



# From Vision to Valuation: South Africa's journey to develop the first experimental Biodiversity Economy Satellite Account

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South African National Biodiversity Institute

# Defining the Biodiversity Economy

## From South Africa's **National Biodiversity Economy Strategy**:

The biodiversity economy consists of businesses and other economic activities that either ***directly depend on biodiversity*** for their core business or that ***contribute to conservation of biodiversity*** through their activities

Adapted from a definition proposed by van Paddenburg et al. 2012



Defining the biodiversity economy is not straightforward, and there is no international consensus on a definition. Not the same as *green economy* or *bioeconomy*.



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# Conceptual framework for the Biodiversity Economy



## Biodiversity-related economic activity

### A. Conserving biodiversity

(sectors/activities that contribute directly to conserving or managing biodiversity)

A1. Protecting and managing biodiversity assets

A2. Maintaining and restoring ecological infrastructure

A3. Research and professional services

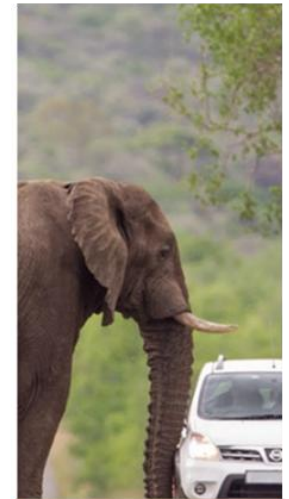
### B. Using biodiversity

(sectors/activities that depend directly on utilising biodiversity)

B1. Non-consumptive use of biodiversity

B2. Extractive use of biodiversity

Focus is on natural or semi-natural ecosystems and indigenous species



# Why a satellite account approach for measuring the Biodiversity Economy?

- Satellite accounts:
  - Allow experimentation with new concepts and methodologies
  - Fully embedded in the traditional set of national accounts, and enable analysis of a range of economic statistics (GDP, jobs etc)
  - Stats SA have experience in satellite accounts compilation(e.g. tourism satellite account)
- There are other ways to measure the biodiversity economy (e.g. ecosystem service valuation, Green GDP) but no standardised or regularly produced approaches exist.
- The BESA is intended to complement accounts that are being produced in South Africa through the System of Environmental-Economic Accounting (SEEA) Ecosystem Accounting (EA).
- BESA will focus on ecosystems and species to activities that fall inside the SNA production boundary.



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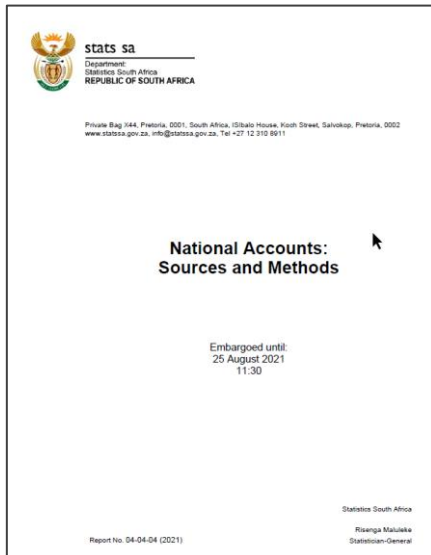
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# Draft experimental BESA – where did we start?

## Supply and Use-tables



**SUT compilation level:**  
118 product groupings  
**SUT publication level:** 108 product groupings



**SUT compilation level:**  
213 industry groupings  
**SUT publication level:** 124 industry groupings

### Scoping workshop

- Initial one day scoping workshop used for planning of work, identifying key stakeholders, and agreeing on adopting the conceptual framework for the biodiversity economy from the NBA.

### Scoping working sessions

- 12 scoping work sessions with the core working group - roughly two hours per session.
- Invitations to join these sessions were extended to a broader reference group comprising subject matter experts in specific areas e.g. marine ecosystems, agriculture, forestry, biomass and others.
- Focused on linking the conceptual framework for the biodiversity economy to the industry and product classifications used for compiling South Africa's national accounts (SUTs).

### Draft BESA compilation

- DFFE provided Stats SA draft BESA scoping document (EXCEL workbook) in order to start compiling a draft BESA according to the scoping requirements provided.

# Biodiversity Economy industry and product scoping

**Each individual industry (SIC) code and product (CPC) code was assessed in respect of five parameters:**

- Inclusion within the biodiversity economy (yes or no).
- Degree of inclusion (indicated as a percentage range).
- Rationale for inclusion, with examples.
- Category and sub-category of the biodiversity economy into which it best fits.
- Areas of research for further refinement or increased certainty.

**Based upon 7 principles:**

1. Use the definition of the biodiversity economy, and keep coming back to it.
2. Where an activity is considered part of the biodiversity economy, no part of that activity is excluded because it has a negative environmental impact.
3. All economic activities related to indigenous species are included.
4. All economic activities that directly depend on natural ecosystems are included.
5. Non observed activities in the biodiversity economy are included (inclusive of subsistence, informal and illegal activities).
6. Activities are included even where the proportion related to biodiversity is currently estimated to be negligible.
7. Activities that may be considered to be part of the green economy more broadly but that are not directly related to biodiversity are excluded.



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# Draft experimental BESA – where did we start?

Table 4: Summary of results for product codes

| Proportion related to biodiversity | Number of CPC codes | % of total number of codes |
|------------------------------------|---------------------|----------------------------|
| All or most (>80%)                 | 3                   | 2.5%                       |
| Some (20-80%)                      | 1                   | 0.8%                       |
| Few (<20%)                         | 35                  | 29.7%                      |
| None                               | 79                  | 66.9%                      |
| <b>Total</b>                       | <b>118</b>          | <b>100%</b>                |

Table 3: Summary of results for industry codes

| Proportion related to biodiversity | Number of SIC codes | % of total number of codes |
|------------------------------------|---------------------|----------------------------|
| All or most (>80%)                 | 2                   | 0.9%                       |
| Some (20-80%)                      | 1                   | 0.5%                       |
| Few (<20%)                         | 36                  | 16.9%                      |
| None                               | 174                 | 81.7%                      |
| <b>Total</b>                       | <b>213</b>          | <b>100%</b>                |

Table 8: Proposed proportions to be used to calculate the economic contribution of the industries and products identified as biodiversity-related to GDP and employment

| Group to which industry/product code allocated                | Proposed proportion to be used to extract data from SUTs | Alternative proportions that could be used for sensitivity testing |          |
|---------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------|----------|
|                                                               |                                                          | Conservative                                                       | Generous |
| <b>All or most</b><br>(estimate >80% related to biodiversity) | 85%                                                      | 80%                                                                | 90%      |
| <b>Some</b><br>(estimate 20-80% related to biodiversity)      | 40%                                                      | 30%                                                                | 50%      |
| <b>Few</b><br>(estimate <20% related to biodiversity)         | 3.5%                                                     | 1%                                                                 | 5%       |

3 different approaches  
3 different answers

# Draft experimental BESA – where did we start?

## Supply and use tables

-SUT Directorate released updated SUTs – ongoing alignment of the draft BESA to the National Accounts

## BESA system development

-Draft BE SUT (automated system), based upon the SUT - and system checking.  
-3 Draft BESA (proposed, conservative and generous) (automated system), based on draft BE SUT and DFFE, SANBI and Stats SA draft BESA scoping – and system checking

## Initial macro indicators

-Draft BE gross value added (GVA) and gross domestic product (GDP) – 3 approaches.  
-Draft BE taxes less subsidies - 3 approaches.  
-Draft BE exports- 3 approaches.

## BESA employment

-Ongoing engagements - how must BE employment be disaggregated – what would DFFE and SANBI want to monitor and report on for BE employment for policy.



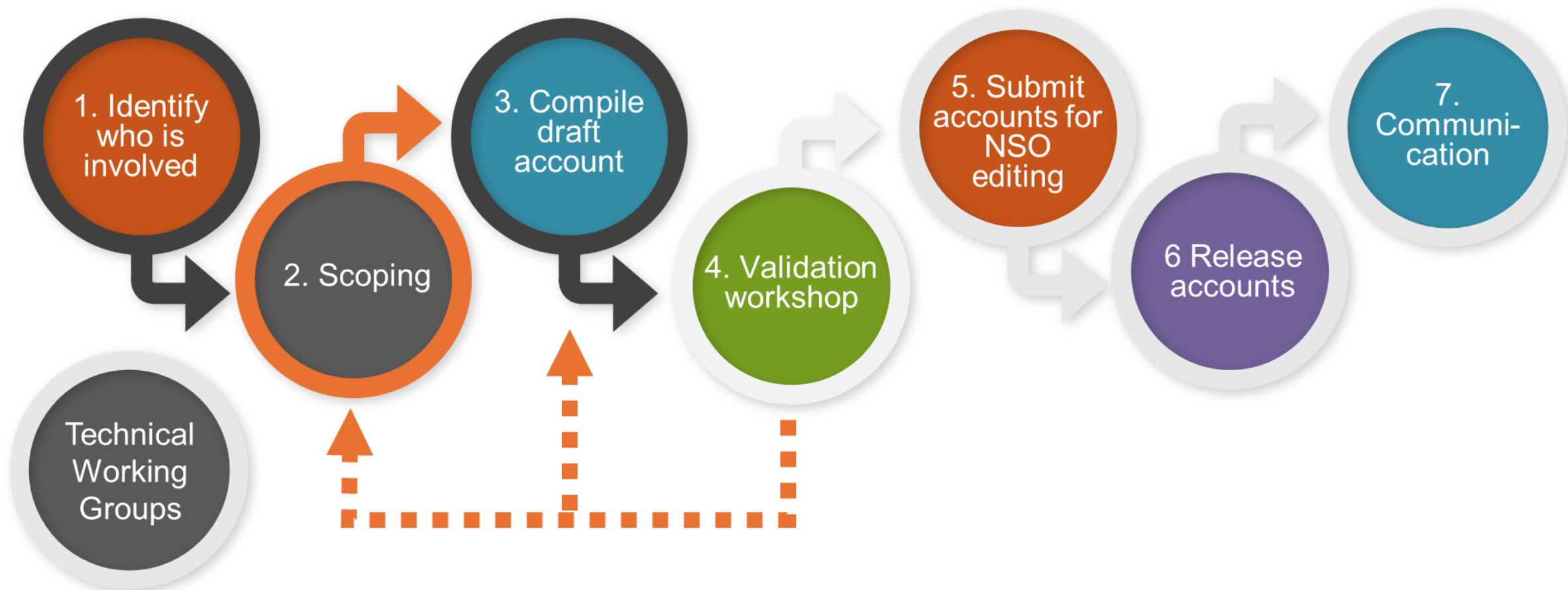
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# The process for the compilation of natural capital accounts



# Re-scoping exercise of the BESA industry ratios

## BESA industry ratio re-scoping exercise focussed on the following, per each of the 39 identified BE industries from the SUT:

- Estimate *industry ratios* for each identified industry of the biodiversity economy.
- For each of the identified industries of the biodiversity economy, an explanation is given of the identified information sources and reasoning for the initial estimate.
- These biodiversity economy industry ratios are a *best estimate* based on the available information.
- In some cases, there is detailed industry information that allows an estimate with high certainty.
- In other cases, a reasoned estimate is made based on limited available information with less certainty.

*Table 2: Descriptive terms for assessing the level of certainty in the estimates of the industry ratios.*

| Level of certainty | Explanation                                                                                                                                                           |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low                | Speculative. The estimate is based on very limited evidence and large gaps remain. Significant assumptions are needed to arrive at an estimate. Accuracy is uncertain |
| Medium             | Probable. The estimate is supported by some relevant, available evidence, although there are still some uncertainties that might affect accuracy.                     |
| High               | Reliable. The estimate is backed by reasonable and consistent evidence, although minor uncertainties may still exist. Accuracy is relatively certain.                 |



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# Re-scoping exercise of the BESA industry ratios

- A detailed list of BE industries was developed, using the conceptual framework for the biodiversity economy.
- The list began with a list of industries used in previous estimates of biodiversity employment.
- It was then cross-checked and added to from the *Compendium of Benefits of Biodiversity* of the National Biodiversity Assessment 2018.
- It was also cross checked with the dependencies database of the ENCORE model to identify possibly relevant dependencies that had been overlooked.
- Finally, it was checked against the list of industry classes from the Standard Industrial Classification (SIC) to identify any SIC classes that may not have been covered already.

## A1: Protecting and managing biodiversity assets

National government departments (DFFE, DWS, DALRRD)

Wildlife crime prevention

Biodiversity entities (incl. SANBI, SANParks, iSimangaliso)

Provincial departments (relevant programmes)

Municipalities (relevant sections)

Conservation NGOs

## A2: Restoring and maintaining ecological infrastructure

Department of Public Works - Expanded Public Works Programme

Water resource management

## A3: Research and professional services related to biodiversity

Government research institutions

Research and education

Environmental assessment

Wildlife veterinarians

## B1: Non-consumptive use of biodiversity

Biodiversity-based tourism

Water provision

Sports and recreation

Media and photography

Organic fertiliser

## B2: Consumptive or extractive use of biodiversity

Ocean fisheries

Pollinator-dependent crops

Rangeland agriculture

Wildlife ranching, hunting and game products

Bioprospecting and biotrade

Indigenous plant trade

Traditional medicine

Industry organisations



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# Re-scoping exercise of the BESA industry ratios

## Draft working document

than a dependency. If the underlying natural resource, the ecosystems, reduces in condition, the spending in these industries will increase due to the increased risk (a negative relationship). This is counter to the other sub-sectors included, in which economic activities benefit from a higher condition of the underlying resource (a positive relationship).

### Organic fertiliser

The SIC contains a specific class for the production of organic fertiliser such as compost (116; Table 29). It is likely that this production relies to some extent on natural micro-organisms.

Table 29: Standard Industrial Classification classes (Stats SA, 1993) related to organic fertiliser.

|                                      | Industry ratio | Confidence |
|--------------------------------------|----------------|------------|
| <b>Direct dependency</b>             |                |            |
| 116 Production of organic fertiliser | 50.0           | Medium     |

Many organic fertilisers are created through composting, which involves the breakdown of organic materials by microorganisms like bacteria and fungi. A diverse range of microbes in the compost pile accelerates the decomposition process and leads to a richer, more effective fertilizer. Often, natural micro-organisms will be relied on for the composting process, although it is possible to introduce decomposing bacteria and organisms from elsewhere. Hence, the industry is moderately dependent on biodiversity. Other types of organic fertiliser include animal manure from domestic animals. A suggested estimate is that 50.0% of the industry relies on natural micro-biodiversity.

The confidence in the estimate is medium, as there is a single SIC class related to organic fertiliser, a large proportion of which is likely to be biodiversity-relevant. Remaining research questions include:

- What portion of organic fertiliser production in South Africa involves decomposition?
- To what extent does organic fertiliser production rely on indigenous microbes?

## B2: Consumptive use

### Ocean fisheries

South Africa has a long coastline of more than 3 200 km and a rich marine biodiversity of more than 10 000 species.<sup>79</sup> There are 22 commercial fisheries in the country that produce an estimated 600 000 tonnes of fish annually.<sup>79</sup> Hake, Cape horse mackerel, rock lobster and small pelagic fish are the largest fisheries.<sup>80</sup> Indigenous wild fish stocks are a biodiversity resource, that is also highly dependent on water quality and nursery spaces.

Table 30: Standard Industrial Classification classes (Stats SA, 1993) related to ocean fisheries.

|  | Industry ratio | Confidence |
|--|----------------|------------|
|--|----------------|------------|

<sup>79</sup> Stats SA (2018) Environmental Economic Accounts Compendium. Statistics South Africa, Pretoria.

<sup>80</sup> DAFF (2019) A profile of the South African aquaculture market value chain. Department of Agriculture, Forestry and Fisheries, Pretoria.

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|                            |                                                                                         |       |        |
|----------------------------|-----------------------------------------------------------------------------------------|-------|--------|
| <b>Direct dependency</b>   |                                                                                         |       |        |
| 131                        | Fishing, operation of fish hatcheries and fish farms                                    |       |        |
| 1310                       | Ocean and coastal fishing                                                               | 100.0 | High   |
| 1311                       | Fish hatcheries and fish farms                                                          | 10.0  | Low    |
| 301                        | Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats |       |        |
| 3012                       | Processing and preserving of fish and fish products                                     | 50.0  | Medium |
| <b>Indirect dependency</b> |                                                                                         |       |        |
| 612                        | Wholesale trade in agricultural raw materials, livestock, food, beverages and tobacco   |       |        |
| 61221                      | Wholesale trade in foodstuffs                                                           |       |        |
| 622                        | Retail trade in food, beverages and tobacco in specialised stores                       |       |        |
| 62209                      | Other retail trade in food, beverage and tobacco                                        |       |        |

The wild harvested species are the direct resource of ocean fisheries. If fisheries collapse, so do the economic sectors that rely on them. Saltwater, wild-caught fish is highly dependent on nursery habitats and the genetic diversity of the populations<sup>81</sup>. Thus, the entire industry class for 'ocean and coastal fishing' (1310; Table 30) is considered to be dependent on biodiversity. Aquaculture farms rely far less on biodiversity as they may use exotic fish species and constructed pools, but fish farms located in the ocean or estuaries still rely on biodiversity for water quality and animal feed.<sup>81</sup> Aquaculture remains a very small part of the fisheries sector in South Africa, contributing only 5 418 tonnes (0.8%).<sup>82</sup> The remainder is wild-caught fish.

Since the fish species themselves are the product, it is fair to include the processing of fish as a direct dependency. Not all fish products sold in South Africa come from local fisheries, some are imported. But, South Africa is a net exporter of fish.<sup>83</sup> South Africa imported 149 879 tonnes of fish products in 2023 and exported 402 181 tonnes (73%).<sup>84</sup> This implies that of the fish used for local markets, approximately 200 000 tonnes (57.0%) are locally caught (600 000 – 402 181) and 149 879 imported (43.0%). Thus, at least 50.0% of fish processed in South Africa comes directly from wild harvesting in our oceans.

The confidence in the estimate for ocean fisheries is high, as the dependency of ocean fisheries on biodiversity is well established and a single SIC class covers all ocean fishing, so the entire class can be included. Confidence in fish farming is low, as there is little information available on the industry in South Africa to determine its dependence on indigenous fish species, food or water quality. The degree to which fish processing is based on indigenous, wild caught fish compared to imported fish is also uncertain, leading to a medium confidence in that estimate. Remaining research questions include:

- Is there any portion of ocean and coastal fishing that is not dependent on indigenous species?

<sup>81</sup> ENCORE (2024) Exploring Natural Capital Opportunities, Risks and Exposure.

<sup>82</sup> <https://encore.netlify.com/en>

<sup>83</sup> DAFF (2019) A profile of the South African aquaculture market value chain. Department of Agriculture, Forestry and Fisheries, Pretoria.

<sup>84</sup> FAO (2024) Fishery and aquaculture country profiles: South Africa. Food and Agriculture Organisation. <https://www.fao.org/fishery/en/fao/cp/za/>

<sup>85</sup> Klein, A.M., Vaissiere, B.E., Cane, J.H., Steffan-Dewenter, I., Cunningham, S.A., Kremen, C. & Tscharntke, T. (2007) Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society B: Biological Sciences, 274(1608): 303–313.

<sup>86</sup> FAO (2018) The State of the World's Biodiversity for Food and Agriculture, J. Bélanger & D. Pilling (eds.). FAO Commission on Genetic Resources for Food and Agriculture Assessments. Rome. 572 pp. <http://www.fao.org/3/C3129EN/C3129EN.pdf>

<sup>87</sup> SANBI (2019) National Biodiversity Assessment 2018 Supplementary Material: Compendium of Biodiversity Data. Compiled by South African National Biodiversity Institute.

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- What proportion of fish processing in South Africa uses wild caught, indigenous fish from South African waters?
- To what extent are South African aquaculture farms dependent on biodiversity or ecological infrastructure?

### Pollinator dependent crops

Crops at least partially pollinated by animals account for 35% of global food production.<sup>85</sup> This means that pollination is either essential for these crops or results in increased production. Animal pollinators are particularly important for production of fruit and vegetables. Cereals are more often wind pollinated. South Africa uses two indigenous sub-species of honeybee in addition to wild pollinators.<sup>87</sup> Pollinators need a variety of plants and flowers for food.

Pollinators do not get 'consumed' or used up during production of crops, hence this sub-sector does not fit perfectly within the 'extractive use' sector of the biodiversity economy, and may be more correctly included under 'non-consumptive use'. However, it is included here with other agricultural and production activities.

Table 31: Standard Industrial Classification classes (Stats SA, 1993) related to pollinator-dependent crops.

|                                                                                             | Industry ratio | Confidence |
|---------------------------------------------------------------------------------------------|----------------|------------|
| <b>Direct dependency</b>                                                                    |                |            |
| 111 Growing of crops                                                                        |                |            |
| 1111 Growing of cereals and other crops                                                     | 4.6            | Medium     |
| 1112 Growing of vegetables, horticultural specialties and nursery products                  | 95.0           | Medium     |
| 1113 Growing of fruit, nuts, beverage and spice crops                                       | 70.0           | Medium     |
| <b>Indirect dependency</b>                                                                  |                |            |
| 301 Production, processing and preservation of meat, fish, fruit, vegetables, oils and fats |                |            |
| 3013 Processing and preserving of fruit and vegetables                                      |                |            |
| 612 Wholesale trade in agricultural raw materials, livestock, food, beverages and tobacco   |                |            |
| 6121 Wholesale trade in agricultural raw materials and livestock                            |                |            |
| 61221 Wholesale trade in foodstuffs                                                         |                |            |
| 622 Retail trade in food, beverages and tobacco in specialised stores                       |                |            |
| 62201 Retail trade in fresh fruit and vegetables                                            |                |            |

<sup>85</sup> Klein, A.M., Vaissiere, B.E., Cane, J.H., Steffan-Dewenter, I., Cunningham, S.A., Kremen, C. & Tscharntke, T. (2007) Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society B: Biological Sciences, 274(1608): 303–313.

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<sup>87</sup> SANBI (2019) National Biodiversity Assessment 2018 Supplementary Material: Compendium of Biodiversity Data. Compiled by South African National Biodiversity Institute.



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# Experimental BESA compilation system development in progress

Table 8. Proposed proportions to be used to calculate the economic contribution of the industries and products identified as biodiversity-related to GDP and employment

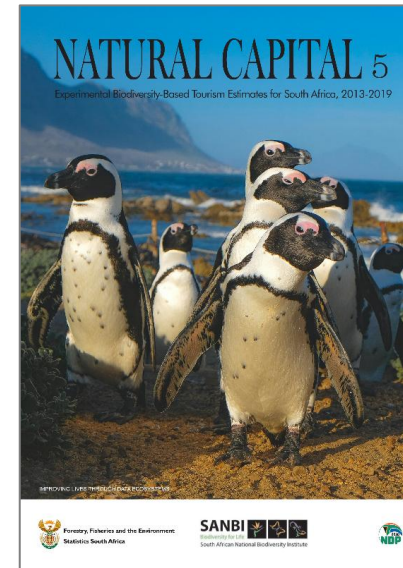
| Group to which industry/product code allocated        | Proposed proportion to be used to extract data from SUTs | Alternative proportions that could be used for sensitivity testing |          |
|-------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------|----------|
|                                                       |                                                          | Conservative                                                       | Generous |
| All or most (estimate >80,0% related to biodiversity) | 85,0%                                                    | 80,0%                                                              | 90,0%    |
| Some (estimate 20,0-80,0% related to biodiversity)    | 40,0%                                                    | 30,0%                                                              | 50,0%    |
| Few (estimate <20,0% related to biodiversity)         | 3,5%                                                     | 1,0%                                                               | 5,0%     |

Sources: Driver et al, 2021.



Biodiversity economy - industry ratio estimates - working document

ONE agreed upon approach and ONE answer!



## Biodiversity-related economic activity

**A. Conserving biodiversity**  
(sectors/activities that contribute directly to conserving or managing biodiversity)

A1. Protecting and managing biodiversity assets

A2. Maintaining and restoring ecological infrastructure

A3. Research and professional services

**B. Using biodiversity**  
(sectors/activities that depend directly on utilising biodiversity)

B1. Non-consumptive use of biodiversity

B2. Extractive use of biodiversity

Focus is on natural or semi-natural ecosystems and indigenous species

# Way forward (work in progress) – experimental BESA for South Africa

Stats SA recompiling the draft BESA and applying the new BE industry ratio's for a next version of the draft BESA for SA

DFFE, SANBI and Stats SA further engaging on the development of the BE product ratios re-scoping – similar process the BE industry ratio re-scoping

DFFE, SANBI and Stats SA further engaging on the labour market related variables which are relevant for the biodiversity economy.

Decisions on the inclusion of more detailed employment data will depend on the labour market issues that are considered of special significance for policy and research by DFFE and SANBI for the biodiversity economy.

Aim is to release the first experimental BESA for South Africa in the Stats SA NC series by latest November 2028



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