ISRG Journal of Economics, Business & Management (ISRGJEBM)

ISRG PUBLISHERS

Abbreviated Key Title: Isrg J Econ Bus Manag

ISSN: 2584-0916 (Online)

Journal homepage: https://isrgpublishers.com/isrgjebm/

Volume – IV Issue - II (March-April) 2026

Frequency: Bimonthly

Eastern Cape Ocean Economy Satellite Account

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| **Received:** 01.04.2026 | **Accepted:** 04.04.2026 | **Published:** 23.04.2026

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Abstract

This study developed the satellite account for the Eastern Cape province ocean economy. As of now, South Africa has not fully implemented a dedicated satellite account for its ocean economy. Nonetheless, the country has recognized the significant potential of its marine resources and has initiated several strategic frameworks to harness this potential. In line with the frameworks established by both the System of National Accounts (SNA) and the European System of Accounts (ESA), specifically the 1993 and 2008 SNA, as well as the 1995 and 2008 ESA, the annual estimates for Gross Value Added (GVA), final demand, total production output, and intermediate consumption expenditure for the Ocean Economy Satellite Account should be extracted from the Supply and Use Tables. In this respect, the Eastern Cape Ocean Economy Satellite Account was estimated using the Eastern Cape Supply and Use Tables for the reference year 2023. In 2023, the Eastern Cape Ocean economy was estimated at R27 942 million, representing 5.2% of the overall Eastern Cape economy.

Keywords: *Ocean economy, satellite account, supply and use table.*

JEL Classification: D57, L88, Q25

1. Introduction

A satellite account consists of a statistical procedure that provides a detailed analysis of a specific sector's contribution to the economy, complementing the central national accounts. In the context of the ocean economy, a satellite account would offer comprehensive insights into the economic activities related to marine and coastal resources, including metrics such as gross value added, employment, and investment within the sector (2008SNA).

Currently, South Africa has not fully implemented a dedicated satellite account for its ocean economy. However, the country has recognized the significant potential of its marine resources and has initiated several strategic frameworks to harness this potential (CLIA, 2019).

The South African government established “Operation Phakisa: Oceans Economy”, aiming to find answer to the economic potential of the country's oceans in 2014. The initiative identified six priority growth areas including aquaculture, costal and marine tourism, marine transport and manufacturing, offshore oil and gas

DOI: 10.5281/zenodo.19703617

exploration, marine protection services and ocean governance, and small harbours development.

Operation Phakisa aims to generate at least R177 billion to the GDP by 2033 and stimulate approximately 800,000 direct jobs. Its framework considered the five years from 2020 to 2024 in real, or constant 2010 values for GDP and targeted employment, as per the eight sub-sectors in the following table (DFFE, 2024). Table 1 presents Operation Phakisa targets for the period 2020 and 2024.

Table 1: Operation Phakisa (OP) targets as of 2020 and 2024

Sector	**GDP Growth (R'mil)**		**Job creation**	
Operation Phakisa GDP & Job Ocean Sectors Considered	2020	2024	2020	2024
Marine Transport & Manufacturing	23604	32188	22000	30000
Tourism	13750	18750	85938	117188
Offshore Oil & Gas	6417	8750	458	625
Construction	9396	12813	182646	249063
Renewable Energy	7104	9688	458	625
Fisheries & Aquaculture	5958	8125	96250	131250
Communication	3896	5313	19250	26250
Desalination	46	63	733	1000
Total (2010 Prices, Real, Constant Values)	70171	95688	407733	556000

Source: Department of Forestry, Fisheries and Environment (DFFE) Operation Phakisa (OP) framework for the Ocean Economy (OE)

The current custodians of Operation Pakisa, the Department of Forestry, Fisheries and Environment (DFFE) compiled a summary of the OP investment values and direct employment creation for the year 2020, with the information inherent to the investment and employment ratios as depicted in the following table 2:

Table 2: Operation Phakisa Investment Performance for 2020

Operation Phakisa Investments - 2020 Investment Value & Jobs Recorded		**Investment**	**Job**	**Investment Ration & metrics**		
		Total	Total	Investment %	Job %	Job / R1m
1	Marine Transport and Manufacturing	9229	1589	22.50%	33.70%	5.81
2	Oil and Gas- Offshore	29850	234	72.80%	5%	0.01
3	Aquaculture	1200	2030	2.90%	43%	1.69
4	Marine Protection & Ocean Governance	59	58	0.10%	1.2%	0.99
5	Small Harbours Development	500	611	1.20%	12.90%	1.22
6	Coastal and Marine Tourism	164	200	0.40%	4.20%	1.22
	Total	41002	4722	100%	100%	0.12

Source: Zimmerman D. and NMU, 2021. Interpretation of DEFF Operation Phakisa Investment Profile for 2020.

Table 2 depicts that marine transport and manufacturing generated the highest level of employment per R 1 million of investment in 2020, with aquaculture generated the most employment, Offshore Oil and Gas has the highest capital expenditure with low employment per R 1 million (DFFE, 2024).

Building upon this national initiative, the Eastern Cape province developed its own Oceans Economy Master Plan, which was officially adopted by the Eastern Cape Cabinet on December 11, 2019, and publicly launched on March 6, 2020. The Master Plan is projected to inject approximately R10.4 billion into the Eastern Cape economy and generate at least 33,785 jobs following the five years of the project's establishment (NMU, 2019).

While these initiatives underscore the commitment to developing the ocean economy, the absence of a formal satellite account means that detailed, systematic data on the ocean economy's specific contributions to the Eastern Cape's GDP, employment, and other economic indicators are not readily available. Implementing a satellite account for the ocean economy would provide policymakers, researchers, and stakeholders with valuable insights, enabling more informed decision-making and effective monitoring of the sector's performance (Duarte, Sánchez Chóliz, & Bielsa, 2002).

Against this backdrop, although South Africa and specifically the Eastern Cape have established strategic plans to develop the ocean economy, the creation of a dedicated satellite account remains a future goal. Such an account would be instrumental in quantifying the sector's economic impact and guiding sustainable development initiatives (Pascoe, 2019). Section 2 presents the literature review on the satellite account, Section 3 describes the methodology, Section 4 constructs the satellite account for the ocean economy in the Eastern Cape, while the last Section concludes this research.

DOI: 10.5281/zenodo.19703617

2. Literature review

Globally, the oceans occupy 72% of the entire blue planet and comprise at least 95% of the biosphere, portraying a vital function in environmental economic expansion. Most of African's countries have begun considering proactive steps to protect the Blue Economy. Meanwhile, the incessant technological development combined with the escalating prices of products are stimulating the exploitation and exploration. Consequently, the High Seas represent the ultimate global commons, demanding imperative consideration to ensure the comprehensive organisation of ocean reserves for the achievement of sustainable improvement. Every time the ocean economy, sustainability, and environmental stewardship intersect, this integrated structure represents Blue Economy (Verma & Vasudha, 2019).

Approximately 75% of South Africa's trade by value—and 95% by volume—is transported by sea (SANGP100, 2013:18). The country's ports and maritime infrastructure are highly developed, facilitating efficient international commerce. Between 90% and 95% of South Africa's import and export trade, measured in terms of volume, relies on maritime transport.

Previous studies indicate that approximately 75% of South Africa's trade by value (95% by volume) is shipped by sea (SANGP100, 2013). The country's ports and maritime infrastructure are well industrialised, facilitating efficient international commerce. In fact, between 90% and 95% of South Africa's import and export trade, measured in terms of volume (159 million tons in 2000), or in excess of 75% in terms of value (Rand billion 369 in 2000), 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).

The acceptable definition used for the construction of the satellite account framework relates to the measurement of the product, income and balance sheet status of the ocean economy. This is required for future studies, including a strong emphasis on biodiversity preservation and enhancement. Hosking (2017) used the GDP decomposition methodology for establishing an 'Ocean Economy framework.

Although it is recognised that the GDP decomposition approach does have limitations, it is seen as being acceptable for Hosking to develop a satellite account as presented in Table 3. Consequently, statistical data could not be disaggregated to a sufficiently low level to isolate specific Ocean Economy industries. Despite the fact that the formal definition of the Operation Phakisa sectors was aligned to the Standard Industrial Classification (SIC) system, it was necessary to approximate particular SIC industries into the respective Operation Phakisa sectors. In the case of multiple industries, the average of the identified multipliers was used to determine the Operation Phakisa sector's multiplier (Dasgupta, 2021).

A broad range of ocean economy satellite accounts are available in the literature, with the one common element being that they are not similar or standardised. The OECD analyses various countries efforts at producing ocean or maritime satellite accounts. It concludes that advances in economic measurement and monitoring could signify breakthrough in providing data and information for decision making. This could be achieved by standardising approaches to measuring and valuing ocean-based industries, measuring and valuing marine natural resources and ecosystem services, and better identifying and measuring the benefits of public investment in sustained ocean observation systems (OECD, 2015).

Many countries are beginning to commit resources to collecting more robust ocean economy data within their own national account framework (Van Zyl, 2014). This is laying the foundation for an international set of satellite accounts which can lead to international comparability of these accounts (Economist Intelligence Unit, 2015).

There are, however, a number of issues preventing consistent measurement of the ocean economy. Two such issues are:

1. Data from official sources tends not to be sufficiently disaggregated by the area of the economy upon which it is focused, and

2. It is often difficult to define precisely which activities qualify as land-based, and which qualify as ocean-based (Thornton, 2014). An example here would be port and ocean-based towns construction activities allocated to the Ocean Economy. Hosking (2015 and 2017) alludes to both of these issues for the South African Ocean Economy.

In a 2020 study commissioned by the High-Level Panel for a Sustainable Ocean Economy, 16 teams of global experts across 50 countries were assembled to conduct an analysis of the pressing challenges at the nexus of the ocean and the economy. The study was to inform the role that national accounts play in a country's ability to provide critical information on the ocean economy. The report had a number of outcomes and emphasises the need to develop sound data structures that avoid potential unintended consequences of policy decisions, which can lead to severe negative environmental and economic impacts (Fenichel, 2020).

The report indicated that the term 'satellite account' is used for separate accounts of interest that are not part of the central structure of the System of National Accounts. Satellite accounts are seen as rearrangements of items already included in a national account structure (GOAP, 2019).

The shortcoming in not being able to measure environmental assets has been partially addressed by designing a separate satellite account which allows items to be treated differently and has been described as follows:

One important system of satellite accounting is the System of Environmental Economic Accounting (SEEA), which is coordinated by the UN Statistical Division. The SEEA Central Framework (SEEA-CF) is an internationally agreed standard for accounting for environmental assets and their supply to and use in the economy. It provides guidance for services from non-produced assets, such as fisheries, in greater detail than the System of National Accounts (European Commission, 2020).

The SEEA-CF provides the specific guidance on fisheries, forests and agriculture, which reflects the SNA guidance with additional details for natural resources. The SEEA also has a system of Experimental Ecosystem Accounting (SEEA-EEA) that is currently being revised, with the goal of establishing an international standard by 2021. The experimental ecosystem accounts focus on the biophysical condition of ecosystems and interactions among non-produced assets. The SEEA-EEA will likely also provide guidance on ecosystem services that can be counted as income beyond the current income boundary, though

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this guidance is still in development. The revisions working groups have produced working papers, which are available on the SEEA webpage, https://seea.un.org/.

A system for using National Accounts in a way which records the processes of generating, consuming, saving and building wealth within the ocean economy system is proposed. This is based upon recording 'Ocean Product' as the economic activity, and an ocean 'Balance Sheet' as a sustainability indicator, with 'Ocean Income' as the societal benefits to the nationals or citizens of a country (Fenichel, 2020).

Satellite Accounts are seen as being a framework for the presentation of a particular set of activities which are not readily provided for in the country's system of National Accounts, typically represented by the accepted Standard Industrial Classification (SIC) for economic sectors and sub-sectors. Satellite accounts would cover activities that are linked to the general economy but are not part of the core national accounts and would typically be for sectors such as tourism, education, health, social protection, the environment, arts and culture (SNA, 2008).

Satellite accounts for the ocean economy would provide an organised method for collecting consistent ocean economy data (NOAA, 2022). This would require building upon existing national and industry level data collection efforts. The development of satellite accounts could offer a framework for monitoring aspects of a country's ocean economy not shown in detail in the core national accounts, while allowing for greater flexibility of ocean-based industries not covered by industrial classifications, and enabling, in time, international comparability between regions and nations.

The ocean economy plays a critical role in Australia's economic and environmental landscape. Given the vast coastline and rich marine resources, sectors such as fisheries, aquaculture, offshore energy, maritime transport, and coastal tourism contribute significantly to national economic output. The Satellite Account for the Ocean Economy (SAOE) provides a structured framework to assess the economic value of these sectors (ABS, 2021).

According to the Australian Institute of Marine Science (AIMS), the ocean economy generated approximately AUD 81 billion in economic activity in 2020 (AIMS, 2026).

In Canada, satellite accounts are supplementary economic accounts that provide a detailed picture of specific sectors, such as the ocean economy. They offer insights into economic activities not fully captured in traditional national accounts. The ocean economy encompasses various sectors, including fisheries, tourism, marine transportation, and offshore energy, contributing significantly to national GDP (OECD, 2022).

In Spain, the ocean economy, also known as the blue economy, encompasses economic activities that rely on the marine and coastal environment. Traditional national accounts often fail to capture the full economic contributions of this sector, necessitating the development of satellite accounts—a complementary statistical framework that provides a detailed assessment of ocean-related activities (World Bank (2021), UN (2021) and UNCTAD (2020)).

The OECD (2016) and European Commission (2020) have provided frameworks for ocean economy measurement, advocating for the adoption of Sea Satellite Accounts (SSA) at the national and regional levels. These frameworks serve as a basis for Spain's initiatives in this domain.

The literature on satellite accounts for the ocean economy in the USA highlights both the promise and the challenges of capturing the full economic impact of maritime industries. While significant methodological and data integration challenges remain, ongoing efforts by researchers and government agencies are paving the way for more comprehensive and actionable economic insights. These satellite accounts not only enhance our understanding of the ocean economy but also provide critical guidance for sustainable policy-making and strategic economic planning (Jolliffe et. al., 2021)

3. Methodology

Although Statistics South Africa (Stats SA) is the official producer of the Supply Use Table (SUT), we constructed a new SUT with the specific ocean economy satellite account for the reference year 2023 due to unavailability of appropriate SUT. This SUT constitutes the main contribution of this study as it offers an exhaustive look at the interactions between sectors including ocean economy and their contribution to GDP. Data sources from Stats SA, South Africa Revenue Service (SARS), South Africa Reserve Bank (SARB) and other institutions were considered to pinpoint ocean-associated expenses and production to assess the contribution of the ocean economy, following the techniques described in the 1993 and 2008 System of National Accounts (SNA, 2008).

The new constructed SUT will be used as an analytical tool to assess the economic data contained in the national accounts, and for detecting weaknesses in the economic data. Moreover, they are conveniently integrated into macroeconomic models in order to analyse the link between final demand and industrial output levels (Parsons, 2021).

The SUT also has many other uses such as symmetric input-output tables specialising in analysing the interactions between sectors based on their production and importation; satellite accounts focusing on associating accounts described by the SNA with particular required codes and social accounting matrices aiming at linking the SUT with organisational sector accounts.

The appropriate methodology for assessing the ocean economy should be the one described by Hosking *et al (2013)* which considered the 'sum of value added (sectoral)' based GDP apportionment methodology based on Standard Industry Classification (SIC) codes for South African data in 2010. Essentially this is a 'GDP Decomposition' approach which establishes a sub-set economy to that of the national account's framework. The various sectors and sub-sectors are analysed with a view to determining to what extent they have an impact on the ocean economy or have linkages thereto. Extensive modelling was carried out and the estimated value added by industrial sector and sub-sectors for the Primary and Secondary Sectors in 2023 was established for the ocean economy in the Eastern Cape province (Hosking *et al., 2013).*

This study takes into consideration the Ocean Economy framework formulated by the 2014 Operation Phakisa programme, a range of national and international studies and views, as well as data supplied by Statistics South Africa (Stats SA), South Africa Revenue Service (SARS), South Africa Reserve Bank (SARB), Global Insight, Quantec, Department of Environmental Affairs and other sources.

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3.1. Construction of the Satellite Account for the Eastern Cape Province

SU-tables for the year 2022 is used to create the satellite account for the ocean economy in the Eastern Cape province. The role of SU-tables is primarily to organise the goods and services, production and generation of income accounts. In the structure of the SU-tables, the goods and services account show how the total amount of product available (resources) is equal to the total amount used. Resources are shown on the left-hand side and uses are shown on the right-hand side (BEA, 2022).

The production account emphasises the concept of GDP or value added as one of the main balancing items in the 2008 SNA. The 2008 SNA recommends the calculation of GDP for the entire economy and the calculation of value added for the various industries. The GDP is essentially a production measure as it is obtained through the sum of the gross values added of all resident institutional units, in their capacities as producers, plus the values of any taxes, *less* subsidies, on production or imports not already included in the values of the outputs and values added by resident producers.

Value added measures the value created by production and may be calculated either before (gross) or after (net) deducting the consumption of fixed capital on the fixed assets used. Gross value added is defined as the value of output less the value of intermediate consumption. Gross/net value added is the balancing item in the production account for an institutional unit, sector, establishment or industry, while gross/net domestic product is the balancing item in the production accounts for the total economy.

It is important to note that value added does not cover all transactions linked to the production process, but only to the result of production, i.e. output and the utilisation of goods and services when producing this output, is called intermediate consumption. In other words, it includes output as a resource (see right-hand side of the production account) and intermediate consumption as a use (see lefthand side of production account). As the consumption of fixed capital is not shown separately, the resulting balancing item is *gross* domestic product (World Bank, 2020).

The generation of income account records distributive transactions resulting from the production process. Distributive transactions consist of transactions by which the value added generated by production is distributed to labour, capital and government, and transactions involving the redistribution of income and wealth (taxes on income and other transfers).

Thus, the resources include gross domestic product, and the uses refer to compensation of employees as well as taxes less subsidies on production and imports. The balancing item is gross operating surplus/mixed income. The mixed income refers to the balancing item in the generation of income account for the household sector. The reason is that the surplus generated by unincorporated household enterprises includes both remuneration for the labour of the owner as well as a return to the entrepreneurship and capital employed.

3.1.1. Output of goods and services

Output consists only of those goods and services that are produced within an establishment and that become available for use outside that establishment and for own final use in that establishment. Output may be valued in various ways.

The 2008 SNA prescribes three ways in which output of goods and services may be measured, namely at basic prices, producers' prices or purchasers' prices. Firstly, the basic price consists of any sum of revenue collected from the output produced and sold by subtracting any due tax payable except for any subsidy received. Basic prices disregard the transport charges invoiced separately by the producer. Secondly, the producers' price consists of any sum of revenue collected from the output produced and sold by subtracting every VAT paid. This producer's price disregards all transport expenses the producer paid. Thirdly, the purchasers' price consists of the charges covered by the purchaser except the amount of VAT charged for goods and services. It takes into consideration the transport expenses covered by the purchaser.

The mathematical expression of the output is presented as follows:

1. Output at basic prices = Tax payable + subsidy – transport expenses
2. Output at producers' prices = taxes on products – VAT – subsidies on products
3. Output at purchasers' prices = Trade and transport margins + non-deductible VAT

Usually, the application of basic prices is recommended due to the use of VAT when applied during the process of production of goods and services.

3.1.2. Assessment of gross value added and intermediate consumption

The recommendation of 2008 SNA is observed when assessing the gross value added for each industry at basic prices by omitting taxes while considering subsidies applied on goods. In fact, the basic price measures the amount retained by the producer it is, therefore, the price most relevant for the producer's decision taking. Gross value added at basic prices is also the measure preferred and adopted by Stats SA.

In this case, the intermediate consumption consists of all produces at purchasers' price used as inputs during various stages of production.

3.1.3. Categorisation of taxes

Various taxes are taken into consideration during the process of production, service delivery and importation. Taxes are imposed per unit on good and service rendered by the producer. For instance, labour employed include personal income tax, while sales taxes, excise and import duties are imposed on products produced. Additional taxes on production comprise taxes on the proprietorship of land, buildings and assets exploited during the production.

In the system of national accounts 1968 SNA, the entire amount of money used for intermediation services was captured as a negative item while in the 2008 SNA, the total output is classified by industries.

3.1.4. Trade and transport margins

The output of wholesalers and retailers is measured by the value of the trade margins realised on the goods they sell i.e. the difference between the sale value of products sold and the cost of purchasing these products. The reason for measuring the output of the wholesale and retail trade by the trade margins is because the productive activity associated with distribution is construed to be the provision of services for marketing purposes. In addition, the

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estimation of trade margins should include the goods and services from informal sector.

Transport margins derived from the output of transport of goods are accounted as specific item.

3.1.5. Secondary and ancillary production

In the process of classifying the type of products produced by establishment, a secondary activity consists of the activity performed in addition to the main activity and its output. The products generated from the secondary activity are captured as *off diagonal entries* in the supply table. Nonetheless, the value added of a secondary activity should reflect a value less than that of the main activity.

Regarding the ancillary production, both the main and secondary products are produced for internal use and not for external use of the establishment. Supply Use table has made provision to capture this information. Secondary and ancillary production are merely supporting activities undertaken within the establishment for purposes of creating the necessary conditions within which the principal and secondary activities can take place.

The kinds of activities that are typical examples of ancillary products include documenting every transaction; acquiring materials; maintaining the infrastructures; protection service; and operational services.

3.1.6. Estimation of Gross capital formation

Usually, investment is captured in the 2008 SNA as gross capital formation which is determined by the total value of the gross fixed capital formation, changes in inventories and acquisitions less disposals of valuables.

The classical type of gross capital formation comprises the expenditure that the government budgets when purchasing materials or fixed assets for military hospitals and other military buildings.

3.1.7. Estimation of Import

The provision made in the 2008 SNA indicates that the import data is determined by considering the difference between cost of insurance and freight (c.i.f.) and free on board (f.o.b.). In fact, the value of imported commodities at c.i.f. prices is assessed with the total imports at f.o.b. prices. Moreover, the difference between the f.o.b. price and the c.i.f. price implies the costs of transportation and insurance between the border of the exporting country and the border of the importing country. Identified sectors involved in the ocean economy are included in Table 3.

Table 3: Sectors involved in the Ocean Economy

	SIC-Code	Sector	Ocean economy involvement
1	SIC13	Fisheries and Aquaculture	major
2	SIC25	Marine mining	major
3	SIC21	Offshore, Oil and Gas	major
4	SIC3012	Manufacturing of fish	small
5	SIC331-333	Coke, petrolium products and nuclear fuel	medium
6	Sic 38	Marine Equipment Manufacturing	medium
7	Sic 3840	Ship & Boat building and Repair	medium
8	SIC36	Water, water collection, treatment and supply (desalination)	small
9	SIC50	Maritime Transport and Port Operations (Sea and coastal)	major
10	SIC6420	Marine tourism, travel agencies, and recreation	major
11	SIC75	Submarine cables & Telecommunications	small
12	SIC70	Coastal real estate and development	medium
13	SIC8210	Renewable Energy, Engineering Services for Renewable	major
14	S7420	Marine environmental services	minor
15	SIC63	Marine insurance	minor
16	Sic 94-96, 99	Other community, social and personal services	minor
17	SIC7310	Aquatic Research, Oceanographic Research, and Ma	small
18	SIC95	Coastal defense and security	medium
19	SIC92	Marine waste management and recycling	small
20	SIC7410	Marine legal services	minor

Source: 2008 SNA & Author's calculation

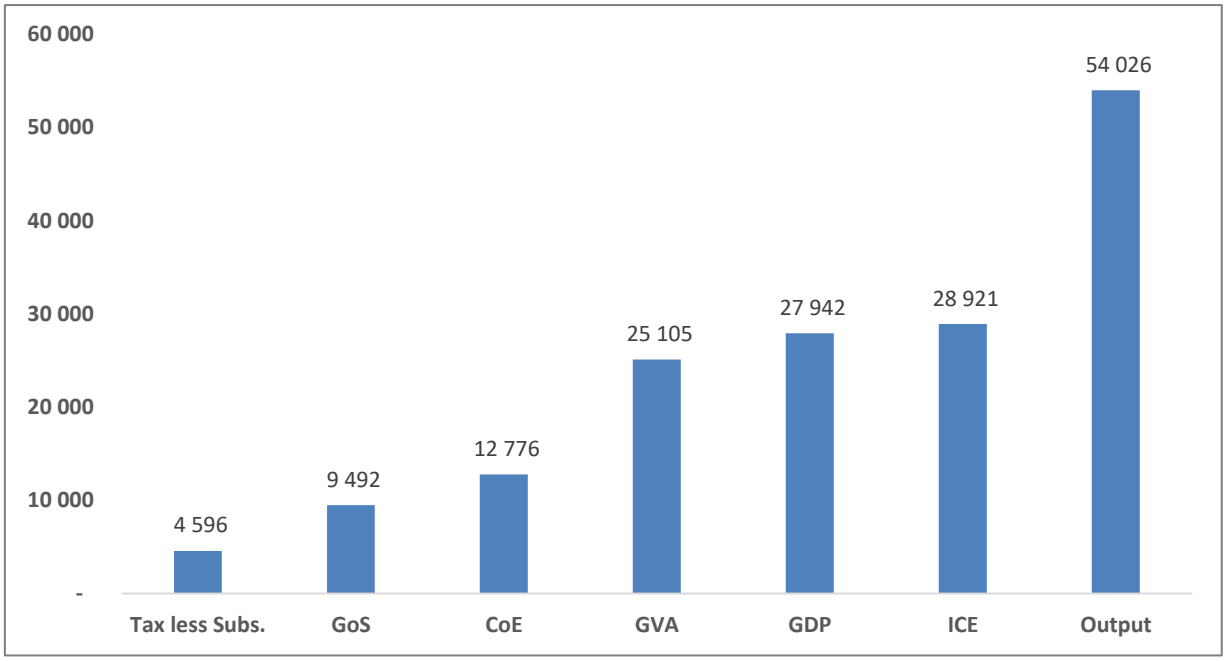
4. Findings

In line with the frameworks established by both the System of National Accounts (SNA) and the European System of Accounts (ESA), specifically the 1993 and 2008 SNA, as well as the 1995 and 2008 ESA, the annual estimates for gross value added (GVA) and its components, final demand and its components, total production output, and intermediate consumption expenditure for the Ocean Economy Satellite Account should be derived from the

DOI: 10.5281/zenodo.19703617

Supply and Use Tables (Stats SA, 2020). In this study, the Eastern Cape Ocean Economy Satellite Account was estimated using the Eastern Cape Supply and Use Tables for the reference year 2023. Figure 1 presents Eastern Cape satellite account and macroeconomic indicators of the ocean economy during 2023.

Figure 1: Eastern Cape satellite account and macroeconomic indicators of the ocean economy (R million – 2023)



Source: Own calculations derived from the Eastern Cape Supply and Use Table, 2023

In 2023, the Eastern Cape Ocean economy was estimated at R27 942 million, representing 5.2% of the overall Eastern Cape economy.

The approach used in this report not only aligns with international best practices but also highlights the significant role that the ocean economy plays in contributing to the region's economic landscape.

The SNA and ESA outline three methodologies for calculating annual Gross Domestic Product (GDP) estimates: the production approach, the expenditure approach, and the income approach. Each of these methodologies corresponds to specific accounts within the accounting system. For example, the income approach aligns with the generation of income account, and the expenditure approach with the goods and services account. This integration through the Eastern Cape Supply and Use Tables facilitates rigorous verification of the consistency and accuracy of Economic Accounting System of the Eastern Cape Ocean Economy Satellite data by interlinking various accounts within a cohesive framework.

4.1. Satellite accounts and GDP estimates of the Eastern Cape Ocean economy

For the Eastern Cape satellite Account, the three approaches to deriving the provincial Ocean Economy's GDP estimates from the EC Supply and Use Tables, along with the associated three economic accounts, are discussed below.

4.1.1. The production approach and the Eastern Cape Ocean economy satellite production account

The Eastern Cape Ocean economy satellite production account defines output as resources, and the utilization of goods and services when producing this output (intermediate consumption), as use. The ocean economy GDP is the main balancing item in the production account. It is derived as the sum of the gross value added (at basic prices) by all producers in the blue economy plus net taxes on products.

The formula used to derive the production account for the Eastern Cape Ocean Economy is presented in the following equation

$$\text{GDP} = \sum_{ic=1}^{n}(P_{ic} - Y_{ic}) + \sum_{ic=1}^{n} TS_{ic}$$

Output at basic prices	(Pci)	54 026
Intermediate consumption expenditure	(Yci)	− 28 921
Taxes less subsidies on products	$(TSci)$	+ 2 837
Eastern Cape Ocean Economy's GDP at market prices		**27 942**

What does this account mean? In 2023, the Eastern Cape Ocean Economy's total domestic production of goods and services amounted to R54 026 million. The input cost (intermediate consumption expenditure) used to produce output was R28 921million. Total resources less the cost of production yield to the provincial GDP in the blue economy as presented in Table 4.

Table 4: Eastern Cape Ocean Economy's Production Account, 2023

Uses (R million)	**Resources (R million)**
Intermediate Consumption 28 921 Expenditure	Output 54 026
South Africa's GDPR 27 942	Taxes less subsidies on products 2 837
Total 56 863	**Total 56 863**

Source: Own calculations derived from the Eastern Cape Supply and Use Table, 2023

Impact and implications

DOI: 10.5281/zenodo.19703617

Emerging insights from the production account are summarised below:

- The significant output indicates strong industrial activity within the marine sector, including fishing, tourism, transport, and shipbuilding.
- High intermediate consumption suggests a reliance on imported inputs, which may require policy intervention to strengthen local supply chains.
- The economic contributions reinforce the sector's role in job creation and regional development.
- To enhance value addition, policies should focus on increasing local processing of marine resources.
- Investment in technological innovation and infrastructure can improve efficiency and reduce intermediate costs.
- The sector's sustainability and long-term growth require a balance between economic activity and environmental conservation.

4.1.2. Generation of income and the Eastern Cape Ocean economy satellite account

Income account for the Eastern Cape Ocean records distributive operations by which the value added produced by the production process in the blue economy is distributed to primary inputs, including labour, gross operating surplus and mixed income, taxes on income, and other transfers. The Ocean economy GDP is the main corresponding item in the production of income account.

The formula used to derive the generation of income account for the Eastern Cape Ocean Economy is presented in the following equation:

$$\text{GDP} = \sum_{ic=1}^{n}(CE_{ic} + OS_{ic}) + \sum_{ic=1}^{n}(TS_{ic} + ts_{ic})$$

$$= \sum_{ic=1}^{n}(CE_{ic} + OS_{ic}) + \sum_{ic=1}^{n}(\text{ϖ}TS_{ic})$$

Compensation of employees	(CEci)	12 776
Gross operating $\frac{\text{surplus}}{\text{mixed}}$ income	(OSci)	9 492
Taxes less subsidies on products	(TSci)	4 596
Other taxes less subsidies on production	(tsci)	1 078
Eastern Cape Ocean Economy's GDP at market prices		**27 942**

Table 5: Generation of income account in the Eastern Cape Ocean economy, 2023

Uses	**(Rmillion)**	**Resources (R million)**
Compensation of Employees	12 776	Eastern Cape GDP 27 942
Taxes less subsidies on products	4 596	
Taxes less subsidies on production	1 078	
Gross Operating Surplus	9 492	
Total	**27 942**	**Total 27 942**

Source: Own calculations derived from the Eastern Cape Supply and Use Table, 2023

Table 5 indicates that in 2023, the total income generated in the Eastern Cape Ocean economy was shared between three parties:

- The workers in the ocean economy earned R 12 777 million (45.7 per cent) in form of wages and salaries (Compensation of employees),
- The return on investment (Gross Operating Surplus) was R9 492 (33.9 per cent). This is the amount earned by investors in the ocean economy,
- The government (11.9 percent) in form of taxes and subsidies.

Three lessons emerged from the generation of income accounts

- Employee compensation constitutes a significant portion, reflecting the labour-intensive nature of the industry.
- Gross operating surplus indicates substantial profitability within the sector.
- Tax revenue derived from the sector supports government funding for infrastructure and public services.

Impacts and implication

- The high wage bill demonstrates that the sector plays a vital role in employment generation in the Eastern Cape.
- The profitability levels signal opportunities for further reinvestment and expansion.
- Strong tax contributions provide financial resources for sustainable ocean economy initiatives.
- Policymakers should prioritize skills development programs to enhance workforce productivity and wages.
- Reinvestment in ocean-based industries can stimulate innovation and technological advancement.
- Enhancing tax incentives for sustainable marine projects can attract further private investment.

4.1.3. Goods and service account and the Eastern Cape Ocean economy satellite account

Goods and service account refers to the expenditure approach of estimating GDP. This approach is well exploited in most academic literatures with the Keynesian Identity Y = G + C + I + X-M, where Y = GDP, where G = government consumption expenditure, C = household consumption expenditure, I = investment, and X-M = net export.

$$\text{South Africa GDP} = \sum_{ic=1}^{n}(F_{ic} + X_{ic} - M_{ic})$$

DOI: 10.5281/zenodo.19703617

Table 6: Eastern Cape Goods and Services Account, 2023

Resources	(R million)	Uses	R million)
Output	54 026	Intermediate Consumption Expenditure	28 921
Taxes less subsidies on products	4 596	Final demand	37 955
Imports of Goods & Service	8 254		
Total Resources	**66 876**	**Total Uses**	**66 876**

Source: Own calculations derived from the Eastern Cape Supply and Use Table, 2023

Table 6 indicates that the goods and services account reflect the broader economic interactions within the ocean economy. The sector is integrated into both domestic and international markets, as evidenced by import and final demand figures.

- Imports of R8 254 million suggest a reliance on foreign goods and services for production.
- Final demand surpasses intermediate consumption, indicating robust market demand.
- High import levels may create vulnerabilities due to exchange rate fluctuations and global supply chain disruptions.
- Strong final demand supports business growth, employment, and economic expansion.
- The sector's ability to meet both domestic and export needs enhances its competitiveness.
- Strengthening local industries to reduce import dependence can enhance economic resilience.
- Diversifying export markets for marine products and services can mitigate economic shocks.

4.1.4. Integrated satellite accounts

Having dealt with the three techniques of the Eastern Cape satellite account, it is evident that each method produces the same estimate of the provincial GDPR. The integration of the three approaches is presented in the following equation

$$\text{GDP-R} = \sum_{ic=1}^{n}(P_{ic} - Y_{ic}) + \sum_{ic=1}^{n} TS_{ic} = \sum_{ic=1}^{n}(CE_{ic} + OS_{ic}) + \sum_{ic=1}^{n}(\text{Ѡ}TS_{ic}) = \sum_{ic=1}^{n}(F_{ic} + X_{ic} - M_{ic})$$

Overall, the value of GDP must equivocally be the same when each method is applied i.e. income, production, or expenditure method.

4.1.5. Macroeconomic analysis derived from the Ocean economy satellite account

Understanding productivity dynamics and economic efficiency in the ocean economy is essential for policymakers, businesses, and stakeholders aiming to maximize value creation while ensuring sustainable growth. By analysing key performance indicator, such as output per worker, investment efficiency, and compensation structures—we can assess the sector's strengths, challenges, and areas for improvement. Table 7 includes key ratios which were extracted from the Eastern Cape Ocean economy satellite account.

Table 7: Key ratios derived from the Eastern Cape Ocean economy satellite account

Indicator	Formula	Calculation	Interpretation
Productivity	Output / Intermediate Consumption Expenditure	54,026 / 28,921 = 1.87	The sector generates 1.87 units of output for every unit of intermediate consumption. A value above 1 means the sector adds economic value.
Output per CoE	Output / CoE	54,026 / 12,776 = 4.23	For every unit paid to employees, the sector produces 4.23 units of output. A higher value indicates efficient labour compensation.
Output per GVA	Output / GVA	54,026 / 25,105 = 2.15	For every unit of GVA, the sector produces 2.15 units of output. It reflects the sector's contribution to GDP relative to its value addition.
Output per GoS	Output / GoS	54,026 / 9,492 = 5.69	The sector produces 5.69 units of output per unit of operating surplus, indicating the profitability and capital efficiency of the sector.
CoE / GoS Ratio	CoE / GoS	12,776 / 9,492 = 1.35	Compensation of employees is 1.35 times the operating surplus, suggesting a labour-intensive sector where wages dominate costs.
Output per Investment	Output / (Investment × 1000)	54,026 / (3,122 × 1000) = 17.3	The sector generates 17.3 units of output per unit of investment, reflecting investment efficiency.

DOI: 10.5281/zenodo.19703617

Indicator	Formula	Calculation	Interpretation
Output per Worker	Output / Employment	54,026 / 43,264 = 1.25	Each worker contributes 1.25 units of output, indicating the sector's labor productivity.

Source: Own calculations derived from the Eastern Cape Supply and Use Table, 2023

Firstly, the analysis shows high labour costs vs. operating surplus**.** The ratio (1.35) between Compensation of Employees (CoE) and Gross Operating Surplus (GoS) indicates that the wage costs exceed operating surplus. Sectors like tourism, fisheries, and shipbuilding often have similar structures.

Secondly, it reveals investment efficiency**.** The sector has moderate investment efficiency (17.3 output per unit investment). This suggests that higher investment may lead to proportional output growth, but further technological improvements might be needed.

Thirdly it shows moderate labour productivity**.** With 1.25 output per worker, labour productivity is relatively low, which means the sector relies on high employment levels rather than automation.

Lastly, it shows overall moderate total productivity. The 1.87 productivity ratio (output per intermediate consumption) suggests a positive economic contribution but may require resource efficiency measures.

Emerging economies rely on high employment, lower labour productivity (e.g., fisheries in Southeast Asia). However, developed economies have high capital investments, lower employment, but higher output per worker (e.g., Norway's offshore industry).

From the Table 8, the analysis reveals that while the sector generates substantial output, it remains labour-intensive, with high wage costs relative to operating surplus. Investment efficiency and productivity improvements are necessary to enhance competitiveness, particularly through automation, workforce upskilling, and infrastructure development. International best practices from high-performing economies highlight the importance of technology adoption and value chain enhancement. Policymakers should focus on balancing employment growth with productivity gains, ensuring that economic policies support long-term sustainability and global competitiveness in the ocean economy

Table 8: Selected key macroeconomic indicators derived from the Ocean economy satellite account

	Sector	Output	CoE	GoS	Taxes less subsidies on products	Taxes less subsidies on production	GVA	Investment	Employment	Intermediate Consumption Expenditure
1	Fisheries and Aquaculture	4 052	958	712	345	81	1 883	172	6 922	2 169
2	Marine Mining	4 862	1 150	854	414	97	2 259	312	1 298	2 603
3	Offshore Oil and Gas	7 293	1 725	1 281	620	146	3 389	578	1 644	3 904
4	Manufacturing of fish	1 351	319	237	115	27	628	94	2 077	723
5	Coke, petroleum products and nuclear fuel	2 971	703	522	253	59	1 381	225	1 211	1 591
6	Marine Equipment Manufacturing	2 053	485	361	175	41	954	150	2 682	1 099
7	Ship & Boat building and Repair	2 431	575	427	207	49	1 130	187	2 899	1 301
8	Water: collection, treatment, supply and desalination	1 081	256	190	92	22	502	78	779	578
9	Maritime Transport and Port Operations	8 644	2 044	1 519	735	172	4 017	375	4 110	4 627
10	Marine tourism, travel agencies, and recreation	5 132	1 214	902	437	102	2 385	156	8 653	2 747
11	Submarine cables & Telecommunications	1 351	319	237	115	27	628	78	562	723
12	Coastal real estate and development	2 971	703	522	253	59	1 381	134	1 514	1 591
13	Renewable Energy, Engineering Services for Renewables	3 512	830	617	299	70	1 632	250	1 731	1 880
14	Marine environmental services	972	230	171	83	19	452	53	1 082	521
15	Marine insurance	432	102	76	37	9	201	28	303	231
16	Other community, social and personal services	378	89	66	32	8	176	22	779	202
17	Aquatic & Oceanographic Research, and Marine Education	1 081	256	190	92	22	502	47	1 298	578
18	Coastal defense and security	2 053	485	361	175	41	954	116	1 860	1 099
19	Marine waste management and recycling	1 026	243	180	87	20	477	66	1 601	549
20	Maritime legal services	378	89	66	32	8	176	3	260	202
		54 026	**12 776**	**9 492**	**4 596**	**1 078**	**25 105**	**3 122**	**43 264**	**28 921**

Source: Own calculations derived from the Eastern Cape Supply and Use Table, 2023

5. Conclusion and recommendation

The purpose of this study was to create the satellite account of the Ocean Economy for the Eastern Cape province which should be included in the SAM to be constructed. The Eastern Cape Ocean Economy is directly tied to the South African national economy and factors affecting the growth and stability of the larger economy which directly impact this sector and its outlook.

In 2023, the Eastern Cape Ocean economy was estimated at R27 942 million, representing 5.2% of the overall Eastern Cape economy. The methodology used in this report not only aligns with international best practices but also highlights the significant role that the ocean economy plays in contributing to the region's economic landscape.

The System National Account (SNA) and European System of Accounts (ESA) outline three methodologies for calculating annual Gross Domestic Product (GDP) estimates: the production approach, the expenditure approach, and the income approach.

DOI: 10.5281/zenodo.19703617

Each of these methodologies corresponds to specific accounts within the accounting system.

Regarding the findings, firstly, the analysis shows high labour costs vs. operating surplus**.** The CoE/GoS ratio (1.35) suggests that the wage costs exceed operating surplus. Sectors like tourism, fisheries, and shipbuilding follow the similar structures.

Secondly, it reveals investment efficiency**.** The sector has moderate investment efficiency (17.3 output per unit investment). This suggests that higher investment may lead to proportional output growth, but further technological improvements might be needed.

Thirdly it shows moderate labour productivity**.** With 1.25 output per worker, labour productivity is relatively low, which means the sector relies on high employment levels rather than automation.

Lastly, it shows overall moderate total productivity. The 1.87 productivity ratio (output per intermediate consumption) suggests a positive economic contribution but may require resource efficiency measures.

Emerging economies rely on high employment, lower labour productivity (e.g. fisheries in Southeast Asia). Nonetheless, developed economies have high capital investments, lower employment, but higher output per worker (e.g., Norway's offshore industry).

The analysis reveals that while the sector generates substantial output, it remains labour-intensive, with high wage costs relative to operating surplus. Investment efficiency and productivity improvements are necessary to enhance competitiveness, particularly through automation, workforce upskilling, and infrastructure development. International best practices from high-performing economies highlight the importance of technology adoption and value chain enhancement. Policymakers should focus on balancing employment growth with productivity gains, ensuring that economic policies support long-term sustainability and global competitiveness in the ocean economy

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DOI: 10.5281/zenodo.19703617