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Economic Impact of the Ocean Economy in the Eastern Cape Province

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Abstract

This study assesses the impact of the Ocean Economy on the Eastern Cape province in South Africa. The study adopts a science-based, policy-oriented approach to evaluate the positive economic spillovers from the ocean economy. The Social Accounting Matrix (SAM) is used as model to estimate some key multipliers for GDP, employment, compensation of employees (CoE), gross operating surplus (GoS), investment, and exports—that measure the economy-wide effects per R1 million of final demand in ocean economy sectors. These multipliers are mapped to core policy areas, such as: inclusive economic growth (GDP multipliers), labour market policy (employment multipliers), poverty and inequality reduction (CoE, GoS, employment multipliers), export promotion and trade policy (export multipliers), enterprise and private sector development (GoS multipliers), regional and rural development (all six multipliers), investment attraction (investment multipliers), and industrial diversification (export, GVA, GoS, employment multipliers).

Keywords: *Ocean Economy, Social Accounting Matrix, Satellite Account.*

JEL Classification: *E16, L88, Q25*

INTRODUCTION

The objective of this study is to assess the economic impact of the ocean economy on the entire economy of the Eastern Cape province using a SAM-based microsimulation model. Unlike generic or national-level assessments, this model captures the unique structural features of the Eastern Cape economy. It allows a more granular understanding of how different sectors within the ocean economy contribute to income generation, employment, investment, and overall growth. Its uniqueness lies in its ability to trace the direct, indirect, and induced effects of sector-specific activity across the province's economy. By integrating disaggregated regional data and simulating the transmission mechanisms of various policy levers, the study provides tailored insights that can inform precise, high-impact policy interventions. As one of the first of its kind for the Eastern Cape, the study offers a valuable empirical foundation to guide inclusive and sustainable economic planning in the province.

The ocean economy holds significant potential to drive inclusive and sustainable economic growth in the Eastern Cape province. With a long coastline, multiple ports, and untapped marine resources, the province is strategically positioned to leverage the ocean economy to support trade, job creation, and industrial development. Activities such as marine transport and logistics, coastal tourism, aquaculture, shipbuilding, and offshore energy have the capacity to catalyse growth across a range of interlinked sectors. However, to fully understand and maximize this potential, a comprehensive economy-wide analysis is required, one that captures both direct and indirect impacts on production, employment, income distribution, and investment. This study positions the ocean economy as a catalyst for regional development, supported by a data-driven, economy-wide policy framework grounded in SAM-based economic analysis.

According to Hosking (2015), South Africa's Exclusive Economic Zone spans **1,553,000 square kilometres**, which exceeds the country's land area of **1,219,090 square kilometres**. This maritime zone is administered by the **Maritime Zones Act of 1994** and the **United Nations Convention on the Law of the Sea (UNCLOS)**, which was adopted in **1982**.

The ocean environment supports and enables a diverse array of economic activities—not only shipping, transport, recreation, and fishing, but also government functions such as navigation aids and communication services, weather prediction, sea salvage, protection facilities, policing and customs, sea and coastal patrolling, research and education. Additionally, it facilitates industries including mining, aquaculture, pharmacology, science and technology, and energy production.

Previous studies indicate that approximately 75% of South Africa's commerce by value and 95% by volume is carried by

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sea canal (SANGP100, 2013: 18). Over the years, South Africa improved considerably its ports and maritime infrastructure. Just about 90% and 95% of the country's import and export trade by volume—**159 million tonnes in 2000**—and over **75% by value—R369 billion in 2000**—is in excess of 75% in terms of value (Rand billion 369 in 2000), which is transported by sea. A total of 14 098 merchant vessels called into South African ports during 2000 and 75% of South Africa's energy requirements in terms of fuel comes by sea from the Middle East (SANGP100, Chapter 2).

South Africa's ports and maritime infrastructure are well developed. Between **90% and 95%** of the country's import and export trade by volume—**159 million tonnes in 2000**—and over **75% by value—R369 billion in 2000**—is carried by sea. In that same year, a sum of **14,098 merchant vessels** was recalled at South African ports. Furthermore, **75% of South Africa's energy supplies inherent to fuel** are imported by sea from the Middle East (SANGP100, Chapter 2).

LITERATURE REVIEW

A **SAM** is described as an accounting structure used to depict the flow of income and expenditure within the circular flow model of the economy. It serves two key purposes: firstly, it analytically classifies the social and economic data of a country, region, or any economic unit under investigation. Secondly, it points out the interconnections between several economic agents and activities (Thorbecke, 1992). SAM is a valuable tool for informing policymaking, as it offers critical insights into the structure of production and the distribution of income within an economy (Miller and Blair, 2009).

Another objective of a SAM is to establish a robust statistical foundation for improving a comprehensive economy-wide model. These models elucidate the functioning of an economy and are instrumental in forecasting the effects of various policy interventions or decisions—such as, in this study, assessing the impact of the ocean economy on the Eastern Cape province.

Both OECD (2020) and Dasgupta (2021) argues that an economy is composed of various economic agents who are engaged in many different economic activities. A circular flow model is a means to simplify the economic relationship of those agents in the economy. Activities may include buying, selling, manufacturing, and farming for instance (OECD, 2020). Dasgupta (2021) pointed out that economic agents can include economic sectors, households, governments, companies, and the rest of the world. He further notes that the transaction of goods and services occurs within marketplaces—specifically, factor markets and product markets.

Alonso (2004) elucidates that within the circular flow of goods and services—an interaction that a SAM seeks to represent—land, labour, and capital, as the primary factors of production, are maintained by institutional representatives. The income generated from these factors is recorded in the institutional accounts of government, households, and firms. To produce final goods and services, sectors draw upon these primary factors alongside intermediate inputs acquired from the product market. In this respect, the domestic production is complemented by imports, which enhance the availability of final goods and services. These outputs are subsequently distributed via the product market to various agents, such as households, government, and for financing reasons. Exports also play a pivotal role by linking the domestic economy to global markets. As soon as imports are combined with domestically produced final goods and services, they constitute the overall supply within the economy.

Miller and Blair (2009) pointed out that within the circular flow of goods and services, the spending incurred by each economic agent constitutes income for another. This reciprocal movement of expenditure and income is central to comprehend the changing aspects of an economy. A SAM serves as a valuable analytical tool for capturing and representing this interlinked flow, while also enabling the integration of detailed data into these transactions.

The economy is commonly represented by a circular flow diagram, which elucidates the transfer of resources and goods among various industries and institutions. Industrious activities draw on land, labor, and capital from factor markets, as well as intermediate inputs from product markets, to produce goods and services. These outputs are then sold to households, governments, investors, and foreign buyers. The circular flow emphasizes how one institution's expenditure turns out to be another's income, with mechanisms such as taxes and savings helping to maintain the balance between income and expenditure.

A SAM offers a mathematical illustration of the circular flow. As described by Alonso (2004), each box cell in the SAM symbolises an account. Usually, each cell denotes a transfer of funds from the account indicated by the column to the account denoted by the row. In fact, the circular flow diagram portrays private consumption spendings as a transfer from households to product markets. In the SAM, this transaction is recorded in the household column and the commodity row. The principle of double-entry accounting requires that, for every account in the SAM, total income must equal total expenditure. Accordingly, the sum of entries in both the row and column for each account must be alike. In fact, SAM comprises six key accounts: activity or industry accounts, commodity accounts, factor accounts, current accounts, capital or accumulation account, and rest-of-the-world accounts.

Punt (2013) put forward that the activity account, as reflected in its column entries, captures the spending incurred by industries in the production of output. These include costs related to intermediate inputs and factors of production—namely labor, capital, and land—as well as value-added components and intermediate spending. Additionally, the activity account captures net production taxes, which play a crucial role in the calculation of GDP. In fact, the row entries of this account represent income generated from the sale of final output in commodity markets, encompassing goods produced for market sale, regardless of whether they are sold or distributed in category.

According to Robinson, Cattaneo and El-Said (2001), commodity accounts represent the total value of goods and services supplied over a specific period, typically one year. The columns detail the value of these goods and services, encompassing imports and net taxes on commodities. The rows reflect income generated from sales to diverse institutions—covering both intermediate and final demand—and incorporate transaction charges or trade surpluses.

Factor accounts capture the distribution of income generated by production factors across institutions—households receive wages, firms earn profits, and the government collects tax revenues. Some income is also transferred abroad as remittances. The rows record income from industries and the rest of the world contributing to the overall value-added (OECD, 2020). Usually, withdrawing subsidies could lead to changes in factor incomes. For instance, a decline in agricultural production driven by rising water costs could impact both farmworker wages and the profitability of agricultural enterprises.

Institutional accounts include specifically companies, households, and governments. The rows capture income derived from production factors and inter-institutional transfers, while the columns reflect current expenditures on goods and services. These accounts are essential for analysing the operational impacts of policy shifts. Specifically, the research will examine how shifts in the ocean economy influence household earnings, government tax revenues, and the financial viability of enterprises across diverse industries (OECD, 2020).

The capital account records investments in assets and inventories that contribute to overall stock levels. Its columns represent expenditures, at the same time its rows depict income emanating from household savings, government funds, corporate contributions, and the capital account balance. Furthermore, the South Africa reserve Bank make available this information in the national balance of payments.

Regarding the rest of world account, focus on business deal between resident and non-resident agents is taken into consideration. In this respect, final demand is derived from the exports and transfer income collected from various countries worldwide, without neglecting the income generated from imports by transferring payments to foreign institutions. Usually, all incomes should be captured in specific row while all spendings in other specific column. This study will be interested in how changes in prices affect the competitiveness of the ocean sector and how this might impact the balance of trade (OECD, 2020).

It must be noted that the Eastern Cape SAM used in this study groups households according to deciles, where each decile represents 10% of the population, ranked by income. The deciles (hhd0, hhd1, etc.) contain roughly the same number of households, but the number of peoples depends on the size of each household. The typical case relates to decile 0 (hhd0) for example, which portrays only 10% of households with the smallest earning, but with 1.7 million households and 9.5 million people. Consequently, the more the income rises across deciles 1 and 8, the number of people per household drops to some extent, signifying household with lesser sizes in higher income categories.

According to Leontief (1936), the movement of goods and services is imperative within the economic system. The use of SAM in analysing the linkages between various economic agents has been performed over the years for policy purposes. Miller and Blair (2009) applied the forward and backward linkage techniques to estimate the linkage coefficients between the production and cost configurations in the economy.

Globally, several studies have adopted microsimulation techniques to assess the economic impacts of the ocean economy, setting a strong precedent for sub-national applications such as the Eastern Cape. One notable example is “Blue Economy and Coastal Livelihoods: A Microsimulation Analysis in Indonesia” by Susilowati and Arifin (2020), which utilized a microsimulation model to analyze how changes in fisheries policy and marine resource management affected household incomes and employment. Similarly, “Microsimulation Modelling of the Irish Marine Economy” by European Commission (2020) employed a hybrid SAM and satellite account approach to capture the indirect and induced effects of marine industries on regional GDP. In Canada, “Measuring the Economic Contribution of Canada’s Oceans Sectors Using a Satellite Account Framework” by Pascoe (2019) used a microsimulation structure to estimate GDP, employment, and value-added from ocean industries, incorporating both direct and secondary effects. In the Pacific, the study “The Contribution of Ocean-Based Sectors to Fiji’s Economy” by Fenichel et al (2020) applied SAM-based microsimulation to assess sustainable tourism and fisheries, emphasizing environmental trade-offs. Lastly, “Evaluating the Socioeconomic Impacts of Ocean Renewable Energy in Scotland” by Parsons (2021) used a regionalized microsimulation approach to understand job creation and income effects linked to offshore wind investments.

These studies reflect a growing global trend toward applying microsimulation models in ocean economy policy planning, particularly for capturing sectoral linkages and spillovers. Drawing on these international best practices, the Eastern Cape has adopted a similar microsimulation framework grounded in the integration of Ocean Economy Satellite Accounts with its provincial Social Accounting Matrix. By aligning with these proven methodologies, the Eastern Cape ensures consistency with global standards while contextualizing the findings to its unique socio-economic landscape.

METHODOLOGY

Analytical Framework

This study employs a SAM-based economy-wide model to explore the economic contribution of the Eastern Cape's Ocean economy to provincial development. The SAM framework, a comprehensive and widely recognised analytical tool in applied economics, captures the complex interdependencies among economic agents by detailing the circular flow of income between production activities, factors of production (labour and capital), institutions (households, government, corporations), and the rest of the world (Pyatt and Round, 1985).

Unlike simpler input-output models, the SAM framework explicitly maintains accounting consistency and encompasses the full set of income and expenditure relationships, enabling analysis of how exogenous shocks propagate throughout the economic system (Breisinger et al., 2009). This feature is particularly relevant when evaluating policy interventions in emerging sectors like the ocean economy, where multiplier effects across the economy are critical to understand (Thorbecke, 1992).

At its core, the SAM framework represents the economy through *n* interlinked accounts. For every account, total inflows equal total outflows, ensuring balance and consistency. The basic input-output relationships can be represented as follows:

$$X_i = \sum_{j=1}^{n} Z_{ij} + f_i \quad \forall_i \in \{1,\ldots,n\} \tag{1}$$

$$X_j = \sum_{i=1}^{n} Z_{ij} + w_j \quad \forall_j \in \{1,\ldots,n\} \tag{2}$$

Where:

X_i Entire output of sector *i*,

Z_{ij} Intermediate input from sector i to sector *j*,

f_i Final demand for sector *i*'s output,

w_j Primary inputs employed in sector *j*'s production.

These expressions capture the full value of goods produced and consumed across sectors and will serve as the foundation for the multiplier analysis that follows.

SAM-Based Multiplier Model for Economy-Wide Impact Assessment

SAM multiplier models enable a systematic estimation of direct, indirect, and induced effects of economic shocks. This study employs both demand-driven (Leontief-type) and supply-driven (Ghosh-type) SAM multiplier models, allowing for nuanced analysis depending on the source and nature of the shock (Leontief, 1986; Ghosh, 1958).

Final Demand Shocks: Demand-Driven SAM Multiplier Model for the Ocean Economy

The demand-driven SAM model traces how increases in final demand, such as tourism, seafood exports, or government investment in marine infrastructure, ripple through the economy. It is particularly suitable where unused capacity exists, allowing the economy to respond to demand-side stimuli without price adjustments (Miller and Blair, 2009).

The basic model is defined as:

$$X = (I-A)^{-1} F \tag{3}$$

Where:

X Total output vector,

F Final demand vector,

A Matrix of technical coefficients $\left(a_{ij} = \frac{z_{ij}}{x_j}\right)$

$(I-A)^{-1}$ Leontief inverse matrix.

The coefficient matrix *A* is structured as:

$$A = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{pmatrix} \tag{4}$$

Every factor a_{ij} in the matrix symbolizes the direct input prerequisite from sector *i* to produce one unit of output in sector *j*. Concerning the Eastern Cape Ocean economy, this could mean, for example, the amount of marine equipment (sector *i*) required to produce one unit of output in the aquaculture sector (sector *j*). In other words, the matrix *A* quantifies the share of inputs sourced from a given supplier sector employed in the production process of a recipient sector, thus capturing the underlying technical production structure and inter-industry dependencies specific to the provincial ocean economy. (Miller and Blair, 2009).

Production Supply Shocks: Supply-Driven SAM Multiplier Model for the Ocean Economy

The supply-driven model, on the other hand, is appropriate for scenarios where production-side changes, such as improvements in port throughout or new marine biotechnology products which expand supply potential. In this formulation, outputs are assumed to be driven by primary inputs (Ghosh, 1958).

The model is expressed as:

$$X_i' = \sum_{j=1}^{n} X_j' C_{ji} + w_j' \tag{5}$$

Where:

X_i' is the total output of sector ***i*** after accounting for supply-side changes. It reflects how the output of a given sector responds to changes in the availability of inputs and inter-industry demand.

X_j' is the *total output of sector j*, from which inputs are supplied to sector *i*.

C_{ji} is the output coefficient, representing the proportion of sector *j*'s output that is supplied to sector *i* as an intermediate input. This coefficient captures how outputs from various sectors are distributed across the production network.

w_j is the primary input (e.g., value-added) used by sector *i* to generate its total output.

or in matrix notation:

$$X' = X'C + w' \tag{6}$$

The output coefficient matrix C is defined as:

$$C = \begin{pmatrix} c_{11} & \cdots & c_{1n} \\ \vdots & \ddots & \vdots \\ c_{n1} & \cdots & c_{nn} \end{pmatrix} \tag{7}$$

Where:

$$C_{ji} = \frac{z_{ji}}{x_j} \tag{8}$$

Equation 6 provides a powerful analytical lens for understanding how expansions in the productive capacity of upstream ocean economy sectors can stimulate broader economic activity. The output coefficient matrix C, where each element $C_{ji} = \frac{z_{ji}}{x_j}$ captures the proportion of output from sector j that is sold to sector i as an intermediate input (Ghosh, 1958). For example, an increase in output from the marine engineering sector (e.g., shipbuilding and repair) would result in greater availability of intermediate goods and services that feed into maritime logistics, fisheries, or coastal tourism. This framework is particularly relevant when modelling the impact of supply-side interventions, such as infrastructure upgrades or technological innovation, which enhance the productive capacity of key ocean sectors and generate cascading effects through downstream linkages in the provincial economy (Dietzenbacher, 1997).

Data and Structure of a Social Accounting Matrix

The SAM is calibrated for 2023 reference year. Previous studies including the United Nations System of National Accounts (SNA 2008) indicate that a SAM is a matrix-based representation of the national accounts framework that systematically captures the interactions between the supply and use tables and the institutional sector accounts. It provides a widespread and regular depiction of the circular flow of income within an economy (Round, 2003). The foundational structure of the Eastern Cape macro-SAM is organised as a 7×7 matrix, comprising 43 Activities, 43 Commodities, 5 Factors, 14 Household-levels, Government, Savings and Investment, and the Rest of the World as depicted in the Table 1 below.

Table 1. Structure of the Eastern Cape Macro-SAM

		Expenditure – Columns							
		Activities C1	**Commodities C2**	**Factors C3**	**Households C4**	**Government C5**	**Savings and Investment C6**	**Rest of World C7**	**Total**
Income – Rows	**Activities R1**		Domestic supply						Activity income
	Commodities R2	Intermediate demand			Consumption spending (C)	Recurrent spending (G)	Investment demand (I)	Export earnings (E)	Total demand
	Factors R3	Gross Value-Added							Total factor income
	Households R4			Factor payments to households		Social transfers	Foreign remittances		Total household income
	Government R5		Sales taxes & import tariffs		Direct taxes		Foreign grants and loans		Government income
	Savings and Investment R6			Private savings		Fiscal surplus		Current account balance	Total savings
	Rest of World R7	Import payments (M)							Foreign exchange outflow
	Total	Gross output	Total supply	Total factor spending	Total household spending	Government expenditure	Total investment spending	Foreign exchange inflow	

Source: Adapted from Breisinger et al., 2009

This study develops a disaggregated SAM that explicitly identifies ocean economy sectors[1] within the Eastern Cape. The Data was compiled from:

1 *The sectors included in the Eastern Cape Ocean Economy Satellite Account (ECOESA) are fisheries and aquaculture, marine mining, offshore oil and gas, manufacturing of fish, coke, petroleum products and nuclear fuel, marine equipment manufacturing, ship and boat building and repair, and water collection and desalination. They also include maritime transport and port operations, marine tourism, travel agencies and recreation, submarine cables and telecommunications, coastal real estate and development, renewable energy and engineering services for renewables, marine environmental services, and marine insurance. Additionally, the account covers other community, social, and personal services, aquatic research, oceanographic research and marine education, coastal defence and security, marine waste management and recycling, as well as maritime legal services.*

- Statistics South Africa (Stats SA): Provincial supply-use tables, GDP by industry, and labour market statistics.
- Eastern Cape government departments: Sector-specific data on tourism, ports, fisheries, and aquaculture.
- South African Reserve Bank (SARB): national account aggregates.
- Operation Phakisa and Nelson Mandela University Reports: Ocean economy development indicators (DFFE, 2024; NMU, 2019).
- Industry surveys and financial statements with targeted data collection from marine sector firms.

SAM Balancing to Ensure Consistency in the Ocean Economy Framework

The development of a SAM from heterogeneous data sources often results in discrepancies between row and column totals due to reporting inconsistencies, aggregation mismatches, or estimation errors. To ensure the internal consistency of the Eastern Cape SAM, particularly one that disaggregates the ocean economy into detailed subsectors, balancing techniques are essential. This study employs two well-established methods: the RAS method and the Cross-Entropy (CE) method.

RAS method, originally proposed by Stone (1961), is a bi-proportional matrix modification algorithm that iteratively modifies the initial matrix a^{o}_{ij} using row multipliers R_i and column multipliers C_i until the adjusted matrix $a^{*\prime}_{ij}$ matches predefined row and column control totals.

Mathematically, the adjusted matrix is expressed as:

$$a^{*\prime}_{ij} = R_i \cdot a^{o}_{ij} \cdot C_i \qquad (9)$$

Where:

$a^{*\prime}_{ij}$ is the adjusted cell value in the balanced SAM, representing the transaction from account *i* (e.g., supplying sector) to account *j* (e.g., receiving sector).

a^{o}_{ij} is the original unadjusted cell value from the initial SAM.

R_i is the row scaling factor, applied to ensure that the sum of row *i* (total outflows from account *i*) matches the updated row control total.

C_i is the **column** scaling factor, used to ensure that the sum of column *j* (total inflows to account *j*) matches the updated column control total.

This approach is computationally straightforward and preserves the original structure of the data as much as possible. It is especially suitable for preliminary balancing stages where the underlying structure of the data is assumed to be broadly accurate but misaligned due to scaling issues. For the Eastern Cape Ocean economy SAM, the RAS method is applied initially to align the base matrix with known aggregates such as total provincial output, household income, or government expenditure—sourced from official statistics or institutional accounts.

However, the RAS method may face limitations when dealing with zero entries or when prior information suggests structural changes in the economy, for instance, the emergence of new sectors within the ocean economy such as marine biotechnology or offshore renewable energy. To address these limitations, the study adopts the Cross-Entropy (CE) method in a second step to refine the SAM (Golan et al., 1996).

The entropy-based balancing procedure begins with a prior matrix *A*, which represents an unbalanced SAM constructed from available but inconsistent or incomplete data sources. The prior matrix *A* reflects initial beliefs or estimates about the organisation of the economy. The main purpose of the cross-entropy method is to derive a new, balanced coefficient matrix *A**, which satisfies known row and column totals while remaining as close as possible to the prior A. This is accomplished by minimizing a statistical distance measure, the so-called *cross-entropy*, between *A** subject to the required accounting constraints.

The entropy problem is formally specified as follows:

Minimise

$$\left[\sum_i \sum_j A_{i,j} \ln \frac{A_{i,j}}{\bar{A}_{i,j}}\right] = \left[\sum_i \sum_j A_{i,j} \ln A_{i,j} - \sum_i \sum_j A_{i,j} \ln \bar{A}_{i,j}\right] \qquad (10)$$

Subject to

$$\sum_j A_{i,j} y^{\bullet}_j = y^{\bullet}_i$$

and

$$\sum_j A_{j,i} = 1$$

$$0 \le A_{j,i} \le 1$$

The control totals are sourced from aggregate data or known macroeconomic indicators. The entropy minimization procedure ensures that the adjusted matrix adheres to the row and column constraints while minimizing the information loss between the original estimates and the revised values.

Coefficient Stability and Model Validation

To justify the use of fixed-coefficient models, coefficient stability must be confirmed. Following Chen and Rose (1990), the degree of change is assessed using:

$$\Delta a_{ij} = (a_{ij} - a*_{ij}) = \left(\frac{Z_{ij}}{X_j} - \frac{Z*_{ij}}{X*_j}\right) \qquad (11)$$

Where:

a_{ij} Original technical coefficients,

$a*_{ij}$ Adjusted coefficients under hypothetical structural changes.

Z_{ij} **and** Z^*_{ij} are the intermediate inputs from sector *i* to sector *j* in the original and perturbed matrices respectively, and

X_j **and** X^*_j are the total outputs of sector j in each case.

Δa_{ij} captures the magnitude of deviation between the two coefficient sets.

In terms of If the differences remain small across the matrix, it supports the assumption of structural rigidity, thereby justifying the use of linear SAM-based multiplier models for policy simulation and impact assessment. Conversely, large deviations would suggest that further model refinement, such as incorporating flexible functional forms or endogenous technical coefficients, may be warranted.

Inter-Industry Linkage Analysis of the Ocean Ecosystem

Understanding how the ocean economy interacts with the broader provincial economy is critical for designing effective policy interventions and identifying sectors with the greatest potential for spillover effects.

In line with the approaches developed by Sánchez (1998), Duarte et al. (2002), and Alonso (2004), a strong backward linkage indicates that the growth of an ocean economy sector stimulates demand across a wide range of upstream industries, thereby generating indirect economic activity.

The backward linkages assess how much a sector draws inputs from other sectors:

$$BL_j^c = \sum_{i=1}^{n} \frac{x_{ij}}{x_j} = \sum_{i=1}^{n} b_{ij} \qquad (12)$$

Where:

BL_j is the backward linkage of industry *j*,

xij represent the input from sector *i* used in the production of sector *j*,

x_j is the total output of sector *j;* and

b_{ij} represent the input coefficient

This formulation enables the identification of ocean economy sub-sectors with high inter-industry connectivity, providing insight into their potential to stimulate broader economic development in the province.

Forward linkages capture the extent to which sectors within the ocean economy serve as suppliers to other industries by providing essential intermediate inputs. A high forward linkage implies that the output from a particular ocean economy sector is widely utilised by other industries, amplifying its strategic importance in the provincial production network and its potential to drive value chain development.

The forward linkage coefficient for a given sector I is calculated as:

$$FL_i^c = \sum_{j=1}^{n} \frac{x_{ij}}{x_i} = \sum_{j=1}^{n} a_{ij} \qquad (13)$$

Where:

FL_j is the forward linkage of industry *j*,

xij is the output from sector *i* used in sector *j* as intermediate input

x_j represent the total output of sector *i;* and

a_{ij} denotes the technical output coefficient

Identifying sectors with strong forward linkages helps pinpoint key industries for policy support, as their growth can generate significant ripple effects throughout the provincial economy.

Shocks in the SAM-Based Model

Shocks in the SAM (economywide SAM-based model), can be introduced to analyse how the economy responds to various changes. These shocks can affect both endogenous and exogenous variables, allowing for the evaluation of potential impacts on economic performance.

There are five types of shocks that can typically be used in a SAM model:

Demand shocks: Changes in consumer preferences or spending habits can lead to shifts in demand for goods and services. For example, an increase in household income may raise demand for goods and services.

Supply shocks: Events affecting production capacity, such as natural disasters or technological advancements, can impact the supply side of the economy. A supply shock might lead to increased production costs or changes in output levels.

Price shocks: Variations in commodity prices, such as oil or food prices, can influence both production costs and consumer prices, affecting overall economic equilibrium.

Policy shocks: Changes in government policies, such as tax increases, tariff, or the introduction of new subsidies, can alter economic behaviour and resource allocation.

External shocks: Global economic events, such as financial crises or international trade agreements, can impact domestic economies by affecting trade balances and investment flows

SIMULATION RESULTS

Demand Shock and Output Multiplier

An output multiplier measures the entire rise in economic output that results from a unit rise in final demand for a specific sector's goods or services. For example, using the Eastern Cape SAM model, when final demand increases by R1 million in Trade sector, total production output in the Eastern Cape will rise by R3.1 million (See Table 2). Output multiplier captures not only the direct effect on the targeted sector, but also the indirect impact through its linkages with suppliers and other industries. Output multipliers help quantify how interconnected each sector is within the economy, making them a crucial tool for analysing the potential impact of policy or investment decisions. Sectors with high multipliers can be prioritized to maximize economic growth, while lower-multiplier sectors may require complementary policies to improve their linkages and spillover effects.

The Eastern Cape SAM-based Leontief Output Multiplier (See Table 2) reveals three tiers of economic influence.

- ***High multipliers*** are found in sectors like manufacturing (3.942), finance (3.565), Trade (3.114), and agriculture (3.107), indicating that these sectors are strongly interconnected and have wide-reaching impacts on the rest of the provincial economy. These sectors typically support large supply chains, generate significant employment, and induce further consumption. A multiplier of 3.9 suggests that R1 million in new demand in manufacturing could generate up to R3.9 million in total economic activity.
- ***Moderate multipliers,*** such as in construction (2.722), transport (2.862), and government services (2.948), suggest these sectors still stimulate growth but with less intensity. They tend to support broader public service delivery and infrastructure, providing both direct and indirect support to the economy.
- ***Low multipliers,*** notably in mining (1.864) and energy (1.615), imply weaker integration within the Eastern Cape economy. These sectors are often capital-intensive, rely heavily on external inputs, and contribute less to local supply chains and job creation. This means an increase in final demand has a smaller ripple effect, e.g., only R1.6 million for energy sector and R1.8 million for mining sector per R1 million invested. While they may still be strategic sectors, their multiplier effects are weaker. Targeted interventions might be needed to increase their local linkages or spillovers as depicted in Table 2 below.

Table 2. SAM-Based Leontief Output Multipliers by Sector – Eastern Cape (2023)

Sector	Output Multiplier	Interpretation
Agriculture	3.107	Strong rural and peri-urban linkages; output is driven by household consumption and growing demand for agro-processing, especially in citrus, livestock, and forestry value chains.
Mining	1.864	Low domestic linkages. Limited economic footprint in the Eastern Cape; sector is small, capital-intensive, and largely disconnected from local supply chains.
Manufacturing	3.942	Strong backward linkages and labour-intensive; highly interconnected with other sectors, notably in automotive and food processing industries; high employment potential and integration with logistics, agro-industry, and retail sectors.
Energy	1.615	Low domestic linkages. Capital-intensive with moderate economic spillovers. Limited local content in energy infrastructure projects.
Construction	2.722	Moderate linkage. Drives short-term employment and demand for building materials; responsive to public infrastructure investment and low-income housing demand.
Trade	3.114	Highly consumption-driven, especially in urban and township economies; interlinked with transport, wholesale, and retail sectors.
Transport	2.862	Essential for freight and passenger movement across dispersed settlements; key enabler for trade, tourism, and logistics through ports like Ngqura and East London.
Finance	3.565	High multiplier reflects growing access to banking and insurance services; financial services enable investment and SME activity, though urban-centred.
Government	2.948	Major employer and spender in the province; drives demand for education, healthcare, and public administration services, especially in rural districts.

Source: Own calculations derived from the Eastern Cape SAM-based Leontief Model, 2023

Models and Multipliers within the SAM-Based Leontief Framework

Within the SAM-based Leontief framework, there are typically two main types of models used for economic impact analysis, namely the open model and the closed model.

- ***The open model*** treats household income and consumption as exogenous, meaning it only captures direct and indirect effects from increased demand but excludes feedback from household spending.
- In contrast, ***the closed model*** endogenizes households, allowing for the inclusion of induced effects, i.e. the additional economic activity generated when households earn income (Compensation of employees) from production and spend it across sectors.

The open model, which focuses on Leontief multipliers, captures the effects of sector-to-sector linkages, how industries depend on each other through the supply chain. The closed model goes a step further by including the induced effect, which reflects how increased incomes for households and firms (e.g., wages and profits) lead to additional spending in the economy. When these two models are combined, they provide a comprehensive view of total economic impact, known as the economy-wide effect, which accounts for both inter-industry relationships and income-driven consumption responses.

There are different types of impacts. In the context of SAM-based output multipliers, Table 3 shows the following effects:

- The *initial impact* refers to the direct R1 million injections of final demand into a sector.
- The *first round* captures the immediate purchases of inputs from other sectors to meet that demand. Together, the *initial* and *first round* effects form the *direct impact*.
- The *indirect effect* includes subsequent rounds of input purchases as those supplying sectors also increase their output.
- The sum of *direct* and *indirect effects* is the Total Leontief multiplier, reflecting the inter-industry linkages.
- The *induced impact* arises from increased household income and spending due to expanded production and employment.
- The *economy-wide impact* combines all these effects: direct, indirect, and induced, showing the total output generated per R1 million spent.

Emerging from Table 2, the Eastern Cape in 2023, overall, a R1 million final demand increase generates R2.86 million in total output in the open model, while R3.71 million in the closed model indicates a significant role of household consumption in driving economic activity. The policy implication is that focusing only on the open model (inter-industry linkages) underestimates the broader socio-economic benefits. Incorporating induced effects helps assess the full ripple effect on income generation, consumption, and employment. Notably, finance (R5.13 million) and manufacturing (R5.10 million) exhibit the highest economy-wide impacts, reflecting their extensive linkages and strong ability to stimulate activity in both upstream (suppliers) and downstream (consumption) channels. From a policy perspective, sectors with higher economy-wide multipliers should be prioritized for investment and support to maximize growth and employment impacts as depicted in Table 3 below.

Table 3. Output multipliers for the Eastern Cape

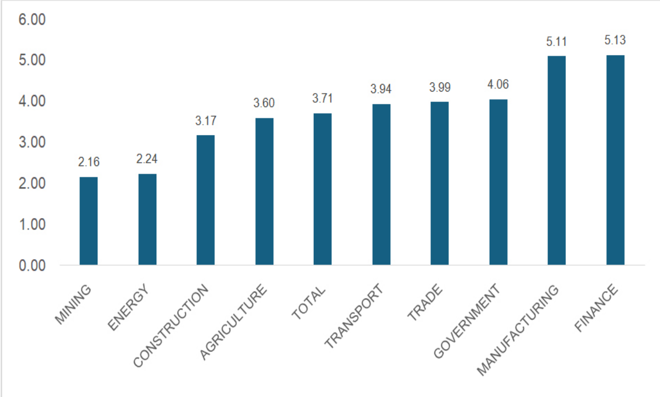
Output at basic prices per R1 million final demand in the Eastern Cape							
	Initial impact	**First round**	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	1,00000	0,70198	1,70198	1,40588	**3,10786**	0,48880	**3,59666**
MINING	1,00000	0,42119	1,42119	0,44353	**1,86472**	0,29328	**2,15799**
MANUFACTURING	1,00000	0,79725	1,79725	2,14555	**3,94280**	1,16264	**5,10544**
ENERGY	1,00000	0,34029	1,34029	0,27530	**1,61559**	0,62592	**2,24151**
CONSTRUCTION	1,00000	0,58046	1,58046	1,14196	**2,72242**	0,45082	**3,17324**
TRADE	1,00000	0,64648	1,64648	1,46796	**3,11444**	0,87751	**3,99196**
TRANSPORT	1,00000	0,76172	1,76172	1,10070	**2,86243**	1,08038	**3,94281**
FINANCE	1,00000	1,02261	2,02261	1,54271	**3,56532**	1,56893	**5,13425**
GOVERNMENT	1,00000	0,91711	1,91711	1,03123	**2,94834**	1,11016	**4,05850**
TOTAL	**1,00000**	**0,68768**	**1,68768**	**1,17276**	**2,86044**	**0,85094**	**3,71137**

Source: Own calculations derived from the Eastern Cape SAM-based Leontief Model, 2023

In contrast, mining (R2.16 million) and energy (R2.24 million) show the lowest multipliers, highlighting their weaker integration into the regional economy and limited spillover effects. The induced effects—representing household consumption feedback—are particularly strong in services and labour-intensive sectors, reinforcing their importance for inclusive and broad-based economic development. Agriculture, with a multiplier of R3.60 million, remains crucial for rural livelihoods and food security, and can be further leveraged through agro-processing linkages. Policymakers should consider sector-specific strategies that strengthen domestic value chains and household incomes to unlock the full potential of induced effects in regional economic planning.

Total Production Output for Sustainable Economic Growth

The Eastern Cape continues to face persistent structural and economic challenges that constrain production output and limit inclusive growth. High levels of unemployment, weak infrastructure, and limited industrial diversification have collectively contributed to sluggish economic performance. Many sectors remain disconnected from broader economic value chains, leading to low levels of economic spillovers and reduced resilience to external shocks.



Output at basic prices per R1 million final demand							
	Initial impact	First round	Direct impact	Indirect effect	Total Leothief	Induced impact	Economy-wide impact
TOTAL	1,00000	0,68768	1,68768	1,17276	2,86044	0,85094	3,71137

Figure 1. Sectoral output multipliers

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

The output multipliers derived from the Eastern Cape SAM model offer critical insights for policy direction. Sectors such as manufacturing (5.11), finance (5.13), trade (3.99), and government services (4.06) exhibit the highest economy-wide output multipliers, signifying strong potential to generate widespread economic benefits through both direct and induced channels. In contrast, sectors such as mining (2.16) and energy (2.24) show much lower multipliers, reflecting limited backward linkages and weaker impact on household incomes. This implies that directing resources toward high-multiplier sectors can yield stronger economic returns and contribute more meaningfully to employment, investment, and poverty reduction

Figure 1 indicates that an increase in final demand of R1 billion in the Eastern Cape economy, based on the total economy-wide output multiplier of 3.71137, would generate an estimated R3.71 billion in total output across all sectors of the provincial economy. This means that for every rand injected into final demand—whether through public spending, investment, or export demand—the overall production of goods and services increases by over threefold. This ripple effect highlights the importance of strategic investments that stimulate final demand, particularly in sectors with high multipliers, to unlock broader economic growth and support employment, income generation, and regional development in the province.

Scenario Simulation Using Output Multipliers in the Eastern Cape Ocean Economy

Using the economy-wide output multipliers derived from the SAM model, we can estimate the potential impact of varying levels of investment across key ocean economy sectors in the Eastern Cape. For instance, the manufacturing sector indicates the highest output multiplier at 0.23762. As shown in Table 4, a R1 billion investment in a catalytic manufacturing initiative—such as the development of a shipbuilding and marine component fabrication facility at the Port of Ngqura—would generate approximately R237.62 million in economy-wide output (R1 billion × 0.23762). Scaling this investment to R3 billion or R5 billion would yield R712.86 million and R1.19 billion in output, respectively.

Similarly, the trade and transport sectors, which also exhibit high multipliers (0.19319 and 0.17511), respectively, demonstrate strong economic returns. This underscores their importance in supporting the movement of goods and services tied to maritime and coastal activities. Further illustration can be presented as follow:

- A R3 billion investment in port logistics infrastructure within the transport sector—an essential component of the ocean economy—would result in an estimated R525.33 million in economy-wide output (R3 billion × 0.17511).
- Likewise, a R5 billion investment in trade-related infrastructure, such as cold chain storage for fisheries and coastal exports, would produce an estimated R965.95 million in output, based on the trade multiplier of 0.19319 as depicted in Table 4.

Table 4. Output multipliers in the Eastern Cape Ocean Economy

Output at basic prices per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,07141	0,05723	0,12865	0,01931	**0,14796**
MINING	0,03787	0,04101	0,07889	0,01505	**0,09394**
MANUFACTURING	0,09705	0,08039	0,17744	0,06019	**0,23762**
ENERGY	0,03601	0,03959	0,07560	0,02700	**0,10260**
CONSTRUCTION	0,04666	0,05891	0,10557	0,01963	**0,12520**
TRADE	0,07769	0,06843	0,14612	0,04708	**0,19319**
TRANSPORT	0,07299	0,05193	0,12492	0,05018	**0,17511**
FINANCE	0,07335	0,04119	0,11454	0,05287	**0,16741**
GOVERNMENT	0,07372	0,04150	0,11522	0,04662	**0,16184**
TOTAL	**0,06520**	**0,05335**	**0,11855**	**0,03755**	**0,15610**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

Sensitivity testing enhances the analysis by simulating the effects of external shocks or policy changes on the ocean economy. For example, an increase in household income—driven by government transfers or wage subsidies—would amplify induced effects, particularly in high-consumption sectors such as trade and manufacturing. Conversely, a decline in global demand for exports like seafood or processed goods could dampen both direct and indirect impacts in sectors such as manufacturing and agriculture. By adjusting key variables such as export prices, household spending patterns, or import leakages, the model enables policymakers to identify which sectors are most resilient or vulnerable to change. This insight is critical for designing adaptive strategies that support sustainable and inclusive development within the ocean economy.

Scenario Simulation with Import Multipliers in the Eastern Cape Ocean Economy

Import multipliers reflect the extent to which a rise in final demand results in higher import activity—either directly through increased demand for foreign goods and services or indirectly through imported inputs required for production. Within the Eastern Cape's ocean economy, the manufacturing sector exhibits the highest economy-wide import multiplier (0.0421), followed by trade (0.0346), transport (0.0260), and construction (0.0254). This implies that a R1 billion investment in manufacturing would generate approximately R42.1 million in import demand.

In contrast, mining and energy sectors have the lowest import multipliers, generating just R8.7 million and R11.9 million in imports per R1 billion investment, respectively. These figures suggest that such sectors are more locally embedded, with lower import leakages and greater retention of economic value within the province. Table 5 illustrates the import multipliers within the Eastern Cape ocean economy.

Table 5. Import multipliers in the Eastern Cape Ocean Economy

Imports per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,0087	0,0085	0,0172	0,0017	**0,0189**
MINING	0,0008	0,0075	0,0084	0,0004	**0,0087**
MANUFACTURING	0,0205	0,0146	0,0351	0,0070	**0,0421**
ENERGY	0,0025	0,0064	0,0089	0,0029	**0,0119**
CONSTRUCTION	0,0102	0,0129	0,0231	0,0023	**0,0254**
TRADE	0,0169	0,0121	0,0291	0,0055	**0,0346**
TRANSPORT	0,0120	0,0095	0,0215	0,0045	**0,0260**
FINANCE	0,0053	0,0055	0,0108	0,0086	**0,0194**
GOVERNMENT	0,0088	0,0063	0,0151	0,0057	**0,0208**
TOTAL	**0,0095**	**0,0093**	**0,0188**	**0,0043**	**0,0231**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

For example, if the Eastern Cape were to invest R3 billion in developing a marine industrial park focused on shipbuilding and the processing of ocean-derived goods within the manufacturing sector, it would generate an estimated R126.3 million in import demand (R3 billion × 0.0421). Similarly, a R2 billion investment in expanding maritime logistics infrastructure within the transport sector would result in approximately R52 million in import leakages. These projections indicate that while high-output sectors can drive robust GDP growth, they also tend to have greater exposure to foreign supply chains—unless proactive local sourcing strategies are implemented.

Understanding import multipliers is essential for designing sustainable ocean economy strategies. High levels of import leakage reduce the local economic benefits of investment and dampen the multiplier effects on domestic industries. Therefore, reducing reliance on imported inputs—by strengthening local supply chains, promoting domestic production of intermediate goods, and investing in workforce development—can significantly enhance the province's economic resilience. For the Eastern Cape, where industrial capacity expansion and job creation are critical priorities, minimising import leakages in high-multiplier sectors like manufacturing and trade will help drive more inclusive and locally anchored growth.

Scenario Simulation with Compensation of Employees (CoE) Multipliers in the Eastern Cape Ocean Economy

Unlike output or import multipliers, compensation of employees (CoE) multipliers provide insight into how investments directly and indirectly benefit labour across sectors. In the Eastern Cape's Ocean economy, the finance sector registers the highest CoE multiplier (0.0732), followed by manufacturing (0.0611) and government services (0.0575). This implies that for every R1 million invested in the finance sector, approximately R73,200 is distributed in wages and salaries throughout the economy.

Notably, sectors such as mining and energy exhibit the lowest CoE multipliers, reflecting their limited capacity to stimulate household income and support broad-based wage growth. These findings highlight the importance of directing investment toward labour-intensive and wage-responsive sectors to enhance the province's income distribution and improve overall household welfare. Table 6 illustrates the compensation of employees within the Eastern Cape ocean economy.

Table 6. Scenario simulation with Compensation of Employees (CoE)

Compensation of employees (CoE) per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,0149	0,0108	0,0257	0,0060	**0,0317**
MINING	0,0033	0,0086	0,0119	0,0027	**0,0146**
MANUFACTURING	0,0236	0,0181	0,0416	0,0195	**0,0611**
ENERGY	0,0057	0,0080	0,0137	0,0042	**0,0179**
CONSTRUCTION	0,0090	0,0130	0,0220	0,0018	**0,0238**
TRADE	0,0168	0,0150	0,0318	0,0073	**0,0391**
TRANSPORT	0,0139	0,0107	0,0246	0,0101	**0,0348**
FINANCE	0,0558	0,0148	0,0706	0,0026	**0,0732**
GOVERNMENT	0,0375	0,0122	0,0497	0,0079	**0,0575**
TOTAL	**0,0200**	**0,0124**	**0,0324**	**0,0069**	**0,0393**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

To illustrate, consider a R2 billion investment in a coastal financial services hub offering marine insurance, port trade finance, and shipping-related fintech solutions. Such an initiative would generate approximately R146.4 million in wage earnings (R2 billion × 0.0732). In comparison, a R3 billion investment in onshore aquaculture processing facilities within the manufacturing sector would result in R183.3 million in compensation to workers (R3 billion × 0.0611). These examples underscore that labour-intensive sectors—particularly services and light manufacturing—are better positioned to channel economic value directly into household incomes.

This wage-driven income growth has significant implications for poverty reduction and inequality in the Eastern Cape, a province marked by persistently high unemployment and widespread rural poverty. Sectors with high CoE multipliers are more likely to create formal employment opportunities, especially for semi-skilled and low-skilled workers, thereby improving income security and enabling upward social mobility. By prioritising investments in sectors that effectively convert economic activity into earnings, the province can foster inclusive development and help close existing inequality gaps.

Targeted skills development initiatives—such as training programs in marine finance or seafood processing—can further enhance these benefits, ensuring that economic stimulus translates into real, lasting improvements in people's lives. Additionally, extending support to informal ocean economy workers, including small-scale fishers and coastal traders, through formalisation programmes and financial inclusion efforts, can broaden the reach of wage gains to vulnerable populations. Linking job creation to social protection measures—such as food vouchers, subsidised transport, and access to affordable services—will ensure that income gains are not offset by rising living costs, making economic recovery both equitable and sustainable.

Scenario Simulation with Gross Operating Surplus (GoS) Multipliers and Promotion of Enterprise Development

To stimulate enterprise development and enhance private sector dynamism in the Eastern Cape, Gross Operating Surplus (GoS) multipliers offer a critical lens for identifying which ocean economy sectors yield the strongest capital returns and the greatest potential for reinvestment. Sectors such as finance (0.10144), manufacturing (0.0504), and transport (0.0447) exhibit the highest GoS economy-wide impacts per R1 million increase in final demand.

For example, scaling up a fintech innovation hub focused on marine finance and insurance in East London or Gqeberha could significantly enhance capital efficiency and attract reinvestment within the finance sector. Similarly, launching a coastal logistics infrastructure project—such as a multi-modal freight corridor connected to the Port of Ngqura—could unlock private investment opportunities while strengthening the region's trade capacity and connectivity.

These high GoS multipliers indicate sectors with strong profit-generating capacity, making them ideal targets for policies aimed at fostering entrepreneurship, small business development, and industrial clustering. By aligning investment incentives, enterprise support mechanisms, and regulatory reforms with these high-return sectors, the province can create an enabling environment for sustainable private sector growth. Table 7 illustrates the Gross Operating Surplus multipliers and promotion of enterprise development within the Eastern Cape ocean economy.

Table 7. Gross Operating Surplus (GoS) multipliers and promotion of enterprise development

Gross operating surplus (GoS) per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,006062	0,011882	0,017944	0,008819	**0,026763**
MINING	0,001740	0,010402	0,012143	0,002849	**0,014991**
MANUFACTURING	0,021875	0,020420	0,042294	0,008132	**0,050427**
ENERGY	0,009626	0,010417	0,020044	0,003190	**0,023234**
CONSTRUCTION	0,005391	0,012016	0,017407	0,001966	**0,019373**
TRADE	0,015174	0,016661	0,031836	0,006619	**0,038455**
TRANSPORT	0,023095	0,014072	0,037167	0,007576	**0,044742**
FINANCE	0,076482	0,020289	0,096771	0,004678	**0,101449**
GOVERNMENT	0,011636	0,011891	0,023527	0,006708	**0,030235**
TOTAL	**0,019009**	**0,014228**	**0,033237**	**0,004576**	**0,037813**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

To harness this capital intensity for inclusive growth, targeted enterprise support policies are essential. These may include expanding township and rural enterprise development funds, supporting Black industrialists in marine-linked manufacturing, incentivizing ocean-related SMEs through tax relief, and enhancing access to venture capital and business incubation programmes. Additionally, streamlining regulatory frameworks and removing barriers to capital market participation would further unlock private sector potential, helping to build a resilient, high-productivity economy anchored in the ocean economy value chain.

For example, an injection of R2 billion into the transport sector— which has a gross operating surplus (GoS) multiplier of 0.0447—would yield an estimated R89.4 million in gross operating surplus across the economy. This return represents increased capital income available to businesses, which can be reinvested in fleet upgrades, digital logistics systems, or port technology enhancements. Over time, such reinvestments improve operational efficiency, strengthen firm competitiveness, and lay the groundwork for new private sector ventures, particularly in adjacent services such as maritime security, vessel repair, and port operations.

Scenario Simulation Using GDP Multipliers to Promote Inclusive Economic Growth

To support inclusive economic growth in the Eastern Cape, GDP multipliers at basic prices provide critical insight into which ocean economy sectors generate the highest value-added returns per unit of investment. The GDP multiplier captures the total rise in gross domestic product resulting from a R1 million rise in final demand, including direct, indirect, and induced effects. In the Eastern Cape's ocean economy, sectors such as finance (0.2830), manufacturing (0.1267), and transport (0.0992) demonstrate the strongest economy-wide GDP impacts. These sectors not only drive output growth but also create jobs, raise household incomes, and stimulate economic activity across supply chains—supporting a broader, more equitable growth trajectory.

For example, a R5 billion investment in a shipbuilding and marine component manufacturing facility at the Port of East London could generate approximately R633.5 million in GDP (R5 billion × 0.1267). This would catalyze demand for local inputs, create skilled and semi-skilled employment, and enhance industrial capabilities among black-owned SMEs through supplier development initiatives. Similarly, a R3 billion investment in coastal and regional transport infrastructure—such as upgrading maritime logistics systems and inland port connectors—would yield an estimated R297.6 million in GDP (R3 billion × 0.0992). These upgrades would ease trade bottlenecks, improve logistics efficiency, and create jobs in construction, logistics, and associated services. Table 8 illustrates the GDP multipliers and inclusive economic growth within the Eastern Cape ocean economy.

Table 8. GDP multipliers and inclusive economic growth

GDP at basic prices per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,0259	0,0282	0,0541	0,0188	**0,0729**
MINING	0,0063	0,0237	0,0300	0,0070	**0,0370**
MANUFACTURING	0,0567	0,0481	0,1048	0,0219	**0,1267**
ENERGY	0,0184	0,0228	0,0412	0,0092	**0,0504**
CONSTRUCTION	0,0180	0,0338	0,0518	0,0021	**0,0539**
TRADE	0,0398	0,0396	0,0794	0,0174	**0,0967**
TRANSPORT	0,0461	0,0310	0,0771	0,0221	**0,0992**
FINANCE	0,1659	0,0559	0,2218	0,0611	**0,2830**
GOVERNMENT	0,0618	0,0302	0,0920	0,0181	**0,1100**
TOTAL	**0,0488**	**0,0348**	**0,0836**	**0,0197**	**0,1033**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

To ensure that growth is both inclusive and transformative, capital investments must be deliberately aligned with objectives such as poverty reduction, job creation, and spatial equity. Policy frameworks should incorporate local employment targets, connect major infrastructure projects to rural and township development, and offer wage subsidies or enterprise support for black industrialists and participants in the informal economy. By leveraging public-private partnerships, promoting community ownership models, and investing in targeted skills development, the Eastern Cape can ensure that ocean economy–driven growth directly contributes to reducing inequality and improving livelihoods across both urban centres and historically underserved rural areas.

Investment Promotion

To strengthen investment planning and capital formation strategies in the Eastern Cape's ocean economy, investment multipliers provide essential insights into which sectors generate the highest levels of capital accumulation per unit of final demand. These multipliers measure gross fixed capital formation—capturing the direct, indirect, and induced investment effects triggered by increased demand. Sectors with the highest economy-wide investment multipliers include finance (0.0211), manufacturing (0.0129), and transport (0.0129). This indicates that for every R1 million of final demand in these sectors, a relatively greater return is generated in physical investment—an essential driver of long-term productivity and sustainable growth as depicted in Table 9.

Table 9. Investment multipliers

Investment per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,003175	0,003346	0,006521	0,001024	**0,007546**
MINING	0,000357	0,001771	0,002127	0,001847	**0,003974**
MANUFACTURING	0,005989	0,005499	0,011488	0,001426	**0,012914**
ENERGY	0,006815	0,004105	0,010920	0,000490	**0,011410**
CONSTRUCTION	0,000475	0,003336	0,003812	0,000295	**0,004107**
TRADE	0,004141	0,004521	0,008661	0,001071	**0,009733**
TRANSPORT	0,008441	0,003729	0,012170	0,000688	**0,012858**
FINANCE	0,017259	0,000744	0,018003	0,003089	**0,021091**
GOVERNMENT	0,006259	0,003553	0,009812	0,001864	**0,011676**
TOTAL	**0,005879**	**0,003401**	**0,009279**	**0,001245**	**0,010524**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

For instance, a R1.5 billion investment in a maritime financing hub—designed to support ocean economy ventures such as aquaculture and offshore renewable energy—could result in approximately R31.6 million in total capital formation (R1.5

billion × 0.0211). Such a development would attract additional financial services, enable the creation of asset-financing instruments for SMEs, and enhance the province's profile as a blue economy investment hub. Similarly, a R2 billion initiative to upgrade ship maintenance and logistics infrastructure at the Port of Ngqura—aligned with the transport sector's investment multiplier of 0.0129—could generate around R25.8 million in capital formation, potentially spurring further infrastructure development and associated commercial activities. Table 9 illustrates the investment multipliers within the Eastern Cape ocean economy.

From a policy perspective, sectors with higher investment multipliers should be prioritized for enterprise support, investment incentives, and blended finance mechanisms. This includes expanding rural and township enterprise zones, supporting black industrialists in capital-intensive sectors such as logistics and manufacturing, and introducing sector-specific tax incentives. These interventions not only boost productivity and infrastructure development but also ensure that investment-driven growth reaches historically underserved communities. In doing so, they contribute to building a more resilient and inclusive economy, firmly anchored in the Eastern Cape's ocean economy potential.

Employment Multipliers and Labour Policy

To address high unemployment and drive inclusive growth in the Eastern Cape—particularly within rural and coastal communities—employment multipliers in the ocean economy offer crucial guidance on where job creation potential is greatest. Updated data highlights trade (0.1879), manufacturing (0.1754), and agriculture (0.1547) as the leading sectors in terms of economy-wide employment per R1 million of final demand. These multipliers capture not only direct employment, but also jobs generated indirectly through supply chains and induced effects from household consumption. Sectors such as finance and construction also demonstrate solid employment-generating potential, while capital-intensive industries like mining and energy show comparatively lower employment outcomes.

For instance, a R2 billion investment in a coastal agro-processing and logistics hub—incorporating food storage, marine product packaging, and local market distribution—could leverage the high trade employment multiplier (0.1879), generating an estimated 376 jobs. Located in rural districts such as Alfred Nzo or OR Tambo, such a project would enhance food security, support smallholder marine farmers and fishers, and foster entrepreneurship in transport, warehousing, and retail—key areas for youth and informal sector employment.

Similarly, a R3 billion investment in a composite materials manufacturing facility for boat parts and marine equipment—strategically located near the Coega SEZ—could tap into the manufacturing employment multiplier (0.1754), creating approximately 526 jobs. Beyond direct employment, the project would support skills development, promote SME participation in component supply chains, and strengthen the province's industrial capacity within the ocean economy.

To maximise inclusive impact, these projects should be accompanied by youth apprenticeship programmes, local content requirements, and preferential procurement frameworks that support rural and township enterprises. Together, these strategies would ensure that job creation is both broad-based and transformative, contributing meaningfully to poverty decline and social equity across the region. Table 10 illustrates the employment multipliers within the Eastern Cape ocean economy.

Table 10. Employment and labour policy

Employment: Total (Number) per R1 million final demand					
Eastern Cape Ocean Economy	**Direct impact**	**Indirect effect**	**Total Leontief**	**Induced impact**	**Economy-wide impact**
AGRICULTURE	0,091414	0,045761	0,137175	0,017534	**0,154710**
MINING	0,007486	0,024652	0,032139	0,017043	**0,049182**
MANUFACTURING	0,068019	0,050288	0,118307	0,057047	**0,175354**
ENERGY	0,006061	0,021723	0,027784	0,028737	**0,056521**
CONSTRUCTION	0,065688	0,047671	0,113359	0,019830	**0,133189**
TRADE	0,092461	0,045697	0,138158	0,049764	**0,187922**
TRANSPORT	0,027625	0,025440	0,053066	0,059207	**0,112273**
FINANCE	0,050894	0,023791	0,074685	0,062846	**0,137530**
GOVERNMENT	0,019311	0,026893	0,046203	0,048773	**0,094976**
TOTAL	**0,047662**	**0,034657**	**0,082320**	**0,040087**	**0,122406**

Source: Simulation results derived from the Eastern Cape SAM-based Leontief Model, 2023

CONCLUSION AND RECOMMENDATION

This study focuses explicitly on the ocean economy, applying the SAM-based framework to quantify its direct, indirect, and induced impacts on the Eastern Cape's economic structure. This includes the simulation of policy shocks using the Economy-Wide SAM Model (EWSAMM).

The Eastern Cape's economic development agenda increasingly recognises the ocean economy as a critical lever for growth, diversification, and spatial transformation. Yet, while maritime-related activities are visibly expanding across the province, empirical evidence quantifying their economic footprint remains limited. Accurate measurement is essential to determine how investments and policy interventions in the ocean economy influence production, employment, income distribution, and export performance across various sectors.

An investment project that led to R1 million increases in final demand (whether through public investment, private consumption, or enterprise expansion) could generate approximately R1.91 million in GDP based on the economy-wide multiplier of 1.90980. However, this figure could be substantially higher, potentially exceeding R2.5 million, if the economy were operating under optimal conditions, including stable electricity supply, functional logistics, pro-growth fiscal policy, and improved investor confidence. Therefore, policy must prioritise structural reforms, infrastructure reliability, and demand-side interventions to unlock the full potential of GDP multipliers in the Eastern Cape. The latest GDP-at-basic-prices multipliers reveal considerable sectoral variation in their ability to amplify final demand. Sectors such as transport (2.23205), finance (2.99753), and government (2.78287) exhibit high economy-wide impacts, indicating strong forward and backward linkages as well as labour intensity and induced consumption effects.

Mining (R2.16 million) and energy (R2.24 million) show the lowest multipliers, highlighting their weaker integration into the regional economy and limited spillover effects. The induced effects—representing household consumption feedback—are particularly strong in services and labour-intensive sectors, reinforcing their importance for inclusive and broad-based economic development. Agriculture, with a multiplier of R3.60 million, remains crucial for rural livelihoods and food security, and can be further leveraged through agro-processing linkages. Policymakers should consider sector-specific strategies that strengthen domestic value chains and household incomes to unlock the full potential of induced effects in regional economic planning.

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