.info\shares\ZACPT\Projects\Projects\113834 Bridging Study Clanwilliam Dam\03 Prj Del\13 Reports\20 Socio-economic Impact Analysis (Sub-R)\Socio-economic Impact Analysis sub-Report (Final).docx					
Client		Department of Water and Sanitation		Client contact		Mr M Mugumo	
Rev	Date	Revision details/status	Prepared by	Author	Verifier	Approver	
0	10 September 2019	Draft 1 – v0	Conningarth	W Mullins	Dr P v Niekerk	E v/d Berg	
1	3 December 2019	Final	Conningarth	W Mullins	E v/d Berg	E v/d Berg	
Current Revision		1					

Approval			
Author signature		Approver signature	
			
Name	William Mullins	Name	Erik van der Berg
Title	Economist	Title	Technical Director



DEPARTMENT OF WATER AND SANITATION

Directorate: Options Analysis

**Post Feasibility Bridging Study for the Proposed Bulk Conveyance
Infrastructure from the Raised Clanwilliam Dam**

Socio-Economic Impact Analysis Sub-Report

Final: December 2019

Prepared by:

Aurecon South Africa (Pty) Ltd
P O Box 494
Cape Town, 8000
South Africa

Tel: 021 526 5790
Fax: 086 526 9500
E-mail: erik.vanderberg@aurecongroup.com

Prepared for:

Director: Options Analysis
Department of Water and Sanitation
Private Bag X313
Pretoria 0001
South Africa

Mr Menard Mugumo (CE: OA, South)
Tel: 012 336 6838
E-mail: mugumom@dws.gov.za

This report is to be referred to in bibliographies as:

Department of Water and Sanitation, South Africa. 2019. *Socio-Economic Impact Analysis Sub-Report*. Prepared by Mosaka Economic Consultants trading as Conningarth Economists as part of the Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam.

Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam

Reports produced as part of this project are indicated below.

Bold type indicates this report.

Report Index	Report Number	Report Title
1		Inception Report
2	P WMA 09/E10/00/0417/2	Capacity Building & Training Year 1
3	P WMA 09/E10/00/0417/3	Capacity Building & Training Year 2
4	P WMA 09/E10/00/0417/4	Water Requirements Assessment
5	P WMA 09/E10/00/0417/5	Distribution of Additional Available Water
6		Existing Infrastructure and Current Agricultural Development Sub-Report
7	P WMA 09/E10/00/0417/6	Existing Conveyance Infrastructure and Irrigated Land
8		Suitable Agricultural Areas and Land Ownership Report
9		Evaluation of Development Options Sub-Report
10	P WMA 09/E10/00/0417/10	Suitable Areas for Agricultural Development
11		Right Bank Canal Design Sub-Report
12		Conceptual Design Sub-Report
13		Environmental Screening Sub-Report
14		Jan Dissels and Ebenhaeser Schemes Design Sub-Report
15	P WMA 09/E10/00/0417/13	Feasibility Design
16	P WMA 09/E10/00/0417/7	Topographical Surveys
17	P WMA 09/E10/00/0417/8	Geotechnical Investigations
18	P WMA 09/E10/00/0417/9	Soil Survey
19		Financial Viability of Irrigation Farming Sub-Report
20	P WMA 09/E10/00/0417/11	Agricultural Production and Farm Development
21		Right Bank Canal Cost Analysis Sub-Report
22		Socio-Economic Impact Analysis Sub-Report
23	P WMA 09/E10/00/0417/12	Socio-Economic Impact Analysis
24	P WMA 09/E10/00/0417/14	Record of Implementation Decisions Report
25	P WMA 09/E10/00/0417/1	Main Report
26	P WMA 09/E10/00/0417/15	Historically Disadvantaged Farmers Report

Concise Description of the Content of Study Reports

Report Index	Report Number	Report Title and Description of Content
1		<p>Inception The report forms part of the contract and stipulates the scope of work for the study, the contract amount and the contract period. It contains a detailed description of tasks and methodology, a study programme, human resource schedule, budget and deliverables. The Capacity Building and Training Plan has been included.</p>
2	P WMA 09/E10/00/0417/2	<p>Capacity Building & Training Year 1 Describes the range of capacity building and training activities planned for the study, and the activities undertaken during the first year of the study, including field-based training, training workshop 1 and mentorship of DWS interns through secondment.</p>
3	P WMA 09/E10/00/0417/3	<p>Capacity Building & Training Year 2 Describes the range of capacity building and training activities planned for the study, and the activities undertaken during the second year of the study, including field-based training, training workshop 2 and mentorship of DWS interns through secondment.</p>
4	P WMA 09/E10/00/0417/4	<p>Water Requirements Assessment Provides an analysis of the existing water use and current water allocations in the study area, and addresses ecological water requirements, water use for irrigated agriculture and projections for future use, current domestic and industrial water use and projections for future use, water use for hydropower and water losses in the water supply system.</p>
5	P WMA 09/E10/00/0417/5	<p>Distribution of Additional Available Water Confirms the volume of additional water available for development, after water has been reserved for the current water uses, as well as making recommendations on how the additional yield should be distributed among water use sectors and water users.</p>
6		<p>Existing Infrastructure and Current Agricultural Development Sub-Report Provides an overview of the extent and general condition of the current bulk water storage and conveyance infrastructure. This report also provides an overview of the locality and extent of the existing agricultural areas determined by reviewing Geographic Information System (GIS) data obtained from various sources.</p>
7	P WMA 09/E10/00/0417/6	<p>Existing Conveyance Infrastructure and Irrigated Land An update of the Sub-Report, providing a refinement of the current agricultural water requirements following evaluation of the current crop types, an assessment of the desirability of diverting releases for downstream irrigators via the Clanwilliam Canal and Jan Dissels River, to meet the summer ecological flows in the lower Jan Dissels River, and presents an Implementation Action Plan with costs.</p>

Report Index	Report Number	Report Title and Description of Content
8		<p>Suitable Agricultural Areas and Land Ownership Sub-Report Description of the collection of information and the preparation undertaken for the analysis of options, which includes a summary of existing irrigated areas and water use, cadastral information, land ownership, environmental sensitivity, soils suitability, water quality considerations and constraints, and the initiation of the process to identify additional areas suitable for irrigation.</p>
9		<p>Evaluation of Development Options Sub-Report Describes the salient features, costs and impacts of identified potential irrigation development options for new irrigation development in the lower Olifants River. This provides the background and an introduction to the discussions at the Options Screening Workshop held in December 2018.</p>
10	P WMA 09/E10/00/0417/10	<p>Suitable Areas for Agricultural Development Describes the supporting information, process followed and the salient features, costs and impacts of identified potential irrigation development options for new irrigation development in the lower Olifants River. Recommends the preferred options to be evaluated at feasibility level.</p>
11		<p>Right Bank Canal Feasibility Design Sub-Report Describes the Design Criteria Memorandum, based on best practice in engineering and complying with recognised codes and standards. Description of route alignments and salient features of the new Right Bank canal. Feasibility-level design of bulk infrastructure, including evaluation of capacities, hydraulic conditions, canal design, surface flow considerations, canal structures, power supply and access roads. Operational considerations and recommendations.</p>
12		<p>Conceptual Design Sub-Report Describes the scheme layouts at a conceptual level and infrastructure components to be designed, alternatives to consider or sub-options, and affected land and infrastructure, as well as the updated recommended schemes for new irrigation development.</p>
13		<p>Environmental screening Sub-Report Describes and illustrates the opportunities and constraints, and potential ecological risks/impacts and recommendations for the short-listed bulk infrastructure development options at reconnaissance level. Describes relevant legislation that applies to the proposed irrigation developments.</p>

Report Index	Report Number	Report Title and Description of Content
14		<p>Jan Dissels and Ebenhaeser Schemes Feasibility Design Sub-Report Describes the Design Criteria Memorandum, based on best practice in engineering and complying with recognised codes and standards. Description of route alignments and salient features of the Jan Dissels and Ebenhaeser schemes. Feasibility-level design of bulk infrastructure, including evaluation of capacities, hydraulic conditions, intake structures, balancing dams and reservoirs, rising mains and gravity pipelines and trunk mains where relevant, power supply and access roads. Operational considerations and recommendations.</p>
15	P WMA 09/E10/00/0417/13	<p>Feasibility Design Description of the approach to and design of selected bulk infrastructure at feasibility level, with supporting plans and implementation recommendations.</p>
16	P WMA 09/E10/00/0417/7	<p>Topographical Surveys Describes the contour surveys for the proposed identified bulk infrastructure conveyance routes and development areas, the surveying approach, inputs and accuracy, as well as providing the survey information.</p>
17	P WMA 09/E10/00/0417/8	<p>Geotechnical Investigations Presents the findings of geotechnical investigations of the various identified sites, as well as the approach followed, field investigations and testing, laboratory testing, interpretation of findings and geotechnical recommendations.</p>
18	P WMA 09/E10/00/0417/9	<p>Soil Survey Describes the soil types, soil suitability and amelioration measures of the additional area covering about 10 300 ha of land lying between 60 to 100 m above river level, between the upper inundation of the raised Clanwilliam Dam and Klaver.</p>
19		<p>Financial Viability of Irrigation Farming Sub-Report Describes the findings of an evaluation of the financial viability of pre-identified crop-mixes, within study sub-regions, and advises on the desirability of specific crops to be grown in these sub-regions. It includes an evaluation of the financial viability of existing irrigation farming or expanding irrigation farming, as well as the identification of factors that may be obstructive for new entrants from historically disadvantaged communities.</p>
20	P WMA 09/E10/00/0417/11	<p>Agricultural Production and Farm Development This report will focus on policy, institutional arrangements, available legal and administrative mechanisms as well as the proposed classes of water users and the needs of each. This would include identifying opportunities for emerging farmers, including grant and other types of Government and private support, and a recommendation on the various options and opportunities that exist to ensure that land reform and water allocation reform will take place through the project implementation.</p>

Report Index	Report Number	Report Title and Description of Content
21		Right Bank Canal Cost Analysis Sub-Report Provides an economic modelling approach to quantify the risk of the failure of the existing main canal and the determination of the economic viability of the construction of the new right bank canal to reduce the risk of water supply failure.
22		Socio-Economic Impact Analysis Sub-Report Describes the socio-economic impact analysis undertaken for the implementation of the new irrigation development schemes, for both the construction and operational phases. This includes a description of the social and economic contributions, the return on capital investment, as well as the findings of a fiscal impact analysis.
23	P WMA 09/E10/00/0417/12	Socio-Economic Impact Analysis Synthesis of agricultural economic and socio-economic analyses undertaken, providing an integrated description of agricultural production and farm development and socio-economic impact analysis, as well as the analysis of the right bank canal costs and benefits.
24	P WMA 09/E10/00/0417/14	Record of Implementation Decisions Describes the scope of the project, the specific configuration of the schemes to be implemented, the required implementation timelines, required institutional arrangements and the required environmental and other approval requirements and mitigation measures, to ensure that the project is ready for implementation.
25	P WMA 09/E10/00/0417/1	Main Report Provides a synthesis of approaches, results and findings from the supporting study tasks and interpretation thereof, culminating in the study recommendations. Provides information in support of the project funding motivation to be provided to National Treasury.
26	P WMA 09/E10/00/0417/15	Historically Disadvantaged Farmers Report Describes the activities undertaken by an independent consultant to evaluate existing HDI Farmers policies and legislative context, identify, map and analyse prospective HDI farmers and potential land for new irrigation, as well as propose a mechanism for the identification and screening of HDI farmers.

Glossary

Partial equilibrium: Partial equilibrium is a condition of economic equilibrium which takes into consideration only a part of the market to attain equilibrium.

Gross Domestic Product (GDP): A monetary measure of the market value of all the final goods and services produced in a specific time period, often annually.

Intermediate Costs: Intermediate cost structure is an accounting flow which consists of the total monetary value of goods and services consumed or used up as inputs in production by enterprises, including raw materials, services and various other operating expenses.

Permanent Equivalents: Direct labour on the farms are expressed in “permanent equivalents” where it is estimated in terms of temporary labour. If a worker is temporary employed for 3 months per annum he is classified as 0.25 equivalent.

Capital Formation: Capital formation is a crucial element for economic growth. Capital formation increases investment which stimulates economic development.

Balance of Payments: The balance of payments (BOP) is a statement of all transactions made between entities in one country and the rest of the world over a defined period/

Direct Impact: Impact created in the project area where the capital is spent or production is generated.

Indirect Impact: Impact created by service providers and could be in the project area or outside as part of the marketing of the products.

Induced Impact: Impact generated by the salaries and wages paid and the spending of the income.

Executive Summary

The objective of the Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam is to provide recommendations on the bulk conveyance infrastructure required for the equitable distribution of the existing and additional water from the raised Clanwilliam Dam.

The additional water will be used to meet the ecological water requirements of the Olifants River, provide irrigation water to existing and new irrigators at a higher level of assurance and most importantly support historically disadvantaged farming projects and other broad-based black economic empowerment opportunities.

This report describes the primary objective of the socio-economic impact analysis to measure the nature and magnitude of the socio-economic impacts emanating from the distribution of additional water from a raised Clanwilliam Dam. An analysis was undertaken to evaluate the relevant impacts that could emerge as a result of the development. The socio-economic impact was separately undertaken for the construction and operational period.

Partial general equilibrium analysis¹ has been used to quantify the socio-economic impact of the Clanwilliam Dam project. The Social Accounting Matrix (SAM) provides the basis for this partial general economic equilibrium analysis. In general, apart from information on the interdependence between the different sectors taken up in the Input-Output Table, the SAM differs from the traditional Input-Output Table in one important aspect: it includes detailed information on the income and spending patterns of households. For the purposes of conducting the partial general socio-economic equilibrium analysis, the SAM has been converted into a user-friendly model. This is a detailed econometric model that is generally used for purposes of measuring the socio-economic impacts resulting from a specific project.

The socio-economic impact model used to calculate the impact of the project on the South African economy uses the South African National SAM as its database. The South African SAM was originally compiled by Statistics South Africa and has been adapted and updated by Conningarth Economists to reflect the most recent socio- and macro-economic representation of the South African economy in a monetary value format.

The largest impact comes from the additional water supplied by the proposed project (baseline plus buffer water). To calculate the socio-economic impact, unit volumes are converted into potential production capacity using water use/production coefficients (Rand/million cubic meters).

¹ **Partial equilibrium** is a condition of economic equilibrium which takes into consideration only a part of the market to attain equilibrium.

These water use/production coefficients were derived from the South African Supply-Use Tables, as well as coefficient generated for calculating the impact of the ongoing drought on the Western Cape and Cape Town economies.

Data

Several guidelines were taken into consideration in the decision of a specific crop allocation to a specific area. The following is short listing of the guidelines used:

- Is the proposed crop already produced in the area and is packing and marketing infrastructure available? This specifically applies to available support structures like pack houses and management as the availability of the structures will lower production costs;
- What is the medium to long term price structure outlook for the specific product? This applies specifically to wine grapes as in the opinion of Conningarth Economists the long-term outlook is not very positive;
- The export of citrus appears very positive and as such provision is made for oranges, lime and lemon, and soft citrus varieties;
- The export of raisins is currently very positive and the medium to long term outlook is positive.
- Tomatoes marketing infrastructure is available;
- The potato and wheat in rotation is used as the preference crop in a very specific area according to soil recommendations;
- The other fruit group have the possibility for the expansion of the sub-tropical or deciduous groups that are produced in the area; and
- In the baseline scenario the following table presents the allocation of hectares to a specific crop. This was done in consultation with Aurecon and Agrifusion.

Crop Type	Sub-area 2	Sub-area 4	Sub-area 5	Totals	Percentage
Available Hectares	2 739	2859	463	6 062	
Citrus	1 370	0	0	1 370	23%
Table Grapes	822	2 144	116	3 082	51%
Wine Grapes	0	0	162	162	3%
Dry Grapes (Raisins)	0	658	46	704	12%
Potato/Wheat in Rotation	466	0	0	466	8%
Tomato	0	0	134	134	2%
Other Fruit	82	57	5	144	2%
Total	2 739	2 859	463	6 062	100%

The long term projected tonnage per hectare was determined at 80% Assurance of Supply water provision together with the 2018 prices to determine an income per crop. The individual budgets for the orchard crops make provision for the establishment in year 1 up to full production in the appropriate year, with an estimate lifetime of 30 years.

Construction Phase Results

The following is observed during the construction period when comparing the proposed baseline option with the option where the “betterment” component is added:

- The GDP increased from R328 million to R618 million for the period;
- Capital formation increased from R1 425 million to R2 702 million;
- Employment opportunities improve from 975 to 1 836 which also increases the affected people in the different households from 4 000 to 7 200, if it is accepted that one employment opportunity in rural situation supports four people;
- Salaries and wages increase from R261 million to R491 million per annum for the construction period; and
- The only negative value is the increased negative impact on the Balance of Payments from R108 million to R204 million.

It is therefore possible to conclude that the possible decision to include the “betterment” option will have a very positive impact during the construction period. On a more practical level it will improve the delivery of the water as the losses from the new canal section will significantly reduce when compared with losses from the existing canal section.

Operational Phase Results – New Irrigation Area

The total GDP for the new irrigation areas is estimated to be around R2 674 million per annum (expressed in 2018 prices). The direct component of this projected GDP is estimated at R1 072 million, the indirect component at R687 million and the induced component at R915 million.

The operational activities will also create new capital, which is an important driver of economic growth. The following estimated capital is created per annum in the different segments:

- Direct – R365 million;
- Indirect – R1 892 million; and
- Induced – R2 637;
- This amounts to a total of R4 894 million annually.

In total an estimated 15 031 job opportunities can be created and supported per annum of which 10 924 in the direct category will be in the area and on the farms. It can also be accepted that a percentage of indirect and induced categories will also be in the feeder area. Of the jobs created, 1 665 will be in the skilled category, 5 923 semi-skilled and 7 723 unskilled.

One of the crucial aspects of any socio-economic impact assessment is poverty alleviation. The extent to which poverty alleviation is achieved is measured by the impact on household income, specifically the extent to which low-income households will be affected by the additional water of the Clanwilliam Dam. In total the annual impact of the expected wages to be paid to the households is an estimated total of R2 131 million annually, expressed in 2018 prices of which 14% is to low income households at an average income of R3 500 per month.

Government income (taxes, etc.) will increase, on average, by R766 million per annum. If this amount is translated into social services, by using the social expenditure portion of the current budget, it produces the following increases in social services:

- Additional educators: 194
- Additional hospital beds serviced: 42
- Additional doctors: 9
- Additional low-cost houses built: 64 per annum, which accumulates to over 1 270 over a 20-year period.

When undertaking projections of this kind, it is important to realise that the total cost to government to employ one teacher must be taken into account - that is, not only the educator's remuneration package, but also all of the other costs related to supporting the educator standing in front of a class (i.e. furniture, school buildings, administrative support, etc.). Thus, total government expenditure on education is divided between the total numbers of educators

employed. The figures reflected above thus make provision for all direct and indirect costs associated with each of the social indicators investigated.

A second issue that must be highlighted is that the estimated investment for the baseline option is R725.04 million and for the added “betterment” option R1 239.05 million expressed in 2018 prices, but the projected taxes that will be paid to the Fiscus estimated at R766 million per annum for the duration of the production period expressed in 2018 prices.

Operational Phase Results – Existing Area with Improved Assurance of Supply

The benefits to the Provincial and National Government from the increased assurance to the present producers are:

- Total average GDP increase – R601 million per annum;
- Number of jobs secured – 4 611. This is people that will have a higher job security;
- Average Increase in Household Income – R171 million per annum; and
- Average annual stabilising impact of the increase in Balance of Payments is R328 million.

An additional benefit is the overall improvement of the results attained over the 14 000 current hectares under irrigation per annum as presented in the following table.

Criterion	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R245	R150	R206	R601
Impact on employment [number of job opportunities]	3635	457	519	4611
Impact on Households [R million]				R650
Fiscal Impact [R million]				R171
Impact on the Balance of Payments [R million]				R328

Thus, an increased water assurance of supply provides the farmer more security for sustainable farming. This higher assurance level provides the farmer the opportunity to optimise his farming operations. It doesn't only provide a higher annual yield, but also results in the retention of the temporary labour force that is included in the number of job opportunities.

Conclusion

The analysis undertaken indicates that the availability of the additional water from the raised Clanwilliam Dam will have a substantial positive impact on the social and economic conditions prevailing in the area, and that there will be substantial poverty alleviation in the area.

Contents

1	Introduction	1
1.1	Objective of This Report	1
1.2	Methodology	2
2	Data	5
2.1	New Plantings - Operational Baseline Data	5
2.2	Data and Approach – Existing Irrigating Farmers	10
2.3	Construction Data	11
3	Results	13
3.1	Construction Phase Results	13
3.2	New Areas - Operational Phase Results	17
3.3	Results of the Increased Assurance of Supply on Existing Production	23
3.4	Main Findings and Key Issues	26
4	Appendices	28
4.1	APPENDIX A: Social Accounting Matrix	28
4.2	APPENDIX B: Enterprise Budget in Theory	31

Tables

Table 2.1:	Proposed Crops Area Allocated	6
Table 2.2:	Gross Income, Total Costs and Net Farm Income per Annum (2018 prices)	7
Table 2.3:	Estimate Annual Income per Crop and Total (2018 prices) in million Rand	7
Table 2.4:	Intermediate Cost Structure of the different production items in million Rands (2018 prices)	8
Table 2.5:	Number of Estimated Direct Job Opportunities that can be created	9
Table 2.6:	Existing Irrigation Crops per Sub-area	10
Table 2.7:	Construction Data in million Rands (2018 prices)	11
Table 2.8:	Asset Structure as Applied in Socio-Economic Model (Rand million – 2018 Prices)	12
Table 3.1:	Socio-Economic Impacts of the Baseline Option	14
Table 3.2:	Socio-Economic Impacts of the Total Proposed Option	15
Table 3.3:	Comparison of the Socio-Economic Impacts of the Baseline option and the “Betterment” option separated	16
Table 3.4:	Socio-Economic Impacts of the Operational Phase	17
Table 3.5:	Number of Employment Opportunities	19
Table 3.6:	Impact on Employment Skills	19
Table 3.7:	Annual Payments to Households	21
Table 3.8:	Comparison of the Effectiveness Criteria of different Activities	22
Table 3.9:	Improved Socio-Economic Impacts of the Operational Phase (2018 prices)	23
Table 3.10:	Number of Employment Opportunities	25

Table 3.11: Impact on Households

26

Figures

Figure 3.1: Percentage Distribution of GDP (2018 prices)	18
Figure 3.2: Potential Job Opportunities that can be created.	19
Figure 3.3: Employment Opportunities created per Skilled Category	20
Figure 3.4: Percentage division of Payments to Households	22
Figure 3.5: Percentage Distribution of GDP (2018 prices)	24

1 Introduction

The objective of the Post Feasibility Bridging Study for the Proposed Bulk Conveyance Infrastructure from the Raised Clanwilliam Dam is to provide recommendations on the bulk conveyance infrastructure required for the equitable distribution of the existing and additional water from the raised Clanwilliam Dam. The additional water will be used to meet the ecological water requirements of the Olifants River, provide irrigation water to existing irrigators at a higher level of assurance and new irrigators and most importantly support historically disadvantaged farming projects and other broad-based black economic empowerment opportunities.

1.1 Objective of This Report

The primary objective of the socio-economic impact analysis was to measure the nature and magnitude of the socio-economic impacts emanating from the distribution of the additional water to new irrigators from a raised Clanwilliam Dam as well as the impact of the increased Assurance of Supply of irrigation water to existing irrigating farmers. It is accepted that the raising of the Clanwilliam Dam wall is sunk cost and not part of the analysis. The analysis was undertaken to evaluate the relevant impacts that could emerge as a result of the development and the availability of additional water. Socio-economic impacts were separately determined for the construction and operational periods.

The socio-economic significance of the project has a direct bearing on the willingness of the involved parties to make a success of the project. Not only will the success of the project place the National and Provincial Governments in a better economic position through an increased tax base, but it will also enhance the socio-economic situation in the producing rural area. As such, the involved parties are likely to endeavour to make a success of the project. Notwithstanding this observation, it is important to recognise that, if this project does not contribute to the economy of the participating parties, the possibility exist that the project may fail. For this reason, the financial viability for the parties to participate were examined and where necessary measures introduced to decrease the risk of financial and economic failure.

1.2 Methodology

Partial general equilibrium analysis² has been used to quantify the socio-economic impact of the Clanwilliam Dam project. The Social Accounting Matrix (SAM) provides the basis for this partial general economic equilibrium analysis. In general, apart from information on the interdependence between the different sectors taken up in the Input-Output Table, the SAM differs from the traditional Input-Output Table in one important aspect: it includes detailed information on the income and spending patterns of households. For the purposes of conducting the partial general socio-economic equilibrium analysis, the SAM has been converted into a user-friendly model. This is a detailed econometric model that is generally used for purposes of measuring the socio-economic impacts resulting from a specific project.

In layman's terms a SAM also represents a mathematical matrix depicting the linkages that exist in financial terms between all the major role players in the economy, i.e. business sectors, households and government. It is very similar to the input/output table, in the sense that it also reflects the inter-sectoral linkages that are present in an economy. The development of the SAM also provides a logical framework within the context of the National Accounts, in which the activities of especially households are accentuated and distinguished prominently. The households are indeed the basic economic unit where significant decisions are taken affecting economic variables, such as consumption expenditure and personal saving. By combining households into homogenic groups in the SAM, it makes it possible to study how the economic welfare of these groups is affected by changes in the economy.

To summarise, the SAM serves a dual purpose. Firstly, it is a reflection of the magnitude of financial linkages that exist between the major stakeholders in an economy, and secondly, it becomes a powerful econometric tool that can be used to conduct various economic analyses such as calculating the impact of investment projects on the economy. A detailed discussion is available in Appendix A.

By applying this user-friendly model, the direct, indirect, and induced effects of the development with increased water supply from a raised Clanwilliam Dam have been calculated. For example: the "direct effects" emanating from, for example, the water sector refers to the effect occurring within the water sector itself. The "indirect effects" refer to effects occurring in the different economic sectors that link forwards to the operation of the water supply by the dam via the canal system and withdrawal directly from the Clanwilliam Dam or Bulshoek Weir due to the supply of intermediate inputs. The "induced effects", on the other hand, refer to the chain reaction triggered

² **Partial equilibrium** is a condition of economic equilibrium which takes into consideration only a part of the market to attain equilibrium.

by the salaries and profits that are reintroduced into the economy in the form of private consumption expenditure.

Two types of socio-economic impacts, to distinguish between the phases of the project, have been determined, namely the Construction (capital) impact, and the Operational (production) impact. The operational impacts are further separated into two; firstly, the impacts related to new irrigation areas and, secondly, the impacts related to benefits to the existing irrigation areas due to the improvement in the assurance of supply of water.

Work done by Conningarth Economists for the Water Research Commission (WRC) in the Letaba River, Mhlathuze Valley and the Lower Orange show that the crop mix by farmers are affected by the assurance of supply of the irrigation water. The crop plantings are balanced by producers between short and long term crops as the impact of water restrictions on orchards could be very negative. By allocated a certain percentage of the water to short term crops that the producer can refrain from planting, which limits the negative impacts of the water restrictions on the orchards. It was also identified that as the security of supply improves the long term crop areas are increased.

These impacts are measured separately as the construction phase lasts for only a limited period of time or in phases, after which construction stops completely or is scaled down substantially; whilst the operational phase, which is an ongoing process, has an annual, long-term impact on the economy.

Typically, the impacts of economic interventions of the project are measured in terms of macro- and socio-economic performance indicators such as:

- GDP (value added to the national economy);
- Employment creation (creation of new jobs for skilled, semi-skilled, and unskilled workers);
- Capital utilization (investments in machinery, transport equipment, buildings, and other social and economic infrastructure);
- Income generated for low-income households (incremental income available to low-income households) as a specific measure of poverty alleviation;
- Fiscal Impact (contributions to Government Revenue); and
- Social Indicators (i.e. the number of additional educators; the number of additional beds serviced at hospitals; the number of additional doctors; the number of additional low-cost houses that can be built; etc.).

The socio-economic impact model used to calculate the impact of the project on the South African economy uses the South African National SAM as its database. The South African SAM was originally compiled by Statistics South Africa and has been adapted and updated by Conningarth

Economists to reflect the most recent socio- and macro-economic representation of the South African economy in a monetary value format.

As already explained, the largest impact comes from the additional water supplied by the project for the new identified areas as well as the improved assurance of supply to existing irrigators. To calculate the socio-economic impact, unit volumes are converted into potential production capacity using water use/production coefficients (Rand/million cubic meters). These water use/production coefficients were derived from the South African Supply-Use Tables as published by Stats SA and the water use per crop as available from Irrigation Boards, as well as coefficients generated for calculating the impact of the ongoing drought on the Western Cape and Cape Town economies for the provincial Government in 2017.

It is important to note that the impact of the additional water supplied by the Clanwilliam Dam project has been used in the socio-economic analysis with the assumption that all the proposed production activities will be economically and financially successful. To identify the action to achieve this goal is not part of this study, but broadly speaking the following must be in position to assist the new producers:

- An advisory system assisting in crop selection, marketing channels and labour relations;
- Practical Management Assistance; and
- A financial support system.

2 Data

2.1 New Plantings - Operational Baseline Data

In this section the agricultural production data is discussed and presented. This includes the type and extent of crops, areas, production income and production costs together with involved labour. Several issues were taken into consideration in the final decision of the theoretical allocation of a specific area. The following is short listing of the guidelines used:

- Is the proposed crop already produced in the area and is packing and marketing infrastructure available? This specifically applied to available support structures like pack houses and experienced management. If the support structures are available, the investment capital will be smaller.
- What is the medium to long term price structure outlook for the specific product? The following outlook for the different crops is based on work done with Wits for Transnet:
 - Wine: The medium term outlook is not very positive.
 - Citrus: The export of citrus appears very positive and as such provision is made for oranges, lime and lemon, and soft citrus varieties.
 - Raisins: The export of raisins is currently very positive and the medium to long term outlook is positive.
 - Tomatoes: Marketing infrastructure is available and the domestic market is growing.
 - Potato and Wheat: The potato and wheat in rotation is used as the preference system in a very specific area and the domestic market for both crops are growing.
 - The other fruit group have the possibility for the expansion is from the sub-tropical or deciduous groups that are produced in the area in small quantities. Detailed production data is not available therefor apple production selected as a stand in and was used in the analysis.

The study area has been divided into five sub-areas (also referred to as zones) in which the various development options are located and was used in this analysis, as follows:

- **Sub-area 1:** Olifants River catchment upstream of Clanwilliam Dam;
- **Sub-area 2:** Clanwilliam Dam, Olifants River catchment from Clanwilliam Dam up to and including Bulshoek Weir;
- **Sub-area 3:** Schemes located wholly outside the Olifants River catchment;
- **Sub-area 4:** Olifants River catchment from Bulshoek Weir to Lutzville; and
- **Sub-area 5:** Olifants River catchment from Klawer to the Coast.

In cooperation with Aurecon and Agrifusion the following baseline crops (**Table 2.1**) were analysed, with the total estimated hectares indicated per crop.

Table 2.1: Proposed Crops Area Allocated

Crop Type	Sub-area 2	Sub-area 4	Sub-area 5	Totals	Percentage
Available Hectares	2 739	2859	463	6 062	
Citrus	1 370	0	0	1 370	23%
Table Grapes	822	2 144	116	3 082	51%
Wine Grapes	0	0	162	162	3%
Dry Grapes (Raisins)	0	658	46	704	12%
Potato/Wheat in Rotation	466	0	0	466	8%
Tomato	0	0	134	134	2%
Other Fruit	82	57	5	144	2%
Total	2 739	2 859	463	6 062	100%

The long term projected tonnage per hectare were determined, together with the 2018/2019 prices, to determine an income per crop. The individual budgets for the orchard crops make provision for the establishment in the year that the irrigation water becomes available, up to full production in the appropriate year with an estimated lifetime of 30 years.

In **Table 2.2** the total income per hectare as well as the estimated expenditure, which includes the original land preparation and orchard establishment for a specific period, are shown. In evaluating the different values, it must be kept in mind that these budgets do not represent the values used to determine the financial viability of a product but is aimed at determining the socio-economic impact of the additional availability of the water and the new areas that can be irrigated.

Table 2.2: Gross Income, Total Costs and Net Farm Income per Annum (2018 prices)

Crop	Source	Projected Yield ton/ha	Gross Income R/ha	Total Costs R/ha	Net Farm Income R/ha
Apples	Hortgro	63	437 639	394 685	42 954
Table Grapes	Vinpro	12	430 311	366 886	63 425
Wine Grapes	Vinpro	28	114 591	83 238	31 353
Oranges	Citrus Growers	45	348 166	308 649	39 517
Lemons & Limes	Citrus Growers	40	383 060	290 305	92 755
Soft Citrus	Citrus Growers	26	296 066	215 309	80 757
Tomatoes	Letaba Irrigation Board	70	396 970	305 510	91 460
Potatoes	Potato Growers	40	170 016	103 893	66 123
Raisins	Raisins Board	5.3 (dry)	145 005	106 733	38 272
Wheat Irrigation	Grain SA	8	32 200	26 248	8 952

The yields expressed (ton per hectare) were based on an assurance of supply of 90%. These, as well as the estimated expenditures, were obtained from several sources as identified in the table and reworked by Conningarth Economists. The different Intermediate³ Cost Structures were originally compiled for the Water Research Commission for products produced along the Lower Orange River and the Letaba River. A detailed discussion of the budget structure used is available in Appendix B.

The total estimated potential annual turnover for the **additional irrigated area**, at full production, is estimated at R2 128 million as presented in the **Table 2.3**.

Table 2.3: Estimate Annual Income per Crop and Total (2018 prices) in million Rand

Apples	Table Grapes	Wine Grapes	Citrus (Oranges)	Citrus (Lemons & Limes)	Citrus (Soft)	Tomatoes	Potatoes	Raisins (Dry Grapes)	Wheat Irrigation	Total
63.02	1 326.22	18.57	214.58	141.65	113.54	53.30	79.17	102.08	16.39	2 128.53

Table 2.3 shows that the projected highest total turnover will be from table grapes, followed by the citrus component.

The costs are divided into the following structure for purposes of estimating the total costs (**Table 2.4**). For purposes of determining the socio-economic impact of the production is estimated at the projected year of full production for the orchards and the other crops.

³ Thus, **intermediate** cost structure is an accounting flow which consists of the total monetary value of goods and services consumed or used up as inputs in production by enterprises, including raw materials, services and various other operating **expenses**.

Table 2.4: Intermediate Cost Structure of the different production items in million Rands (2018 prices)

Total costs (Intermediate inputs and labour requirements)	Apples	Table Grapes	Wine Grapes	Citrus (Oranges)	Citrus (Lemons & Limes)	Citrus (Soft)	Winter Vegetables	Potatoes	Raisins (Dry Grapes)	Wheat Irrigation	Total
- Agriculture	0.56	13.33	0.30	2.39	1.43	1.49	1.37	9.11	1.86	0.52	32.37
- Mining	-	-	-	-	-	-	-	-	-	-	-
- Manufacturing	-	-	-	-	-	-	-	-	-	-	-
* Fuel	1.46	9.20	0.84	5.78	3.75	3.86	0.10	0.30	2.12	0.50	27.92
* Fertilizer	1.80	32.77	0.58	7.71	4.63	4.80	2.11	4.94	1.60	4.19	65.13
* Pharmaceuticals	2.99	75.30	0.48	12.78	7.67	7.95	2.04	5.82	4.79	0.76	120.58
* Other	29.25	353.28	1.84	84.07	44.39	27.54	11.20	4.64	6.83	-	563.03
- Electricity	1.07	29.78	0.79	4.57	2.74	2.84	4.42	1.02	2.97	1.16	51.35
- Water	0.31	5.35	0.12	1.33	0.80	0.82	0.60	0.14	1.48	0.50	11.44
- Construction	2.58	89.01	1.13	7.81	4.34	4.59	0.49	0.93	2.57	0.45	113.90
- Trade and accommodation	-	-	-	-	-	-	-	-	-	-	-
- Transport and communication	3.69	4.80	0.21	13.19	9.26	3.26	2.69	4.95	1.90	1.00	44.96
- Financial and business services	1.65	38.90	1.64	2.22	2.00	1.22	8.17	10.39	10.88	1.82	78.970
- Community services	-	-	-	-	-	-	-	-	-	-	-
- Salaries and wages: Skilled	2.79	136.24	1.99	11.25	6.46	5.80	2.95	1.40	13.55	0.68	183.11
- Salaries and wages: Semi-Skilled	4.63	193.44	1.53	19.62	10.35	9.36	2.44	1.67	11.38	0.38	254.80
- Salaries and wages: Unskilled	4.07	149.34	2.04	17.52	9.53	9.04	2.44	3.07	13.20	0.26	210.51
Total	56.83	1 130.75	13.49	190.23	107.35	82.57	41.02	48.38	75.13	12.22	1 757.98

From **Table 2.4** it is deducted that the total annual production costs would be around R1 758 million per annum, expressed in 2018/2019 prices.

In **Table 2.5** the direct labour numbers are expressed in “permanent equivalents” where it is estimated in terms of permanent and temporary labour added. If a worker is temporary employed for 3 months per annum he is classified as 0.25 equivalent.

The numbers were calculated by Conningarth Economists, using published data from Hortgro, Vinpro, Raisins Board, Grain SA and Citrus Growers.

In **Table 2.5** the labour multipliers, as well as the estimated number of workers per crop, is presented.

Table 2.5: Number of Estimated Direct Job Opportunities that can be created

Crop	Pm Eqv/ha	Number	Skilled	Semi-skilled	Unskilled
Apples	1.17	168	10	67	91
Table Grapes	2.56	7 902	500	2 804	4 598
Wine Grapes	0.72	117	7	22	88
Oranges	1.04	640	41	284	315
Lemons & Limes	1.03	383	24	150	209
Soft Citrus	0.85	326	21	136	169
Tomatoes	1.26	169	11	35	123
Potatoes	0.6	279	5	24	250
Raisins	0.94	665	50	160	455
Wheat Irrigation	0.19	87	2	6	79
Total		10 736	671	3 688	6 377

The above numbers per crop depend on the number of hectares allocated to specific crops, while the hectare multiplier will not change. It appears that a total of 10 736 permanent equivalent job opportunities will be created by the additional hectares that can be irrigated in the production area. It is also necessary to mention that the estimated number of dependents on the job opportunities would be in excess of 40 000 people using 4⁴ dependants per employment opportunity.

The division of the labour numbers into skilled, semi-skilled and unskilled was calculated by dividing the Salary/Wage component by the accepted remuneration scale for the different categories. For the unskilled category R3500/month was used, R6 000/month for the semi-skilled and R25 000 for the skilled category.

⁴ This number varies between 3 and 4 depending on urban or rural people.

2.2 Data and Approach – Existing Irrigating Farmers

The following areas (**Table 2.6**) were used in calculating the positive socio-economic impact of the increased “Assurance of Supply” of the provision of irrigation water once the project has been completed.

Table 2.6: Existing Irrigation Crops per Sub-area

Crop type	Sub-area 2	Sub-area 4	Sub-area 5
Citrus	650	0	0
Table grapes	189	812	23
Wine grapes	228	6189	4784
Vegetables	500	373	597
Other fruit	50	145	5
Total	1 617.0	7 519.0	5 409.0

Source: Aurecon

The sub-areas used in the calculation are the following:

- **Sub-area 2:** Clanwilliam Dam, and the Olifants River catchment from Clanwilliam Dam to and including Bulshoek Weir;
- **Sub-area 4:** Olifants River catchment from Bulshoek Weir to Lutzville; and
- **Sub-area 5:** Olifants River catchment from Klaver to the Coast.

In terms of the current assurance of supply the reality is that most irrigators nearly every year experienced some restriction. It appears as if an 80% assurance of supply would be appropriate for the present situation (although it may be even lower). To date, existing irrigators from Clanwilliam Dam were restricted often, because the dam was so small relative to the MAR of the Olifants River. The assurance of supply following the raising of the dam is assumed to be 90% (1: 10 assurance of supply) which is the assurance associated with the new production areas.

A lower assurance of supply level has a negative impact on average crop yield over time, compared to a higher assurance. The negative impact on annual crops can be very dramatic depending on when the restrictions were introduced, but it could also serve as buffer to restrict the impact on the orchard crops by not planting the annual crop at all but use the allocated water on the orchards.

Several assumptions were developed in the calculation of the impacts. One of the assumptions is that it would probably be the temporary workers that will suffer the most in the restriction period as the producers will probably try to retain workers at permanent and skilled levels. Secondly the most dramatic impact would be on the average turnover at the lower water volumes available.

For the purposes of determining the impact of the water the average yield on the 80% water supply security level was estimated and applied in the model.

The same econometric model constructed for the new areas were used to determine the socio-economic impacts of the improved assurance of supply. Only the hectares were changed, but the cost structure were used again. The model was run for an 80% and a 90% assurance of supply.

The outcome was a set of results for the present irrigating areas at the 90% assurance and a set of results at 80% assurance. These two sets were subtracted from each other and the difference was used as the impact of the increased assurance.

2.3 Construction Data

Construction data, provided by Aurecon, were used as the baseline cost for new irrigation development, called Option A in **Table 2.7**. Option B provides for further “betterment” of the existing canal system. The breakdown options, referred to in **Table 2.7**, are the following:

- **Option 1:** Jan Dissels; pumping from Clanwilliam Dam;
- **Option 2:** Clanwilliam; pumping from Clanwilliam Dam;
- **Option 4:** Zandrug; pumping from the Olifants River;
- **Option 5:** Bulshoek; pumping from Bulshoek Weir;
- **Option 15:** Right Bank Canal; replacing the existing Trawal section of the Lower Olifants canal with increased capacity, supplying four new irrigation development areas (Zypherfontein 1, Trawal, Zypherfontein 2 and Melkboom) in the Trawal area, and any increased downstream supply. This option has a betterment component; and
- **Options 21c/22:** Use of spare capacity in the Naauwkoeks/Vredendal canal sections, supplying a combination of the restitution farms to be allocated to Ebenhaeser farmers, augmenting the existing Ebenhaeser community scheme, and potentially supplying a scaled-down Coastal 1 area near Vredendal.

Table 2.7: Construction Data in million Rands (2018 prices)

Cost component	Preferred Development Options							Option A		Option B
	Option 1	Option 2	Option 4	Option 5	Option 15	Option 21 c	Option 22	Baseline	Betterment Option 15	Total
Pipeline	7.14	4.54	10.99	4.96	30.11	6.08	45.28	109.1	25.19	134.29
Pump Station	4.85	18.57	37.21	13.77	96.48	36.84	18.17	225.89	10.34	236.23
Balancing Reservoir	0.06	0	0	0		7.33	20.59	27.98		27.98
Canal					121.04			121.04	399.85	520.89

Cost component	Preferred Development Options							Option A		Option B
	Option 1	Option 2	Option 4	Option 5	Option 15	Option 21 c	Option 22	Baseline	Betterment Option 15	Total
Farm Dam	0.03	0.13	2.26	0.08	17.13		3.58	23.21	6.89	30.1
Purchase of Land	0	11.58	28.94	11.93	61.99	15.54	16.88	146.86		146.86
Prof. Design and Support	1.81	3.47	5.22	2.53	34.7	7.54	15.69	70.96	71.74	142.7
Total	13.89	38.29	84.62	33.27	361.45	73.33	120.19	725.04	514.01	1239.05

As the impact of the construction data is for a short period, the socio-economic impact is sometimes not as dramatic as the impact over the operational period, but it is important to keep in mind that economic growth is dependent on capital investment. This is a new capital investment project that will result in an ongoing annual operational impact.

The above costs include the purchase of the land, which in terms of the definition of SAM model used, is not applied in the calculations and omitted. In the next table, **Table 2.8**, the breakdown of the inputs used in the model is presented.

Table 2.8: Asset Structure as Applied in Socio-Economic Model (Rand million – 2018 Prices)

Asset structure	Option A	Option B
1. Furniture		
2. Rubber products		
3. Structural Metal Products		
4. Other Fabricated metal products		
5. Machinery and equipment	90.36	94.49
6. Electrical machinery and apparatus	56.47	59.06
7. Manufacturing of transport equipment		
8. Other manufacturing and recycling	109.1	134.29
9. Buildings	79.06	79.06
10. Civil Construction	172.23	578.97
11. Business activities (architects, attorneys, etc.)	70.96	142.7
Total	578.18	1088.57

3 Results

As already explained, the impacts of economic interventions of the project are measured in terms of economic and socio-economic performance indicators such as:

- GDP (value added to the national economy);
- Employment creation (creation of new jobs for skilled, semi-skilled, and unskilled workers);
- Capital utilization (investments in machinery, transport equipment, buildings, and other social and economic infrastructure);
- Income generated for low-income households (incremental income available to low-income households) as a specific measure of poverty alleviation;
- Fiscal Impact (contributions to Government Revenue); and
- Social Indicators (i.e. the number of additional educators; the number of additional beds serviced at hospitals; the number of additional doctors; the number of additional low-cost houses that can be built; etc.).

The results of the construction phase are first presented, followed by the benefits obtained during the operational phase of the “new” water and the additional benefits in the existing irrigation as a result of the improved Assurance of Supply volume security.

3.1 Construction Phase Results

Although the construction phase is for a relatively short period it is still necessary that it be analysed and interpreted. The results are presented as a total for the construction period, the so-called Baseline Option A in the first table, **Table 3.1** and for the Total Option B if the “betterment” option is added and implemented in **Table 3.2**.

In the analysis the term Gross Domestic Product is used referring in this specific case to the national economy, where necessary reference will be made to the provincial economy. The same apply to the Balance of Payments.

Table 3.1: Socio-Economic Impacts of the Baseline Option

Criterion	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R103	R117	R109	R328
Impact on capital formation [R million]	R703	R426	R306	R1435
Impact on employment [number of job opportunities]	362	340	273	975
- Skilled impact on employment [number of job opportunities]	38	97	60	196
- Semi-skilled impact on employment [number of job opportunities]	278	142	127	546
- Unskilled impact on employment [number of job opportunities]	46	102	86	233
Impact on Households [R million]				R261
- Low Income Households [R million]				R21
- Medium Income Households [R million]				R51
- High Income Households [R million]				R189
Fiscal Impact [R million]				R99
-National Government [R million]				R68
-Provincial Government (Rm)				R3
-Local Government (Rm)				R28
Impact on the Balance of Payments [R million]				R-108

A survey of the above table shows that the construction period will provide positive impacts, but for the Balance of Payments⁵ a negative value of R108 million for the construction period is forecasted. A total of 975 jobs will be created during the construction period of which 362 will be direct employed in the construction area. A total of R261 million will be paid to households with R21 million to Low-Income Households.

In **Table 3.2** the results of the construction plus the “betterment option presented.

⁵ The **balance of payments (BOP)** is a statement of all transactions made between entities in one country and the rest of the world over a defined period

Table 3.2: Socio-Economic Impacts of the Total Proposed Option

Criterion	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R297	R336	R314	R947
Impact on capital formation [R million]	R2027	R1229	R881	R4138
Impact on employment [number of job opportunities]	1043	981	787	2811
- Skilled impact on employment [number of job opportunities]	110	279	174	564
- Semi-skilled impact on employment [number of job opportunities]	800	409	366	1575
- Unskilled impact on employment [number of job opportunities]	132	293	247	672
Impact on Households [R million]				R751
- Low Income Households [R million]				R60
- Medium Income Households [R million]				R147
- High Income Households [R million]				R544
Fiscal Impact [R million]				R286
-National Government [R million]				R197
-Provincial Government (Rm)				R8
-Local Government (Rm)				R81
Impact on the Balance of Payments [R million]				R-312

A survey of the above table shows that construction period will provide positive impacts, but for the Balance of Payments a negative value of R312 million for the construction period is forecasted. A total of 2 811 jobs will be created during the construction period of which 1 043 will be direct in the construction area. A total of R751 million will be paid to households with R60 million to Low-Income Households.

In the following table, **Table 3.3**, the results of the two canal options are compared.

Table 3.3: Comparison of the Socio-Economic Impacts of the Baseline option and the “Betterment” option separated

Criterion	Baseline Impact	Impact "betterment Option Included
Impact on Gross Domestic Product (GDP) [R million]	R328	R947
Impact on capital formation [R million]	R1435	R4138
Impact on employment [number of job opportunities]	975	2811
- Skilled impact on employment [number of job opportunities]	196	564
- Semi-skilled impact on employment [number of job opportunities]	546	1575
- Unskilled impact on employment [number of job opportunities]	233	672
Impact on Households [R million]	R261	R751
- Low Income Households [R million]	R21	R60
- Medium Income Households [R million]	R51	R147
- High Income Households [R million]	R189	R544
Fiscal Impact [R million]	R99	R286
-National Government [R million]	R68	R197
-Provincial Government (Rm)	R3	R8
-Local Government (Rm)	R28	R81
Impact on the Balance of Payments [R million]	R-108	R-312

The following is observed during the construction period if the Baseline option is compared with the option where the “betterment” is included:

- The GDP increased from R328 million to R947 million for the period;
- Capital formation increased from R1 435 million to R4 138 million;
- Employment opportunities improve from 975 to 2 811 which also increases the impact on the people from 4 000 to 11 200 in the different households if 4 is accepted as the number of dependents per job opportunity;
- Salaries and wages increase from R261 million to R751 million per annum for the construction period; and
- The only negative value is the increased negative impact on the Balance of Payments from R108 million to R312 million.

It is therefore possible to deduct that the possible decision to include the “betterment” option will have a very positive impact during the construction period. On a more practical level, it will improve the delivery of the water by significantly reducing losses. It will also provide greater security against canal failures as there are an ever-increasing threat due to the age and state of the current canals.

3.2 New Areas - Operational Phase Results

In **Table 3.4** below the results as obtained from the model is presented. It is the projected results at a point where all the new areas are fully operational, and the orchards are in full production. Below the table a detailed discussion is provided about the interpretation of the results.

Table 3.4: Socio-Economic Impacts of the Operational Phase

Criterion	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R1072	R687	R915	R2674
Impact on capital formation [R million]	R365	R1892	R2637	R4893
Impact on employment [number of job opportunities]	10924	2082	2305	15310
- Skilled impact on employment [number of job opportunities]	691	486	487	1665
- Semi-skilled impact on employment [number of job opportunities]	3837	1022	1063	5923
- Unskilled impact on employment [number of job opportunities]	6396	573	754	7723
Impact on Households [R million]				R2131
- Low Income Households [R million]				R309
- Medium Income Households [R million]				R658
- High Income Households [R million]				R1164
Fiscal Impact [R million]				R766
-National Government [R million]				546
-Provincial Government (Rm)				R20
-Local Government (Rm)				R201
Impact on the Balance of Payments [R million]				R1310

3.2.1 Gross Domestic Product (GDP)

The definition of Gross domestic product (GDP) states that it is a monetary measure of the market value of all the final goods and services produced in a specific time period, often annually. In this specific situation it presents the projected value when the production is fully developed. In this specific case the GDP refers to the impact on the provincial economy, the difference between the national and provincial is very small, less than 2%.

The total projected GDP is estimated to be around R2 674 million per annum, expressed in 2018 prices, with the direct component estimated at R1 072 million, the indirect at R687 million and the induced at R915 million.

Figure 3.1 shows the percentage distribution of the GDP between the three different components. It is also necessary to keep in mind that the products will nearly all be transported to Cape Town for either marketing purposes or export. The accompanying economic impacts are included in the results.

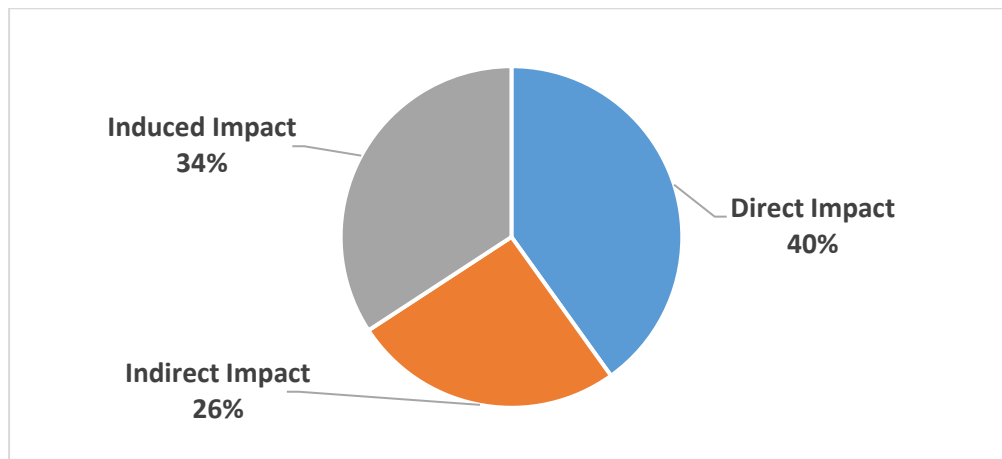


Figure 3.1: Percentage Distribution of GDP (2018 prices)

3.2.2 Capital Creation

Capital formation is crucial element for economic growth. Capital formation increases investment which stimulates economic development in two ways.

- **Firstly**, it increases the per capita income and enhances the purchasing power which, in turn, creates more effective demand; and
- **Secondly**, investment leads to an increase in production.

The following capital is created in the different segments per annum:

- Direct – R365 million;
- Indirect – R1 892 million;
- Induced – R2 637;
- With a total of R4 894 million annually.

3.2.3 Employment Creation

The employment numbers are presented as direct, indirect, induced and also as skilled, semi-skilled and unskilled.

The following table, **Table 3.5**, presents the estimated employment numbers.

Table 3.5: Number of Employment Opportunities

Impacts	Number of Jobs
Direct Impact	10 924
Indirect Impact	2 082
Induced Impact	2 305
Total Impact	15 310

Figure 3.2 presents the potential job opportunities in the percentage per category

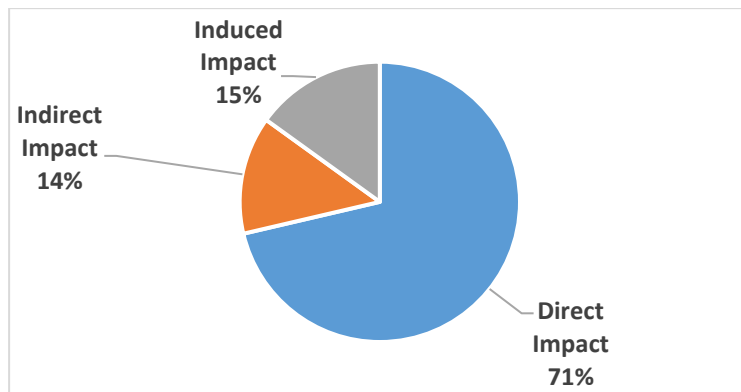


Figure 3.2: Potential Job Opportunities that can be created.

The figure shows that, in terms of job creation, over 71% is in the direct category, with a much smaller percentage in the other two categories. In total, 15 031 opportunities can be created and supported, of which 10 924 in the direct category will be in the area and on the farms. It can also be accepted that a percentage of the other two categories will also be in the feeder area.

Table 3.6 shows the number of jobs at different skill levels that can be created and supported by the proposed new irrigation development.

Table 3.6: Impact on Employment Skills

Impact on employment	Total Impact
- Skilled	1 665
- Semi-skilled	5 923
- Unskilled	7 723
Total	15 310

The table shows that 1 665 of the opportunities to be created will be in the skilled category with the rest in the other two categories, 5 923 semi-skilled and 7 723 unskilled. **Figure 3.3** provides an indication of the skill categories of the number of jobs created per category.

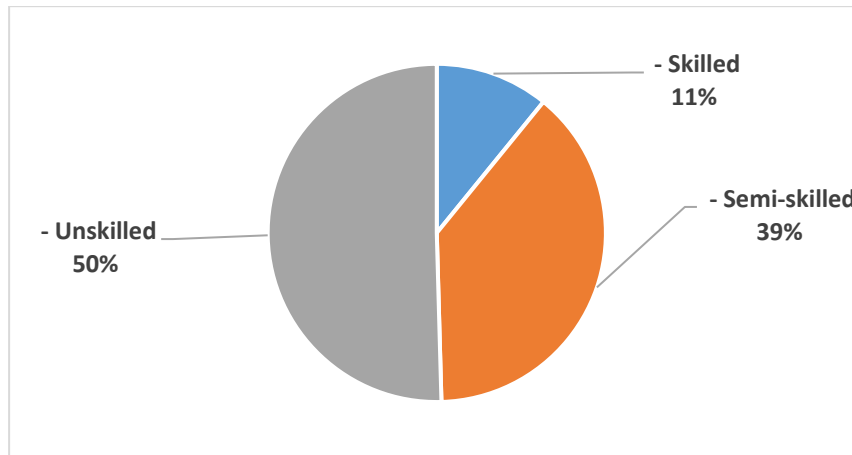


Figure 3.3: Employment Opportunities created per Skilled Category

The graph indicates that only 11% of the potential jobs will be in the skilled category, with 39% in semi-skilled with 50% unskilled.

3.2.4 Fiscus Payment – Social Impact

The total payments to the Fiscus, in terms of different forms of tax at current rates is estimated at R766 million per annum estimated at 2018 prices. The individual tax elements are the National Government, Provincial Government and Local Government.

To provide an estimation in economic terms what the National Tax of R766 million is worth, it is expressed in social values.

In the data below an indication is given of the extent to which the social services of South Africa can be improved by the additional government income emanating from the taxes. These figures are calculated by assuming that a sizeable portion of this additional government income will be allocated to social services. It should be noted that the social services indicators depicted below are not mutually exclusive but should be considered in tandem.

Government income will increase, on average, by R766 million per annum. If this amount is translated into social services, by using the social expenditure portion of the current budget, it can support all the following increases in social services in one year:

- Additional educators: 194
- Additional hospital beds serviced: 42
- Additional doctors: 9
- Additional low-cost houses built: 64 per annum, which accumulates to over 1270 over a 20 period.

When undertaking projections of this kind, it is important to note that the total cost to government to employ, for example, one teacher, must be taken into account - that is, not only the educator's remuneration package, but also all of the other costs related to supporting the educator standing in front of a class (i.e. furniture, school buildings, administrative support, etc.). Thus, total government expenditure on education is divided between the total numbers of educators employed. The figures reflected above thus make provision for all direct and indirect costs associated with each of the social indicators investigated.

A second issue that must be highlighted is that the estimated investment for the baseline option is R725.04 million and for the “betterment” option R1 239.05 million expressed in 2018 prices, but the projected taxes that will be paid to the Fiscus estimated at R766 million per annum for the duration of the production period.

3.2.5 Impact on Households

One of the crucial aspects of any socio-economic impact assessment is poverty alleviation. The extent to which poverty alleviation is achieved is measured by the impact on household income, specifically the extent to which low-income households will be affected by the available water of the Clanwilliam Dam. **Table 3.7** below show the total annual impact of the expected wages to be paid to the households, with a total of R 2 131 million annually, expressed in 2018 prices.

Table 3.7: Annual Payments to Households

Impact on Households	Total Impact Rand Million
- Low Income	R309
- Medium Income	R658
- High Income	R1 164
Total	R2 131

It is estimated that 14% (see **Figure 3.4**) of the total household income generated will flow to low-income households. Households represent an important agent of the economy, due to their Income and Expenditure patterns. It is important to note that people as economic agents are classified as households in terms of national accounts.

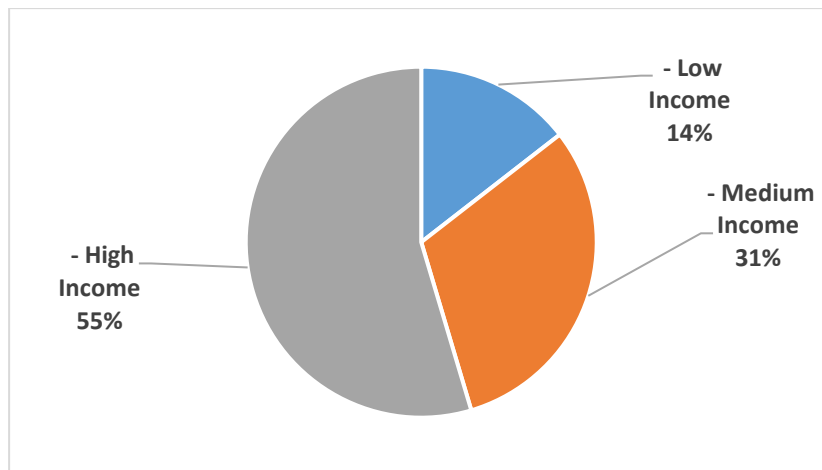


Figure 3.4: Percentage division of Payments to Households

3.2.6 Impact on Balance of Payments

As a large percentage of the crops is exported, a very positive impact is realised on the Balance of Payments of the Treasury, namely R1 310 million annually, expressed in 2018 prices.

3.2.7 Effectiveness Impacts

The following table, **Table 3.8**, provides an indication of the effectiveness criteria of the operational phase compared to investment in other activities. The criteria used is the following:

- GDP/Capital ratio comparing the impact of the capital investment on the resultant GDP;
- Labour/Capital ratio comparing the number of labour opportunities created with the capital invested, number per million Rand used; and
- Low/Total Household Income ratio comparing the income received by the low-income household versus the total household income.

The following table presents the comparison for the different economic activities per million Rand.

Table 3.8: Comparison of the Effectiveness Criteria of different Activities

Criteria	GDP/Capital Ratio	Labour/Capital Ratio	Low/Total Income Households Ratio
Theme Results	0.55	3.13	0.14
Comparative Sectoral Results			
Agriculture, hunting, forestry and fishing	0.28	1.59	0.09
Mining and quarrying	0.79	1.65	0.09
Manufacturing	0.37	0.93	0.08
Electricity, gas and water supply	0.23	0.28	0.07

Criteria	GDP/Capital Ratio	Labour/Capital Ratio	Low/Total Income Households Ratio
Construction	0.51	1.60	0.07
Wholesale and retail trade	0.56	1.46	0.09
Transport, storage and communication	0.31	0.61	0.09
Financial, insurance, real estate and business services	0.38	0.85	0.08
Community, social and personal services	0.24	0.80	0.09
Total	0.37	0.96	0.08

The following can be deduced from the table:

- In terms of the GDP/Capital ratio it is only the mining and retail sectors that have a better ratio value;
- In the Labour/Capital ratio the proposed irrigation expansion creates in terms of capital by far the most jobs; and
- In the Low/Total Household Income ratio the proposed activities also outperform the other sectors in terms of the percentage money paid to the low-income households.

3.3 Results of the Increased Assurance of Supply on Existing Production

The results discussed in this section is an indirect result of the improved Assurance of Supply of water which will reduce the water restriction period considerably. In **Table 3.9** the results of this long term average improvement of the socio-economic conditions in the region is presented by the higher Assurance of Supply of the irrigation water for the existing producers.

Table 3.9: Improved Socio-Economic Impacts of the Operational Phase (2018 prices)

Impact type	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Impact on Gross Domestic Product (GDP) [R million]	R245	R150	R206	R601
Impact on capital formation [R million]	R0	R401	R595	R995
Impact on employment [number of job opportunities]	3635	457	519	4611
- Skilled impact on employment [number of job opportunities]	0	105	109	214
- Semi-skilled impact on employment [number of job opportunities]	0	228	239	467
- Unskilled impact on employment [number of job opportunities]	3635	125	170	3930
Impact on Households [R million]				R650

Impact type	Direct Impact	Indirect Impact	Induced Impact	Total Impact
- Low Income Households [R million]				71
- Medium Income Households [R million]				152
- High Income Households [R million]				256
Fiscal Impact [R million]				R171
-National Government [R million]				122
-Provincial Government (Rm)				4
-Local Government (Rm)				45
Impact on the Balance of Payments [R million]				R328

The results depict a projected improvement attained over the 14 000 hectares currently irrigated per annum. Thus, an increased water assurance of supply provides the farmer more security for sustainable farming. This higher assurance level provides the farmer the opportunity to optimise his farming operations. It doesn't only provide a higher annual yield, but also results in the retention of the temporary labour force that is included in the number of job opportunities. The 3 635 unskilled labourers shown in **Table 3.9** will benefit most, as they now have better chance of a longer employment period.

3.3.1 Gross Domestic Product (GDP)

The total projected improved GDP is estimated to be around R601 million per annum, expressed in 2018 prices, with the direct component estimated at R245 million, the indirect at R150 million and the induced at R206 million.

Figure 3.5 shows the percentage distribution of the GDP between the three different components. It is also necessary to keep in mind that the products will nearly all be transported to Cape Town for either marketing purposes or export. The accompanying economic impacts are included in the results.

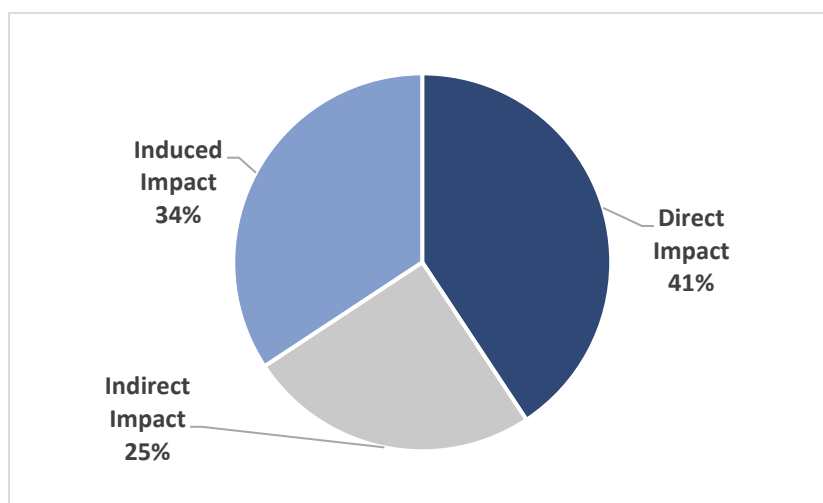


Figure 3.5: Percentage Distribution of GDP (2018 prices)

The figure shows that the impact on the wider economic sectors in terms of the Indirect and Induced impact is 66%, with the direct impact 34%.

3.3.2 Capital Formation

The operational activities will also create new capital, which is an important driver of economic growth. The following capital is created in the different segments per annum:

- Direct – R0.0 million;
- Indirect – R401 million;
- Induced – R595;
- With a total of R996 million annually.

The assumption was that the in case of the direct component the capital was already being spend and in the case of a restrictions mostly lost.

3.3.3 Employment Impact

The employment numbers are presented as direct, indirect, induced and also as skilled, semi-skilled and unskilled.

The following table, **Table 3.10**, presents the estimated employment secured numbers in terms of the specific category.

Table 3.10: Number of Employment Opportunities

Impact on employment [number of job opportunities]	Direct	Indirect	Induced	Total
- Skilled impact on employment [number of job opportunities]	0	105	109	214
- Semi-skilled impact on employment [number of job opportunities]	0	228	239	467
- Unskilled impact on employment [number of job opportunities]	3635	125	170	3930
Total	3635	458	518	4611

Table 3.10 shows that in total 4 611 opportunities is secured of which 3 635 is in the unskilled component in the area component which probably is workers whose jobs is now more secured on average than before. The others are probable not directly involved in the area but will still benefit from a more secure work environment.

3.3.4 Impact on Low Income Households.

Table 3.11 shows the improved impact household income of the improved Assurance of Supply of the irrigation water from the project.

Table 3.11: Impact on Households

Impact on Households	Rand Million
- Low Income Households	71
- Medium Income Households	152
- High Income Households	256
Total	650

The table shows that R650 million in total is more secure to households under the new assurance than before, R71 million is aimed at the low-income households which were probably the workers that lost their employment in larger numbers.

3.3.5 Balance of Payments

According to estimations the average annual increase in the Balance of Payments will amount to R328 million per annum.

3.4 Main Findings and Key Issues

The socio-economic impact analysis for both the Western Cape Province and South Africa indicate that both will be significantly positively impacted by the construction and operation of the water distribution project. In the operational phase it is not only the new receivers that benefit but also the present users, it should however be remembered that the operational phase results will not be immediately available. Firstly, the construction period will be lengthy and only then the production can start. The second is that the new orchard crops can take up to 7 years to reach a level of full production.

Because the dam is situated in the Western Cape, the construction and operation of the dam will have a significant impact on the economy of this province. The following benefits are important for the country during the operational period flowing from the new producing areas:

- GDP will increase, on average, by R2.764 billion per annum;
- Employment will increase by 15 310 jobs in total over the period mostly in the Western Cape Province;
- Household income will increase, on average, by R2.131 billion per annum, of which 14% will accrue to low-income households, and

- Government income will increase, on average, by R766 million per annum. If this amount is translated into social services, by using the social expenditure portion of the current budget, it produces the following increases in social services per annum, all the services listed:
 - Additional educators: 194
 - Additional hospital beds serviced: 42
 - Additional doctors: 9
 - Additional low-cost houses built: 64 per annum, which accumulates to 1270 over a 20-year period.

A second issue that must be highlighted is that the estimated investment for the baseline option is R725.04 million and for the “betterment” option R1 239.05 million expressed in 2018 prices, but the projected taxes that will be paid to the Fiscus estimated at R766 million per annum for the duration of the production period expressed in 2018 prices.

The benefits to the Provincial and National Governments from the increased assurance to the present producers are:

- Total Average GDP increase – R601 million per annum;
- Number of jobs secured – 4611. These are people that will have a higher job security.
- Average Increase in Household Income – R171 million per annum; and
- Average annual stabilising impact of the increase in Balance of Payments is R328 million.

From the above analysis it appears that the availability of the additional water will have a substantial positive impact on the social and economic conditions prevailing in the area and that poverty alleviation will be substantial in the area.

4 Appendices

4.1 APPENDIX A: Social Accounting Matrix

A Social Accounting Matrix (SAM) is a comprehensive, economy-wide database, which contains information on the flow of resources that take place between the different economic agents that exist within an economy (i.e. business enterprises, households, government, etc.) during a given period of time – usually one calendar year.

When economic agents in an economy are involved in transactions, financial resources change hands. The SAM provides a complete database of all transactions that take place between these agents in a given period, thereby presenting a “snapshot” of the structure of the economy for that time period. As a system for organising information, a SAM presents a powerful tool in terms of which the economy can be described in a complete and consistent way:

Complete in the sense that it provides a comprehensive accounting of all economic transactions for the entity being represented (i.e. country, region/province, city, etc.), and Consistent in that all incomes and expenditures are matched.

Consequently, a SAM can provide a unifying structure within which the statistical authorities can compile and present the national accounts.

Like the traditional Input-Output Table, the SAM reflects the inter-sectorial linkages in terms of sales and purchases of goods and services, as well as the remuneration of production factors that forms the essence of any economy’s functioning. What is also of importance is that a SAM reflects the economic related activities of households in some detail. Households are responsible for decisions that have a direct and indirect effect on important economic variables such as private consumption expenditures and savings. These economic aggregates are important drivers of the economic growth processes and ultimately the creation of employment opportunities and wealth. Private consumption expenditure, for example, comprises approximately 60 percent of total gross final domestic spending in the economy. By combining households into meaningful categories, such as a range of income levels, the impact on these households’ welfare of a changing economic environment is made possible by the SAM.

It is clear from the above that because of the intrinsic characteristics of the SAM, once compiled, it renders itself as a useful tool for analytical purposes. Especially, based on the mathematical traits of the matrix notations that describe its structure, a SAM can be transformed into a powerful econometric tool/model. For example, the model can be used to quantify the probable impact on the economy of a new infrastructural project such as a new power station – both the construction phase and the operational phase will be modelled.

Thus, apart from serving as an extension to a country's National Accounts, the SAM in its model form opens up many opportunities for the economic analyst to conduct rigorous policy and other impact analyses for the purpose of ensuring optimal benefit to the stakeholders concerned.

4.1.1 Application(s) of the SAM

The development of the SAM is very significant as it provides a framework within the context of the International System of National Accounts (SNA) in which the activities of all economic agents are accentuated and prominently distinguished. By combining these agents into meaningful groups, the SAM makes it possible to clearly distinguish between groups, to research the effects of interaction between groups, and to measure the economic welfare of each group. There are two key reasons for compiling a SAM:

Firstly, a SAM provides a framework for organising information about the economic and social structure of a particular geographical entity (i.e. a country, region or province) for a particular time period (usually one calendar year), and

Secondly, to provide a database that can be used by any one of a number of different macro-economic modelling tools for evaluating the impact of different economic decisions and/or economic development programmes.

Because the SAM is a comprehensive, disaggregated, consistent, and complete data system of economic entities that captures the interdependence that exists within a socio-economic system, it can be used as a conceptual framework for exploring the impact of exogenous changes in such variables as exports, certain categories of government expenditure, and investment on the entire interdependent socio-economic system. The SAM, because of its finer disaggregation of private household expenditure into relatively homogenous socio-economic categories that are recognisable for policy purposes, has been used to explore issues related to income distribution.

The SAM's main contribution in the field of economic policy planning and impact analysis is divided into two categories:

As a Primary Source of Economic Information

As a detailed and integrated national and regional accounting framework consistent with officially published socio-economic data, a SAM instantly projects a picture of the nature of a country or region's economy. It lends itself to both descriptive and structural analysis.

As a Planning Tool

Due to its mathematical/statistical underpinnings it can be transformed into a macro-econometric model that can be used to:

- Conduct economic forecasting exercises/scenario building;
- Conduct economic impact analysis both for policy adjustments at a national and provincial level and for large project evaluation;
- Conduct self-sufficiency analysis i.e. gap analysis to determine, with the help of the inter industry and commodity flows contained in the provincial SAM, where possible investment opportunities exist; and
- Calculate the inflationary impacts on provincial level of price changes instigated at national level (i.e. administered prices, VAT, etc.).

To summarise, the SAM mechanism provides a universally acceptable framework within which the economic impact of development projects and policy adjustments can be reviewed and assessed at both national and provincial/regional levels. It serves as an extension to the official National Accounts of a country's economy and, therefore, provides a wealth of additional information, especially when disaggregated to more detailed levels.

4.2 APPENDIX B: Enterprise Budget in Theory

In the section below the enterprise budget based on an orchard methodology will be described. To be able consolidated income, variable and fixed costs, capital stock's values in a format to conduct the macro-economic modelling, a bottom-top approach was applied.

A summary of the enterprise budget is as follows:

The different economic items to be calculated are:

- Gross Margin = Gross Income - (Marketing costs + Variable costs)
- Net Farm Income = Gross Margin - Fixed Costs*
- Net Income = Net Farm Income - (Yield on Capital plus Management Fee)

* *The fixed costs are those associated with the general management of the farm.*

The following section will discuss the interpretation of the capital infrastructure of which the annual costs are taken up into the enterprise budget.

Capital items of which to be depreciated, annual maintenance and insurance cost calculated with the applicable depreciation years, and percentages allocated to annual maintenance is shown below. A section of 'Annual Costs of Net Income' shows the items of which the yield on land and capital is determined and separately taken up into the enterprise budget. The management fee that is also taken up separately in the enterprise budget consist of the financial remuneration for the farmer.

Capital Infrastructure items
Annual costs taken up in Fixed Costs:
Sheds
Pack house
Refrigeration
Tractors
Implements
Irrigation Equipment
Bulk Water supply
Vehicles
Loose tools
Crop Insurance
Annual costs deducted from Net Income:
Land
Irrigation Rights
Equipment

Cost of Living for farmer – Management Fees
General Salary (incl. housing, medical and pension fund contribution)
<i>minus:</i> Benefits derived from farm (Housing, Produce used)

By extending the detail of the economic items ranging from the Gross Margin to the Net Income, and having the capital infrastructure costs with the additional separate items annualised costs identified for the enterprise budget is presented below:

Gross Income (Export Market, Fresh Market, Processing, Dry)
Costs
Variable Costs
Marketing Costs
Pre-Harvest Costs (Planting, Fertilizer, Herbicides/Pesticides/Fungicides, Irrigation; Fuel and Repairs)
Harvest Costs (Packaging Costs, Marketing Costs, Transport; Fuel and Repairs)
Insurance
Repairs and maintenance to fixed improvements
Administration Costs
Fuel and Electricity
Sundry
Fixed Costs
Depreciation on Orchard
Fixed Labour
Insurance
Repairs & Maintenance - Fixed
Administration Costs
Fuel & Electricity
Sundry
Net Farm Income (NFI)
Yield on land
Yield on capital (Irrigation Rights, Equipment)
Management fees (Cost of Living)
Net Income (NI)

It must be noted that the total cost is grouped making use of Standard Industrial Classification structure of StatsSA. For the Input and output model as used by Statistics South Africa (StatsSA), the labour costs and intermediate costs are converted to standard economic sectors.

The Economic Sector Structure as used by Stats SA and total costs determination are as follows:

Total costs (intermediate inputs and labour requirements)
Agriculture
Mining
Manufacturing
Fuel
Fertilizer
Pharmaceuticals
Other
Electricity
Water
Construction
Trade and accommodation
Transport and communication
Financial and business service
Community services
Salaries and wages: Skilled
Salaries and wages: Semi-Skilled
Salaries and wages: Unskilled

The total cost is then accrued as follows:

$$\text{Total cost} = (\text{Variable cost} + \text{Fixed cost}) \times \text{hectares}$$



Aurecon South Africa (Pty) Ltd

1977/003711/07

Aurecon Centre
1 Century City Drive
Waterford Precinct
Century City
Cape Town
7441

PO Box 494
Cape Town
8000
South Africa

T +27 21 526 9400

F +27 21 526 9500

E capetown@aurecongroup.com

W aurecongroup.com

