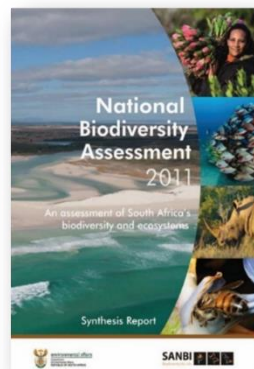
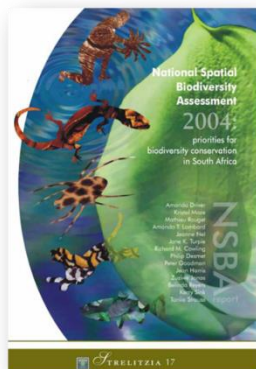


South Africa's National Biodiversity Assessment

Contextual and Operational Framework

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1. ABOUT THIS DOCUMENT

Since the Millennium Ecosystem Assessment¹ (2001-2005) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services² (IPBES) process (established in 2012), the number and variety of biodiversity and ecosystem assessments³ have increased globally. Various frameworks underpin these assessments: some assessments are purely about what the biodiversity is and where it is located, some are on a specific theme or in a specific location, and others focus solely on the consequences of ecosystem change for people (i.e. the sustainability of the goods and services that people derive from nature). Understanding the underlying framework of an assessment is therefore critically important for any users.

South Africa has been undertaking its National Biodiversity Assessment (NBA) at regular intervals since 2004 (see Section 2). The framework that underpinned the first NBA was novel and has continued to provide the basis for subsequent iterations, with adjustments and extensions as the NBA has developed, expanded and evolved.

The framework for South Africa's NBA has not previously been made fully explicit, although it was briefly discussed in the NBA 2011 and 2018 synthesis reports.

This document therefore seeks to:

- Capture the origins of South Africa's NBA and its iterations to date;
- Explain the context of South Africa's NBA in terms of the South African National Biodiversity Institute (SANBI) mandate, the national policy context, and South Africa's obligations to several multilateral environmental agreements;
- Set out the purpose and goals of South Africa's NBA;
- Describe the content covered in the NBA – including what it is and is not within scope, and how this has evolved over successive iterations;
- Clarify the key tenets of the approach to South Africa's NBA;
- Specify the current form (or packaging) of the NBA in terms of the knowledge products produced – a website and a Summary of Findings & Key Messages booklet, with accompanying journal papers, technical reports, datasets and more;
- Explain the model of implementation in terms of collaboration with partners, inter-Divisional linkages within SANBI, governance structures, and tracking tools and reporting.

The intention is to provide a full overview of the context of South Africa's NBA and how it is undertaken, including core concepts and principles⁴.

¹ <https://www.millenniumassessment.org/en/index.html>

² <https://www.ipbes.net/>

³ The *Lexicon of spatial biodiversity assessment, prioritisation and planning in South Africa* (SANBI 2023) contains all definitions, and should be referred to if terminology used in this document needs clarification.

⁴ This document is different to a conceptual framework for an ecosystem assessment as defined by IPBES (see UNEP-WCMC 2010 and Diaz et al. 2015), which usually contains a summary of the relationship between people and nature (i.e. social and ecological components).

2. THE ORIGINS AND ITERATIONS OF SOUTH AFRICA'S NBA

Biodiversity science took on new directions in South Africa in the early 2000s when government recognised the need for more scientific evidence to support decision-making relating to biodiversity⁵. A focussed, coordinated and well-funded institution was needed to support the new legislation relating to biodiversity that was being contemplated and that ultimately came into effect as the National Environmental Management: Biodiversity Act (Act 10 of 2004) (hereafter 'the Biodiversity Act').

The South African National Biodiversity Institute (SANBI; <https://www.sanbi.org/about/>) was the resulting institution, established in September 2004 in terms of the Biodiversity Act, with one of its functions to strengthen the science for policy and decision-making. SANBI reports to the Minister of the Department of Forestry, Fisheries and the Environment (DFFE) and to various DFFE structures.

The new institute required a transformation from the National Botanical Institute (NBI), which had itself been established in 1989 from the merger of the former National Botanical Gardens and the Botanical Research Institute. The new institute had a strong science foundation – however, whereas the previous botanical focus of NBI had been to conserve and study the exceptionally rich southern African flora, SANBI's new mandate required it to extend the focus from just plants to include all aspects of biodiversity, including ecosystems, species and genetic diversity across all realms (terrestrial, freshwater⁶, estuarine⁷, marine). As important, SANBI was expected to play a leadership role in generating, coordinating and interpreting the knowledge and evidence required to support policies and decisions relating to all aspects of biodiversity across all realms.

The Biodiversity Act specifically states that SANBI must undertake regular reports to the Minister of Forestry, Fisheries and the Environment on the status of the country's biodiversity and the status of all listed threatened or protected species and listed ecosystems (Figure 1).

CHAPTER 2	
SOUTH AFRICAN NATIONAL BIODIVERSITY INSTITUTE	40
Part 1	
<i>Establishment, powers and duties of Institute</i>	
Establishment	
10. (1) The South African National Biodiversity Institute is established by this Act. (2) The Institute is a juristic person.	45
Functions	
11. (1) The Institute— (a) must monitor and report regularly to the Minister on— (i) the status of the Republic's biodiversity;	
26 No. 26436	GOVERNMENT GAZETTE, 7 JUNE 2004
Act No. 10, 2004	NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004
(ii) the conservation status of all listed threatened or protected species and listed ecosystems; and	

Figure 1. Section 11. (1) (a) (i) (ii) of the Biodiversity Act gives SANBI mandate to undertake a national report on the status of biodiversity

⁵ These history paragraphs are taken from a booklet SANBI published in 2013 called *SANBI: A Decade of Science 2004-2013*, with some additions (SANBI 2013b).

⁶ The freshwater realm can also be called the 'inland aquatic realm' as not all inland water is fresh. The freshwater realm includes both rivers and wetlands.

⁷ Globally, the trend is to simplify to terrestrial, freshwater and marine as 'realms' (in line with the Global Ecosystem Typology), and estuarine is considered transitional rather than a realm in itself. In South Africa, there is a strong policy and legislative framework with regards to estuary protection and management. We therefore recognise the 'estuarine realm' and report on estuarine threat status and protection level like we do with the other realms.

The following is a narrative about each NBA produced to date. See [*Appendix A. Differences between SA's three National Biodiversity Assessments to date*](#) for the full list.

The '**National Spatial Biodiversity Assessment 2004: priorities for biodiversity conservation in South Africa**' (or NSBA 2004) was one of the first efforts to tackle SANBI's new expanded mandate and fulfil the requirements of the Biodiversity Act. The summary report was cited as Driver et al. 2005, and there were four accompanying technical reports: terrestrial, river, estuary and marine. The NSBA 2004 was produced by a small core team of people (14 lead authors; drawing on a range of existing datasets with large numbers of contributors as well as developing new datasets) over a one-year period. The NSBA 2004 was ecosystem focussed and spatially explicit, and dealt with terrestrial and aquatic realms through assessing the threat status and protection level of each ecosystem type or equivalent using methodology developed for the assessment. It drew on the principles of systematic biodiversity planning, discussed in Section 3.1. The NSBA 2004 was presented to national Parliament in April 2005 as the official launch.

The motivation for the NSBA 2004 came partly from the fact that South Africa was developing its first National Biodiversity Strategy and Action Plan (NBSAP) at the time, led by the (then) Department of Environmental Affairs and Tourism. Staff in SANBI's small, newly established directorate dealing with the provision of biodiversity policy advice approached officials in the Department about the possibility of producing a spatial assessment to inform the NBSAP. The Department agreed to provide a small budget for SANBI to undertake the assessment, which then proceeded alongside the development of the NBSAP (also published in 2005). There was some scepticism in the science and policy communities at the time about the feasibility of undertaking a national spatial assessment of biodiversity, particularly for the freshwater and marine realms, so the NSBA 2004 played the role of a proof-of-concept to some extent. The usefulness and uptake of its products (Reyers et al, 2007) laid the basis for further such assessments. The NSBA 2004 also helped to showcase SANBI as a new institution and to demonstrate that SANBI could step into its mandate of providing policy-relevant science across all realms. At the same time, key data gaps were highlighted, such as the fact that there was no national map of wetlands and only a rudimentary map of marine ecosystem types, laying the basis for concerted programmes of work to address gaps.

The second national assessment was titled '**National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems**' (or NBA 2011). The synthesis report was cited as Driver et al. 2012, and there were technical volumes accompanying the synthesis report for freshwater, estuary and marine (the terrestrial report was drafted but never published). The NBA 2011 involved more than 200 scientists and practitioners from around 30 organisations and took three years to complete. SANBI led the assessment in partnership with the Council for Scientific and Industrial Research (CSIR), South African National Parks (SANParks) and the (then) Department of Environmental Affairs, providing a powerful demonstration of SANBI's ability to convene multiple partners and synchronise their efforts. An initial national map of wetlands had been developed by that stage, so it was possible to include wetlands in the assessment for the first time alongside rivers for a more comprehensive freshwater assessment. The estuary component had an additional publication, the National Estuary Biodiversity Plan, that accompanied the assessment. A Gazette Notice listing threatened terrestrial ecosystems documented key aspects of the terrestrial ecosystem assessment. NBA 2011 included updated information on ecosystems and species, and addressed additional themes such as climate change resilience, species of special concern and invasive alien species. It also briefly described the key responses to pressures on biodiversity and the benefits that biodiversity provides to people. NBA 2011 was launched at the International Biodiversity Day event that the Department organised on 22 May 2012 at the iSimangaliso Wetland Park.

The third and most recent iteration was the '**National Biodiversity Assessment 2018: The status of South Africa's ecosystems and biodiversity**' (or NBA 2018). The synthesis report had a dual citation⁸, either

⁸ In 2017, SANBI EXCO approved a document called 'Guidelines for Citation of SANBI Publications'. This document was informed by the 2017 external review of SANBI's science programmes and a legal opinion regarding authorship, copyright and citation. The Guideline showcases a continuum of publication types ranging from purely scientific papers aimed at a small technical audience to policy-type outputs, and recommends that the scientific assessments that SANBI produces should have a dual citation. The "SANBI XXXX" citation will be used when the report is cited in policy-related publications; while the "Author et al. XXXX" citation should be used in scientific publications.

SANBI 2019 (see 2019b in reference list) or Skowno et al. 2019 to recognise that the report is both a policy-related output and a scientific output where individuals must have recognised authorship. Seven technical reports accompanied the synthesis report – the four main realms: Terrestrial, Inland Aquatic, Estuarine, Marine; and additional reports for cross-realm and unique themes: Coast, Subantarctic and Genetic Diversity. In addition, the freshwater realm also published a technical report about the compilation of the biodiversity representation for rivers and inland wetlands. Additional products included spatial and non-spatial datasets, a Compendium of Benefits of Biodiversity (with a focus on South African examples and data), and a Key Facts, Findings and Messages booklet. The NBA 2018 was launched by the Minister of Forestry, Fisheries and the Environment on 3 October 2019 at the Pretoria National Botanical Garden.

The NBA 2018 was a collaborative effort from over 470 individuals from approximately 90 institutions. The CSIR led the inland aquatic (rivers and inland wetlands) and estuarine components, and the Nelson Mandela University led the coastal component. The NBA 2018 process began in 2015 and ended in October 2019 with the launch event and release of the products online (approximately 4.5 years to complete). This NBA included several innovations (see Appendix A).

Each NBA iteration has thus seen substantial expansion in scope and numbers of people and organisations involved; as well as innovation and change, including improvements in input data, refinement of methods used for the assessment and development of further outputs such as additional national headline indicators (see Appendix A). At the same time, there has been important continuity between the assessments, particularly regarding the national headline indicators of ecosystem threat status and ecosystem protection level, which have been produced in each assessment, and the maps and graphs that accompany these. This consistency and continuity have been important for communicating the results of the assessment to policy and decision makers and enabling their uptake in legislative tools such as regulations for Environmental Impact Assessments (EIAs).

Changes to the ecosystem classification and maps, and the use of the global IUCN Red List of Ecosystems standard in the NBA 2018 (not yet available when the NSBA 2004 and NBA 2011 were undertaken), means that there is not a strict time series in the threat status of ecosystem types across the three NBAs. However, this has not significantly hindered the use of this indicator in policy and reporting.

Important to note is that the NBA process is a catalyst for the development of important stand-alone documents, such as the National Estuary Biodiversity Plan published alongside NBA 2011 and the Compendium of Benefits of Biodiversity published with NBA 2018. Alongside and closely related to the development of all the NBAs, the South African National Ecosystem Classification System (SA-NECS) has been formalised, explaining the increasing detail and accuracy in the hierarchical classification and mapping of ecosystem types across all realms (see also Section 8.4 for the governance of the SA-NECS).

All NBAs have involved a combination of scientists, policy makers and practitioners in the work of the assessment and have paid close attention to the policy, legislative and institutional context in conceptualising and developing the outputs and products of the assessment. This meant that many of the elements of the NBA (e.g. underlying datasets for the assessment, the findings or results of analyses, and the key messages), have fed directly into policy and implementation, including catalysing action and funding. The **impact of the NBA** (or elements of it) is not the subject of this document, although SANBI is endeavouring to collect more data on its use and impact⁹. The manner in which the NBA has been undertaken has strengthened the science-policy interface in the biodiversity sector in South Africa, generating science-based knowledge products, co-produced by scientists, policy makers and practitioners, that have underpinned policy advice and mainstreaming.

⁹ An 'uptake survey' was conducted after NBA 2018, as well as a systematic literature review. Findings are being written up into a journal paper.

3. NATIONAL AND INTERNATIONAL CONTEXT FOR SOUTH AFRICA'S NBA

3.1 Spatial biodiversity assessment as part of a sequential and iterative process of describing, assessing and prioritising biodiversity

The NBA is placed in a sequential process that starts with systematically describing biodiversity features (including ecosystems and species), mapping their location and distribution, assessing their status and then prioritising areas for action. This sequence can be iterated, forming a cycle to ensure continual improvement in the data and products.

In any context there are some fundamental questions related to biodiversity that, when answered, will provide a wealth of information to inform policy, decision-making, and strategy and action planning. Even greater value is obtained by asking and answering these questions in a spatially explicit way. The questions are:

- 1 What biodiversity does a country have and where is it?
- 2 What is the state of biodiversity across the landscape and seascape?
- 3 Where and how should a country act first to manage and conserve biodiversity?

[from the book 'Mapping biodiversity priorities' (SANBI & UNEP-WCMC 2016)¹⁰]

This flow of information from foundational biodiversity research and investigation (e.g. intra- and interspecific genetic diversity, species taxonomy and checklists, the mapping and classification of ecosystem types in each realm, ecological condition data), through assessments of the status of this biodiversity (e.g. threat status and protection level, see Section 5.2), to using this information to prioritise where and how to act is a crucial sequential process that South Africa has adopted. This sequential process allows the development of science-based knowledge products to inform policy, planning, decision-making and action related to biodiversity, both in the biodiversity sector and more widely.

The NBA has its centre of gravity in question 2, providing the impetus and incentive to continue the iterative cycle of continual improvement to the answers to question 1, and providing key information for question 3.

The principles of systematic biodiversity planning is part of the conceptual underpinning the NBA. More information on systematic biodiversity planning can be found in the 'Mapping biodiversity priorities' book.

¹⁰ This book is being updated, with the Second Edition due to be published in 2024. A clear diagram of the sequential and iterative processes of mapping biodiversity, undertaking assessments of status, and prioritisation is included in the Second Edition.

3.2 National policy context

South Africa is a megadiverse country, and the wealth of biodiversity assets and ecological infrastructure can contribute to national development goals.

South Africa has a well-developed suite of policy and legislation for the management, conservation and sustainable use of biodiversity, including two overarching national tools: the National Biodiversity Strategy and Action Plan (NBSAP) (developed as part of South Africa's commitments as a signatory of the Convention on Biological Diversity; CBD), and the National Biodiversity Framework (NBF) (developed as a requirement of the Biodiversity Act). These documents, developed through thorough stakeholder consultation, set out South Africa's strategic objectives for managing and conserving biodiversity and are the primary reference points for related priority actions. The NBA both informs the development of the NBSAP and NBF, and supports their implementation. Together the NBSAP, NBF and NBA provide three key, inter-related anchors for the work of the biodiversity sector in South Africa (Figure 2).

Closely related to these is the National Protected Area Expansion Strategy (NPAES), which builds on the findings from the NBA (e.g. which ecosystem types are under protected) to identify spatial priorities for consolidating and expanding the protected area network. The NPAES could be considered the 'fourth anchor'.

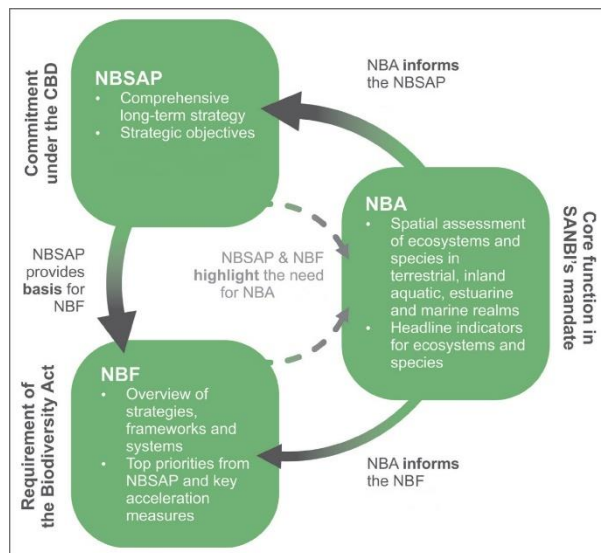


Figure 2: Edited from Figure 100 of NBA 2018 synthesis report Section 4.1. The NBSAP, NBF and NBA together provide key anchors for the work of the biodiversity sector in South Africa. The NBA synthesises best available science to inform the development and implementation of the NBSAP and NBF. The NPAES could be considered the fourth anchor.

The NBA scope is deliberately broad, responding to the broad policy context in South Africa rather than a specific policy question or questions. A key concept from the first NSBA 2004 was that all realms should be considered as equally important, and that the NBA should avoid the terrestrial bias that sometimes characterises the biodiversity sector (perhaps less so now because of the efforts of the NBAs). Another conceptual point was to focus on all components of biodiversity – ecosystems, species and genes.

The broad policy context of South Africa includes pressing development challenges, including poverty, inequality, unemployment and lack of inclusive economic growth, and limited resources to address these. A strength of the NBA is that it is not narrowly tied to a particular policy question in a specific sector, but rather that it becomes a single, authoritative source for information on the status of biodiversity in the country. This source of information is then applied across a wide range of policy uses in different sectors, helping to drive consistency and alignment between policies. The NBA strives to be policy relevant but not prescriptive in its recommendations or advice about responses, providing science-based knowledge products suitable for use and application in a range of sector contexts.

The NBA is cognisant of the policy context but does not pre-empt particular policy issues or questions. Indeed, the broad assessment of biodiversity can help to highlight issues and questions that might not yet be a focus of policy. By providing an overview of the threat status and protection level of biodiversity, conservation actions can be focussed on specific biodiversity priority areas, making the best use of limited resources and avoiding conflicts with other sectors in many cases.

The NBA responds to policy needs partly by distilling key findings (from the huge quantity of findings that result from NBA analyses) that speak to current policy priorities and national development goals. Key findings underpin key messages (see Section 6.4) from the NBA that can be acted on by policymakers and implementers. This aspect of the NBA has been strengthened and made more systematic over successive iterations.

3.3 International context

As signatory to the United Nations Convention on Biological Diversity (CBD) (established in 1992), South Africa is required to produce national reports about biodiversity, as measured through a set of agreed national targets and their associated indicators articulated in the country's NBSAP. The national targets should preferably align with global targets. The most recent global targets were adopted in 2022 as the Kunming-Montreal Global Biodiversity Framework (GBF). The GBF provides for a global alignment and consistent measurement of trends and changes in biodiversity. Since the CBD is the central international context for the NBA it is dealt with in more detail in Section 4.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), established in 2012, aims to strengthen the science-policy interface for understanding human-nature interactions. It achieves this goal by conducting international assessments and promoting national ones (IPBES 2018). A National Ecosystem Assessment (NEA)¹¹ is the IPBES concept of a nationally-driven process aimed at producing an up-to-date, comprehensive synthesis of knowledge on biodiversity and ecosystem services and their connections to people. These assessments are customized to meet national needs and address specific policy questions. The NEA Initiative, overseen by the United Nations Environment Programme's World Conservation Monitoring Centre (UNEP-WCMC), assists countries in adapting the process developed by IPBES to conduct ecosystem assessments.

South Africa's first NBA was undertaken in 2004, well before the IPBES processes or the NEA Initiative. However, the NBA is an excellent example of a NEA. The NBA goes beyond the often used definition of an ecosystem assessment being a synthesis of existing knowledge, as it includes substantial new analyses and generation of new knowledge using a co-production approach.

The NBA plays a role in providing biodiversity related information for reporting on other multilateral environmental agreements in addition to the IPBES and CBD, and these are listed in Section 4.

¹¹ <https://www.ecosystemassessments.net/assessment-process/what-are-neas/>

3.4 The National Biodiversity Monitoring Framework

Although the NBA is the primary mechanism for reporting on biodiversity status in South Africa, there are a number of other relevant and related initiatives.

A National Biodiversity Monitoring Framework (NBMF) has been drafted by SANBI to attempt to align and focus the content of these international, regional and national reporting processes. A key part of this alignment is the selection of a coherent set of biodiversity indicators and indices that communicate the state of biodiversity and allow it to be tracked over time.

Furthermore, a wide range of foundational research and monitoring of biodiversity occurs within SANBI and across other research institutions, various government departments with some level of biodiversity mandate (e.g. Department of Agriculture, Land Reform and Rural Development; DALRRD) and South African universities. Although the NBMF explicitly does not imply that all biodiversity monitoring must directly feed into and fit within the NBMF, the framework nevertheless provides for a strategic approach to allocating effort and resources.

To more widely address biodiversity monitoring and clarify the potential roles and responsibilities of the various partners, SANBI will finalise and publish the draft National Biodiversity Monitoring Framework together with a 5-year implementation plan shortly.

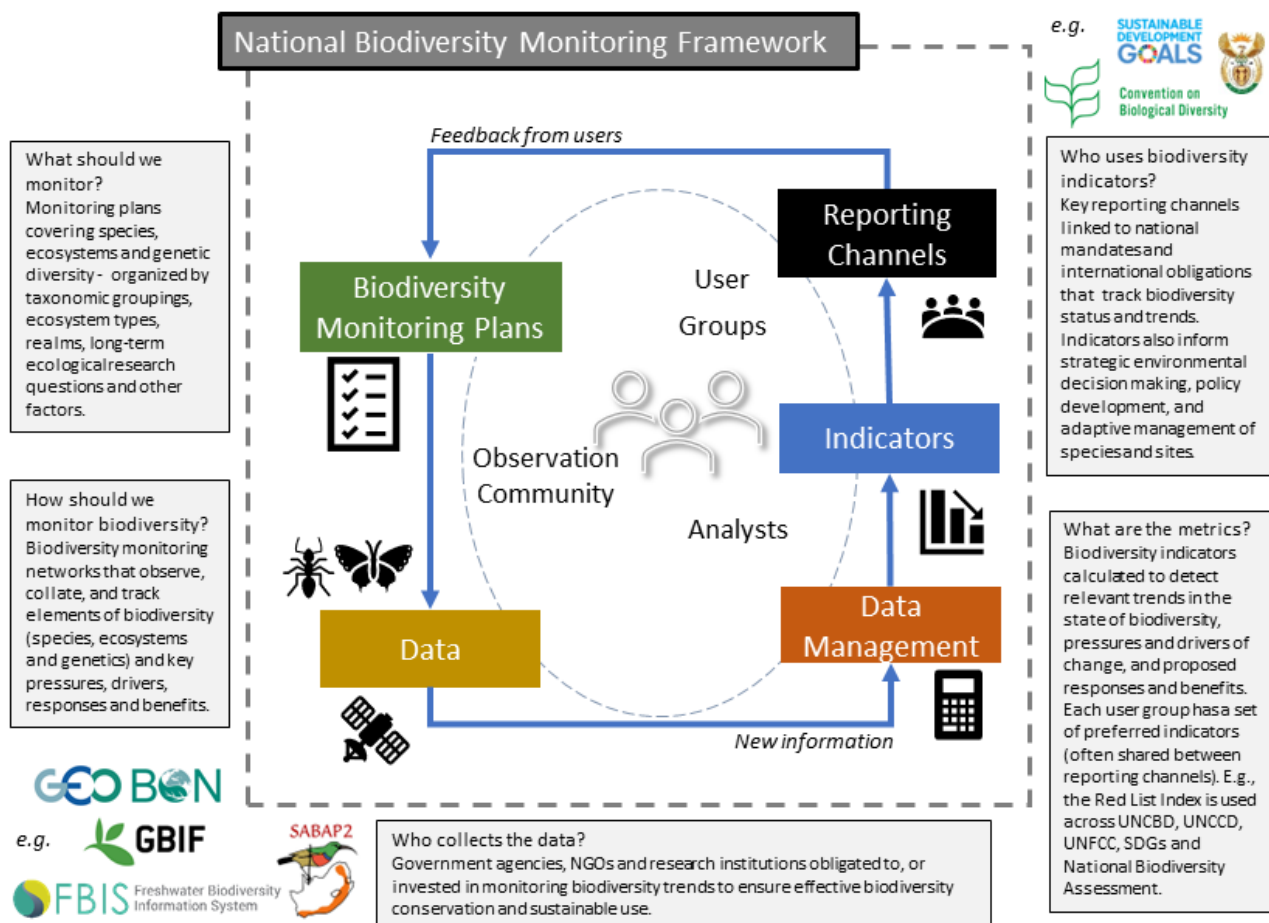


Figure 3: Conceptual diagram of the National Biodiversity Monitoring Framework

4. THE NBA'S PURPOSE

Considering the history and context of the NBA, its purpose can be summarised as:

South Africa's National Biodiversity Assessment is a collaborative effort to synthesise the best available science on the country's biodiversity to inform policy, support decision-making across multiple sectors, and contribute to national development priorities.

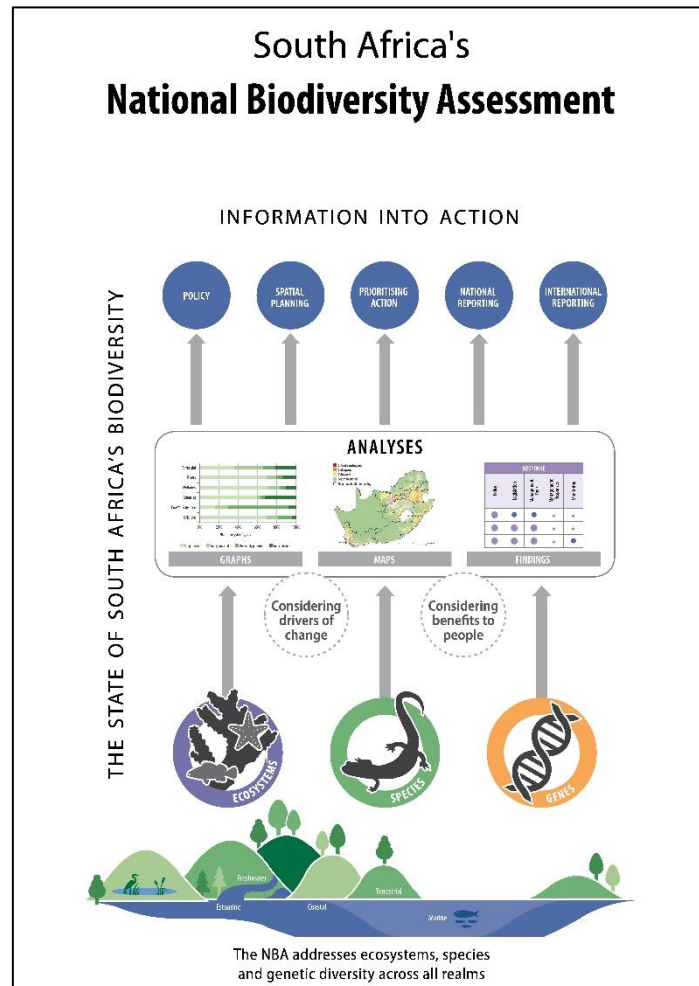


Figure 4: Infographic of South Africa's NBA developed in 2017

This purpose was illustrated through an Infographic (Figure 4) developed before NBA 2018 was released. Subsequent to NBA 2018, the purpose was elaborated on in a journal paper (Poole et al. 2023) and through various consultations. The NBA has seven objectives, which are to:

- i. **inform policy and decision-making across multiple sectors;**
- ii. **support prioritisation and planning for conservation action;**
- iii. **highlight the benefits of biodiversity for people and the economy;**
- iv. **present indicators for both national and international reporting;**
- v. **raise key issues for education and fundraising;**
- vi. **provide a platform for collaboration and capacity development within the biodiversity sector; and**
- vii. **identify crucial data and knowledge gaps to stimulate future research and improvement.**

Each of these is discussed in more detail in their sub-sections below.

i. Inform policy and decision-making across multiple sectors

As a body of work the NBA presents science-based information that can be drawn on by government and civil society in various decision-making processes related to sustainable socio-economic development. The NBA inputs (datasets) and outputs (results) can be applied by a range of different actors and stakeholders in various spatial scales – from granular information that supports local planning and decision-making through to national aggregates that give a high-level picture. Many users may not have read any NBA reports and may not be aware that the information they are using is from the NBA.

The NBA data and information is used in key sectors responsible for natural resources utilisation and/or protection, such as the water, agriculture, fisheries and mining sectors. Examples of the use of elements of the NBA may include certain indicators being repeated in other government reports, a spatial layer from the NBA being used by other sector, or even a concept (like ‘threatened ecosystems’) being used in legislation from other sector (and likely many other examples). The Global Environmental Facility (GEF) defines mainstreaming as: “The process of embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that it is conserved and sustainably used both locally and globally.”

Through its extensive experience, SANBI has learned valuable lessons about mainstreaming that have been shared in numerous publications over the years – including the book *Mainstreaming Biodiversity Priorities* (UNEP-WCMC & SANBI 2022) and an assessment of SANBI’s mainstreaming efforts published as a report for the Living Catchments Project (Marsh et al. 2020).

This document does not seek to cover the lessons learned or how mainstreaming should be undertaken, as this is a diverse topic that usually depends on the situation and audience. Suffice to say that the ‘people, products, process’ approach to mainstreaming recognises that mainstreaming biodiversity involves providing tangible products, but also is an ongoing social process that requires dedicated leadership and expertise.

ii. Support prioritisation and planning for conservation action

An important purpose of the NBA is to support prioritisation and planning for conservation action. The NBA provides information to help prioritise the often-limited resources for managing and conserving biodiversity. Spatial information from the NBA is used in developing provincial spatial biodiversity plans, protected area expansion strategies and protected area planning, and for informing restoration priorities and maps of ecological infrastructure priorities. The NBA data and findings are key for the proactive conservation action led by the conservation sector. The NBA datasets are also useful for processes such as the identification of Key Biodiversity Areas.

SANBI facilitates several communities of practice to ensure that information, findings and datasets from the NBA processes are taken up by practitioners, and many other partners to SANBI make use of elements from the NBA for their particular purposes. No statement, result or product (dataset, etc.) that arises from the NBA processes are legally binding, however such outputs may be taken up into legislation – for example, the results of the terrestrial Red List of Ecosystems assessment has been formally gazetted as the list of terrestrial ecosystems that are threatened and in need of protection.

iii. Highlight the benefits of biodiversity for people and the economy

Highlighting the benefits¹² that South Africa’s biodiversity and ecological infrastructure provide to the economy, society and human wellbeing has been built into NBA since 2004. Even NSBA 2004 noted that a key strategy is to “pursue opportunities to link biodiversity and socio-economic development in priority

¹² There is substantial work ongoing both in South Africa and internationally on the benefits/contributions/services that people gain from biodiversity and terminology in use is continually evolving. Phrases such as ‘ecosystem services’, ‘ecosystem goods’, ‘ecological infrastructure’, ‘benefits of biodiversity’ and ‘nature’s contributions to people’ are in common use. Please refer to the NBA 2018 supplementary document ‘Compendium of Benefits of Biodiversity’ for more information (SANBI 2019).

geographic areas". A key messaging strategy emerging during the NBA processes is that biodiversity assets and ecological infrastructure contribute to national development goals (i.e. it is not 'biodiversity OR development', it is 'biodiversity AND development').

The NBA 2011 identified 'further research on the links between biodiversity and human wellbeing' as a knowledge gap and a research priority for strengthening future NBAs. It is acknowledged that a full assessment of benefits of biodiversity, ecosystem services or nature's contributions to people in South Africa is not within the ambit of the NBA, as many other publications are produced on this material. However, for NBA 2018, an accompanying publication called the Compendium of Benefits of Biodiversity was released – a set of 10 chapters authored by over 90 people. The compendium aimed to illustrate the wide variety of ways that biodiversity and natural systems provide a foundation for economic growth and improved service delivery and human wellbeing – some of the primary intentions of South Africa's National Development Plan.

The Compendium led to some key facts and statistics about benefits being used in the key messages of NBA 2018, which were well received. For example, the statistic estimating that there are 418,000 biodiversity-related jobs was utilised by the Minister of Forestry, Fisheries and the Environment a number of times post NBA 2018.

Work on benefits of biodiversity continues, and the NBA makes use of whatever facts that may help formulate the key messages of the NBA (see Section 6.4).

iv. Present indicators for both national and international reporting

The NBA provides information for a range of national and international level monitoring, reporting and assessment processes, summarised as follows:

National and sub-national reporting

The NBA feeds relevant information or data into the following domestic reports and indicators:

- National State of Environment Report¹³
- Provincial state of environment reports, e.g. the Western Cape State of Conservation Report¹⁴
- Various indicators established by national government to track implementation of national strategies across government departments, for example:
 - o Medium Term Strategic Framework indicators: it is possible that some NBA national headline indicators may also be adopted by the Environment Sector's Medium Term Strategic Framework (which is a five-year framework for each elected government). For MTSF 2019-2024, for example, the Species Protection Level Indicator was adopted, and SANBI reported on this indicator on a regular basis.
 - o Department of Planning, Monitoring and Evaluation (DPME) indicators: Terrestrial Ecosystem Protection Index and Marine Ecosystem Protection Index. SANBI computes these indices, and the data and science that underpins these indicators are produced and refined through the NBA processes (e.g. Marine map of ecosystem types).
- Natural Capital Accounting series (Statistics South Africa and SANBI), where the same underlying spatial data layers used for the NBA are used for accounts; e.g. Land and Terrestrial Ecosystem Accounts, Accounts for Protected Areas

Multilateral environmental agreements and international bodies

Figure 5 showcases some of the international conventions or multilateral environmental agreements (MEAs) to which South Africa is a signatory. The NBA, along with various other scientific outputs from SANBI,

¹³ <https://soer.environment.gov.za/soer/>

¹⁴ <https://www.capenature.co.za/uploads/files/Western-Cape-State-of-Conservation-Report-2022.pdf>

contributes to the national government's responsibilities with regards to reporting on these conventions. The conventions, agreements and international bodies to which the NBA findings contribute include:

- Convention on Biological Diversity (CBD) (including the latest Kunming-Montreal Global Biodiversity Framework and South Africa's National Biodiversity Strategy and Action Plan). It is important to note that several of the NBA's 'national headline indicators' (see Section 5.2) are exactly the 'Headline', 'Component' and 'Complementary' indicators of the GBF – e.g. the Red List of Ecosystems and Red List of Species.
- United Nations Convention to Combat Desertification (UNCCD)
- United Nations Framework Convention on Climate Change (UNFCCC)
- Sustainable Development Goals (SDGs)
- The Ramsar Convention on Wetlands
- Convention on the Conservation of Migratory Species of Wild Animals (CMS), and Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Group on Earth Observation (GEO) and GEO BON (Biodiversity Observation Networks) and affiliates, such as the Freshwater Biodiversity Observation Network (FWBON)
- Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)
- The International Plant Protection Convention

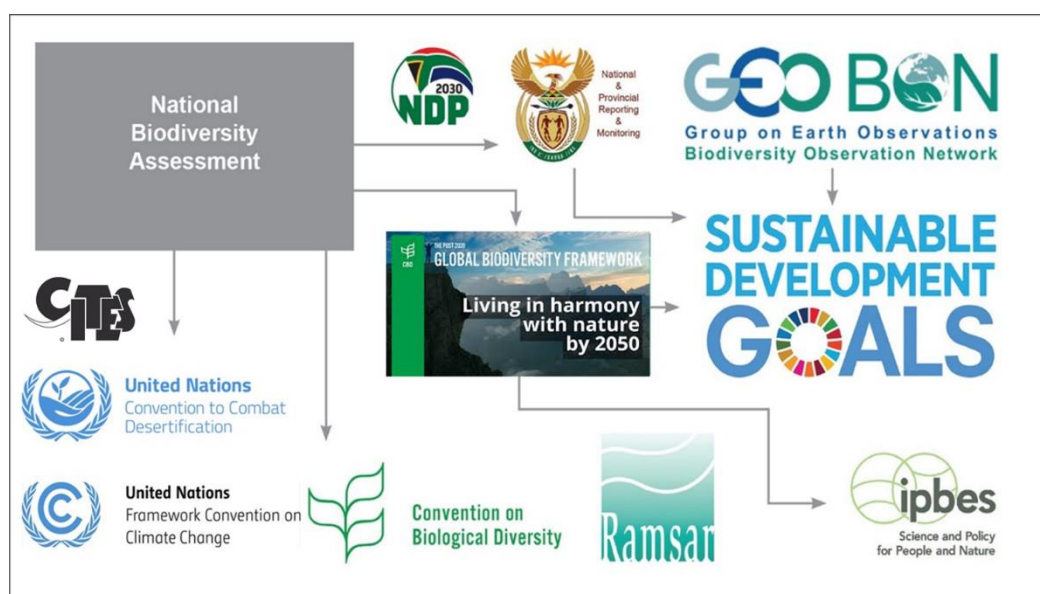


Figure 5. Illustration of national and international reporting processes and channels into which the NBA is a key informant. Including international conventions signed by the South African Government and voluntary processes.

v. Raise key issues for education and fundraising

The NBA is a key reference and educational work for use by academics, scientists, students, non-profit organisations and funders. When asked 'What are the main ways that you used information from the NBA 2018?', survey respondents ticked the options 'In presentations about biodiversity (general awareness)', 'As part of teaching / education / training', and 'To provide an overall biodiversity profile of South Africa' – illustrating how important the NBA is as a resource for general awareness and education.

Findings from the NBA are used as motivation in fundraising proposals. For example, a key data gap acknowledged in NBA 2018 was the lack of terrestrial ecological condition data that can be utilised in Red

List of Ecosystems analyses. This was used as part of the motivation for a regional project with Namibia, Mozambique and Malawi for the period 2022 to 2027, led by SANBI and funded by French donors. Another example is the GEF-funded Grasslands Programme (2008-2013), which was initiated based on NSBA 2004 findings that grasslands are threatened and poorly protected.

vi. Provide a platform for collaboration and capacity building within the biodiversity sector

The NBA process serves as an effective national level platform for encouraging and facilitating collaboration, information sharing and, importantly, capacity building in the biodiversity sector in South Africa. More information about how this is achieved is in Sections 6.1 and 8.

vii. Identify crucial data and knowledge gaps to stimulate future research and improvement

Importantly, the NBA identifies important national knowledge gaps and research priorities linked to biodiversity. Although the NBA and its data sources have evolved over time, a number of avenues for improvement remain.

The NBA importantly scrutinises the current limitations of the assessment and the assumptions necessary, and then provides recommendations for research priorities and essential long-term monitoring needs to improve on current knowledge gaps and make future assessments more accurate. NBA 2018 had a specific chapter on research, monitoring and data management priorities that are necessary for strengthening future NBA analyses.

The filling of data and knowledge gaps is undertaken by the broader biodiversity science community in South Africa, with each NBA revealing the iterative improvements.

5. THE SCOPE OF THE NBA

5.1 The principles of NBA scope

The scope of the NBA is determined by a combination of the SANBI mandate (see Section 2), SANBI's vision, mission¹⁵ and value chain (Figure 9), and the policy context in South Africa (see Section 3.2). Since 2004, the scope of the assessment has become larger and more comprehensive, incorporating more elements of biodiversity, pressures on biodiversity and benefits of biodiversity. The accompanying reports and materials have also expanded in scope over time – resulting in many additional reports being connected to the NBA.

However, the following principles of the scope of the NBA are key:

- a) The NBA covers all three components of biodiversity: ecosystems, species and genetic diversity;
- b) The NBA covers South Africa's full territory, including its offshore marine environment and its subantarctic territory of the Prince Edward Islands.
- c) The NBA covers all realms – the terrestrial, freshwater (rivers and wetlands), estuarine and marine (benthic and pelagic) realms, as well as the coast as a cross-realm zone.
- d) The NBA provides a summary of the state of South Africa's biodiversity at regular points in time (see Section 6.2) and identifies important trends where possible;
- e) The NBA has a strong focus on presenting spatial information (e.g. maps of ecosystem types, maps of ecological condition, species distribution maps, maps of threat status and protection level, etc.), accompanied by rich descriptions and definitions of these types, that can be reused for many other analyses and prioritisation exercises;
- f) The NBA is used to highlight the benefits that biodiversity and ecological infrastructure provide to the economy, society and human wellbeing;
- g) The NBA distils key findings that are of particular policy relevance and highlights possible sector responses and actions to conserve biodiversity and promote sustainable use and development.

The NBA uses a modified version of the 'DPSIR' (the drivers, pressures, state, impact and response) framework for describing the interactions between society and the environment (see Wikipedia URL provided in reference list), focussing on the pressures, state and response elements.

¹⁵ <https://www.sanbi.org/about/vision-mission-and-values/>

5.2 National headline indicators of the state of biodiversity

The NBA uses available foundational biodiversity information (i.e. what biodiversity there is and where it is; see Section 3.1) on ecosystem, species and genetic diversity across all realms and combines it with available information on pressures and ecological condition, thereby allowing for the assessment of the threat status of biodiversity utilising the IUCN categories and criteria of the Red List of Ecosystems and the Red List of Species. The NBA also combines the same foundational information with information on the protected area network, allowing for analyses about how well protected that biodiversity is currently (this protection level analyses utilises South Africa's own methodology).

Current NBA (i.e. South Africa's national) headline indicators are threat status and protection level for both species and ecosystems, and some of these national headline indicators are the same as the Headline Indicators of the GBF. The four national headline indicators (Figure 6) provide the state of ecosystems and species in South Africa:

- Ecosystem Threat Status (using the IUCN Red List of Ecosystems)
- Ecosystem Protection Level (using South Africa's own method)
- Species Threat Status (using the IUCN Red List of Species)
- Species Protection Level (using South Africa's own method)

The two ecosystem national headline indicators have been in place since NSBA 2004, while the species indicators were added in NBA 2011 and NBA 2018 (see Appendix A).

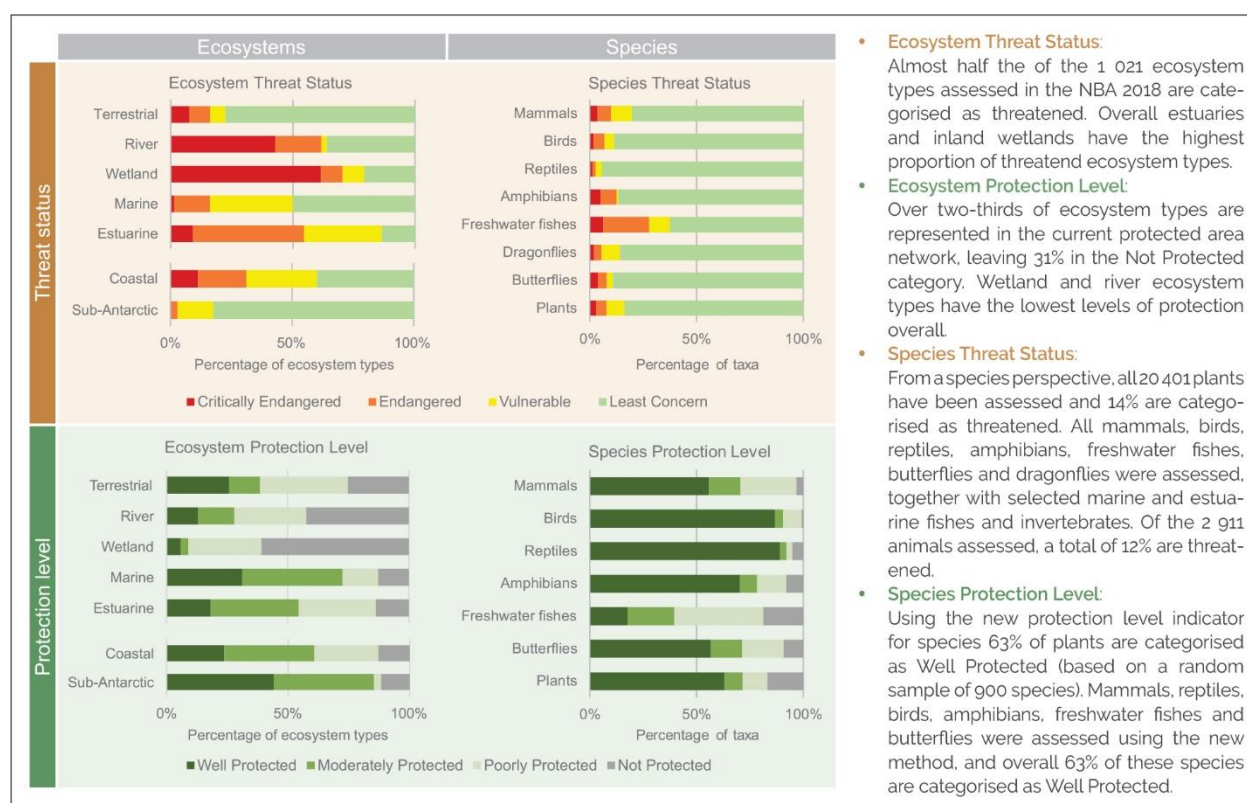


Figure 6. The NBA 2018 national headline indicator graphs and their summaries

Historically, assessing the status of species through the IUCN Red List of Species¹⁶ (established in 1964) was the main indicator of the health of the world's biodiversity. The work is under-pinned by the identifying and classifying of species, as well as key information on species distribution and population sizes. The NSBA 2004 introduced a comparable indicator for assessing the state of ecosystems in South Africa, called

¹⁶ <https://www.iucnredlist.org/>

'ecosystem threat status', underpinned by the classification and delineation of ecosystem types. South Africa therefore developed its own ecosystem threat status framework well before the IUCN Red List of Ecosystems¹⁷ was developed as the international standard for assessing the status of ecosystems (v1.0 released in 2016). NBA 2018 was the first time that the IUCN Red List of Ecosystem methodology was tested alongside the established South African Threatened Ecosystem process, and a journal paper was published about this comparison (Botts et al 2020).

The national headline indicator ecosystem protection level was developed in South Africa for NSBA 2004 and addressed how well represented an ecosystem type is in the protected area network. In the 2004 and 2011 national assessments protection level was only applied to ecosystems, but SANBI's Threatened Species Programme then developed a protection level indicator for species and results were reported on for the first time in the NBA 2018 for selected taxa.

These national headline indicators will feature in all future NBAs, as they enable two powerful types of analysis once the methodology is stable:

- time series analysis of the threat status and protection levels of ecosystems and species (see Section 5.3); and
- meaningful comparison across realms and between taxonomic groups.

The four national headline indicators also provide a standardised framework that links with policy and legislation in South Africa. Thus, the indicators facilitate the interface between science and policy – e.g. if a species or ecosystem at a particular site is on the relevant lists of threatened species or threatened ecosystems, this flags additional criteria for site-level EIAs. There is growing recognition within government and other institutions of this framework and the need to respond to these national headline indicators in planning and decision-making.

Additional national headline indicators are under development to address key elements emerging from the GBF, such as genetic diversity¹⁸, restoration and benefits¹⁹ of biodiversity. The NBA will adapt to these needs and remain aligned to national and international processes.

¹⁷ <https://iucnrl.org/>

¹⁸ Genetic diversity Indicators of the GBF: i) A proxy indicator to track genetic erosion at the national level shows areas that might be sensitive to a loss of overall phylogenetic richness because local populations of species will be lost were the land cover is no longer suitable for that species (was explored for the first time in NBA 2018); ii) Proportion of genetically distinct populations maintained. Distinct populations are the result of demographic and evolutionary history of species, which have resulted in accumulated genetic differences and likely local adaptations. The need to retain all distinct populations ensures species will be able to adapt to different environmental conditions and thus be resilience in an ever-changing world; iii) Proportion of populations within species with an effective populations size (N_e) greater than 500. This is a proxy indicator for the rate of decline of genetic diversity within populations. Below an N_e of 500, populations are at risk of extinction (e.g., due to inbreeding, loss of adaptive potential).

¹⁹ While benefits of biodiversity always featured in NBAs, it will become possible to feature these are more quantitative indicators in future, to better align with GBF and IPBES approaches. For example, SANBI is currently participating in a project called the Multidimensional Biodiversity Index, which includes proposed conceptual models for assessing how loss and degradation of natural areas impact the capacity of these areas to provide services and potential national indicators for reporting on how the condition of natural areas impacts biodiversity benefits to people.

5.3 Trends in threat status, protection level and other indicators

The four national headline indicators of the NBA should form the basis for indices that track change over time. The ability to track change requires stability in methods.

One such index, developed by the IUCN, is the Red List Index for Species that tracks changes in extinction risk across entire species groups between Red List assessments. It is used to track progress against the CBD Targets and Sustainable Development Goals.

A similar Red List Index for Ecosystems has been developed and will form part of future NBAs (Rowland et al., 2018), and South Africa has been a key pilot for testing this index.

Protection Level indices have been developed and will be included in future NBAs (Harris in prep, Von Staden in prep).

Similarly, as the new genetic indicators and benefits indicators mature in terms of input data and computation, the ability to undertake trend analysis will improve and the relevant indices will be published as part of the NBA.

5.4 Priority actions, responses and interventions

The NBA may observe the range of responses or interventions to the pressures on biodiversity currently undertaken by government and civil society – such as national legislation and strategies, provincial and regional spatial biodiversity planning, protected area expansion, sustainable use initiatives and invasive alien plant clearing programmes. The NBA does not do a comprehensive assessment of responses or interventions, or comment on the representation or effectiveness of these responses, although it may provide an overview of what interventions have resulted in positive outcomes, especially through key messages (see Section 6.4).

The NBA is a strategic tool from which important discussions about priority actions, responses and interventions should flow through consultative processes involving all stakeholders. This ‘response’ side of the Driver-Pressure-State-Impact-Response (DPSIR) framework is a multi-discipline arena and such outputs should be co-produced between all relevant stakeholders so that uptake and implementation is enhanced.

In some realm technical reports of the NBA to date (e.g. marine and estuarine), there has been a concerted effort to identify and distil a ‘top 10’ priority actions – this is usually possible to do so while the findings of the NBA are emerging because many of the stakeholders who may be involved in the actions are already associated with the NBA process. This is not always possible in the other components of the NBA (e.g. terrestrial or freshwater realm) where the stakeholders and those who must discuss and make decisions on priority actions are diffuse and are not necessarily closely associated with the NBA process.

6. KEY TENETS OF THE APPROACH TO THE NBA

6.1 Dividing work into Components and Modules

Dividing the NBA up into Components and Modules is essential to ensure that the enormous body of NBA work is undertaken by the experts who are specialists in their field, and so that each group of experts can be managed by a leader who can liaise with the overall NBA Scientific Lead at SANBI. It is also essential for succession planning and capacity building.

The main **NBA Components** are the realms, themes and cross-realm zones, as follows:

NBA Component	Explanation of what the component is
Terrestrial	Realm
Freshwater – sub-components: wetlands, rivers	Realm
Estuarine	Realm
Marine	Realm
Subantarctic territory	Cross-realm terrestrial, freshwater and marine
Coastal cross-realm zone	Cross realm zone, all realms
Genetic diversity	Theme cutting across all realms
Species	Theme cutting across all realms
Pressures on biodiversity: climate change*	Theme cutting across all realms
Pressures on biodiversity: biological invasions*	Theme cutting across all realms
Mainstreaming and uptake	A process-orientated theme that starts during the development of the NBA and continues post release

*Note that these two pressures are not the only pressures on biodiversity, however they have separate programmes of work at SANBI and therefore are each a Component as they have leadership at SANBI.

Each NBA Component has relevant audiences, which may be South African and/or global – e.g., there is an audience for a summary of the findings in the estuarine realm, as there is an audience for a cross-realm summary of findings relating to species. The website format of the NBA (see Section 7) will allow for these summaries of Components.

As each NBA Component is a large body of work, a key feature of the NBA 2025 and onwards is that the work is broken down into smaller **NBA Modules**, each with leads and contributing authors assigned. This Module approach is a) so that Component Leads do not carry the full burden alone, and b) so that new leadership can emerge by individuals managing smaller pieces of the NBA and gradually gaining confidence to lead large Components of work (i.e., succession planning, see Box 1).

An NBA Module is usually the set piece of work that results in a finding, possibly a dataset and likely a message or short summary explanation on a webpage.

A Module has an audience in that a user has likely inputted a search string to land on that Module webpage. For example, Modules of work in the Terrestrial Component of NBA 2025 would be:

- Overall summary of terrestrial findings
- Terrestrial map of ecosystem types
- Pressures in the terrestrial realm
- Ecological condition in the terrestrial realm
- Terrestrial Red List of Ecosystems
- Terrestrial ecosystem protection level
- Terrestrial Red List of Species
- Terrestrial species protection level
- Genetic diversity in the terrestrial realm

Each module of work would result in the webpage for that Module consisting of summary text and an image/map/graph. The webpage then links to any of the following (where relevant): a published peer-reviewed journal article, a GitHub repository containing the code required to replicate the analyses, and a link to an online data repository with the input data (see Section 7.1).

The efforts of all NBA authors and contributors, many of whom are not SANBI employees, must be acknowledged and the ability to cite each module will re-enforce trust between stakeholders. It is envisaged that a citation will be provided on each NBA webpage – i.e., for each Module of work.

Box 1: Capacity building as a key NBA approach and output

An important part of the NBA approach, which also becomes a key output of the NBA process, is the vast capacity building and the broad participation of emerging researchers, interns and students that takes place during the approximately four to seven years of work undertaken between each NBA release and between the ongoing updates on the website. This ensures continuity of experience and knowledge into the future.

Numerous interns, students, research assistants and young staff from various institutions are involved in many aspects of NBA work. Their learning includes observing the NBA governance processes, specialist GIS work improving the maps of ecosystem types, digitising and georeferencing specimen records, assisting on fieldwork, cleaning data for Red List assessments, undertaking literature reviews, assisting with analyses and writing up the results, and much more.

It is important to keep a record of this type of contribution (see Section 9.2). For the NBA 2018, SANBI alone had over 20 research assistants and interns during the 2015-2019 NBA period, and also several students who conducted research projects relevant to the NBA.

6.2 A 'living' assessment that feeds into key reporting requirements at specific times

An important lesson learned from previous NBAs is that the timing of an NBA release should be before the national report is due to the CBD to ensure that the best possible data is incorporated into the national report. While the NBA findings also feed into other Multilateral Environmental Agreements, the CBD national report is the one that utilises the national headline indicators directly (see Section **Error! Reference source not found.**).

This means that although the NBA is a website where certain Modules can be updated whenever relevant (see Section 7), the NBA is still a stand-alone assessment of South Africa's biodiversity at that particular point in time when its data is used for the obligations to the CBD.

This mixture of a 'living' assessment where key Modules are updated when relevant and a stand-alone assessment at a point in time is valuable for several reasons, including:

- The improvement of foundational biodiversity information can continue in between assessments without a rush to have a major update ready by a certain timepoint – i.e. the assessments of threat status and protection level can occur whenever needed and reference the underlying foundational dataset that is used rather than major version releases of the underlying dataset being required before the national headline indicators are assessed;
- The ongoing updates at relevant timepoints means that users of various indicators can cite the latest update without waiting for the 'release' of the full NBA – this goes some way to mitigate certain content of the NBA being outdated as soon as the synthesis or detailed component technical report is published (as was the case in NSBA 2004, NBA 2011 and NBA 2018);
- The feedback loops about priority actions to address pressures on biodiversity (see Section 5.4) can proceed without waiting for the 'release' of the NBA (see Section 7.2) – e.g. if an estuarine threat status indicator is updated and reveals a specific need, then the sector-specific action plans / strategies can be formulated immediately.
- The ongoing updates at regular timepoints are a result of what data are available and which experts can contribute at that particular time (i.e. key to the purpose of the NBA 'to synthesise the best available science on South Africa's biodiversity'), and this ongoing rolling update process will encourage new experts to contribute relevant data and time to ensure ongoing improvements;
- As technology improves, it should become possible to undertake more NBA-related assessments at shorter time intervals and provide information on a more real-time basis.
- The stand-alone assessment of the status biodiversity at the point in time where South Africa is required to submit a national report to the CBD is an opportunity to have a launch event with high-level officials (see Section 7.2).

6.3 Transparent and repeatable workflows, good data management and accessibility

A key principle of the approach to the NBA is to provide clearly documented workflows and metadata for all underlying datasets.

While all methods and data were clearly described in the technical reports for NSBA 2004, NBA 2011 and NBA 2018, many of the underlying analyses were inaccessible to those other than the experts computing the analyses. This prevents reproducibility and hinders transparency. It also makes iterative updates to indicators or metrics challenging and inefficient, and complicates version control. It may also exacerbate the risk of loss of expertise, knowledge and data during staff turnover.

While static documentation is appropriate for some tasks underlying the NBA, for NBA 2025 we aim to develop well documented and reproducible workflows for the analyses, and to serve the indicators and their accompanying synthesis on an interactive web platform that facilitates uptake. This desire is fully described in the paper '*Taking state of biodiversity reporting into the information age – A South African perspective*' (Poole et al. 2023).

It is also essential for input datasets used in the NBA process to be transparent. Documentation should include technical notes, motivations and references for spatial data modifications. Where static documentation has been used for curating tasks, these outputs have been made available over a public repository curated by SANBI called OPUS. This allows for further exploration of the source of changes between NBAs and tease apart differences that are related to the assessment approach versus those related to actual changes in the baseline dataset.

A second component of reproducibility is the ability to conduct analyses on comparable platforms. Efforts were made in NBA 2018 to explore both open source and proprietary software for the analysis of ecosystem loss. Work on exploring various scripting languages (R, Python, SQL) and documentation software (Markdown, Quarto, Jupyter) will continue.

6.4 Development of key messages

Always a key tenant of each NBA, the approach to developing and presenting key messages was refined for NBA 2018, and thereafter the approach was published in Mainstreaming Biodiversity Priorities (UNEP-WCMC & SANBI 2022).

Reflecting the ‘Making the Case for Biodiversity’²⁰ thinking, each key message from the NBA has three elements:

- **A finding** that is linked to the evidence emerging from the NBA analyses or latest research. The finding is usually illustrated in some way through a graph, map or infographic (and possibly also through a photograph). This paragraph is a brief of what the authors want the target audience to know, and usually includes links to where they can read more detailed information about the finding.
- **A ‘so-what’** statement that describes why the finding is important. This paragraph explains a bit more about why this finding matters – e.g. What are the economic or emotional values or consequences of the finding?
- **A ‘call to action’** that describes the practical actions that can be done. This paragraph explains what the target audience can do to make a difference. This positive framing of what can be done inspires action, as opposed to apathy when a message is framed as ‘doom and gloom’ with no solutions presented.

Key messages should be as short as possible, and likely consist of only three paragraphs (the three elements described above). In addition, each key message usually has a number, a catchy title, and a short paragraph containing a confidence statement. See Figure 7.

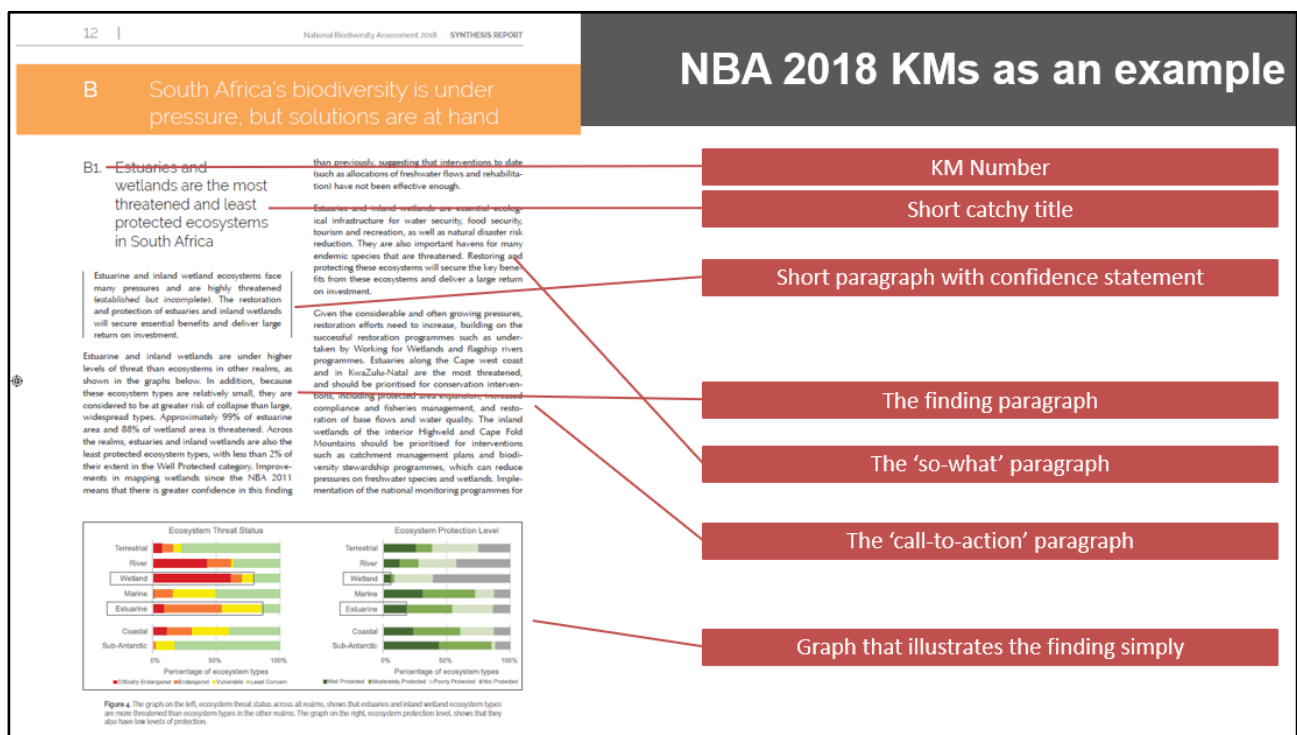


Figure 7. The elements of a NBA key message using an example from NBA 2018

The production of key messages for a particular NBA release (see Section 7.2) is a collaborative process that works from Module level upwards until a coherent set of over-arching key messages for that NBA release is formulated.

²⁰ A SANBI Factsheet is being produced (SANBI in press)

A module may have its own key message – for example, the ‘Ecological Condition of Wetlands’ Module may have a key message that certain wetland types have poorer ecological condition than other types, resulting in decreased ecosystem services (e.g. water purification), and therefore requiring priority actions (e.g. restoration of upstream catchment, better waste water treatment, etc.).

Usually Component teams (i.e. all the authors for Modules within a Component) then come together to discuss and refine the key messages from the Modules in their Component, and collectively decide on key messages important for the overall summary of the Component.

Collectively, Component and Module Leads have several ‘writing retreats’ during the lead up to a release of an NBA to discuss the emerging findings and proposed key messages. Substantial discussions may be held on the current policy priorities for the country, resulting in a smaller number of over-arching (usually cross-component) key messages that go through detailed wordsmithing for a particular NBA release. Key messages are then usually clustered and numbered, with catchy titles and captions of accompanying images and graphs usually requiring substantial workshopping.

The key messages must be co-developed between the scientists who run the analyses and the practitioners / policy advisors / decision makers – as this co-production of knowledge is a vital part of ensuring the NBA findings recommended ‘calls to action’ are taken up and collectively ‘owned’. The key messages must have a policy and/or implementation lens so that the implementation of priority actions, responses and interventions (see Section 5.4) is encouraged.

6.5 Review and approval processes

While the NSBA 2004 and NBA 2011 had good uptake in policy and implementation, the methods and results of these assessments remained largely in grey literature. This may have limited their uptake by other professionally registered and recognised scientists and researchers. For the NBA 2018, there was an explicit goal to publish important aspects of the assessment in formal scientific literature. This was built into the work programme of each realm or theme from the start and was a key focus of 2019 and 2020 after the NBA 2018 launch event in October 2019.

Peer review is an important step in the production of scientific reports and the NBA is subject to such peer review at both the Module level and at the Summary of Findings & Key Messages level.

The **Modules** of NBA work should receive an independent peer review by suitably-qualified experts. The external reviewer(s) should not be a member of the author and contributor group (see Section 8.4), but may have participated in the consultative workshops. The external reviewers are appointed by the Module Lead in consultation with the appropriate NBA Component Lead and the NBA Scientific Lead.

If there is a summary for a particular **NBA Component** that is published as a short technical report, this report should also have an independent review by a suitably-qualified expert who was not a member of the Component Reference Group.

For all external review, an internal SANBI review editor (a SANBI scientist who was not involved in the NBA process) could be appointed to provide guidance to the lead authors on how to address comments obtained from the external review and a 'comments and responses' document should detail how each reviewer comment was addressed. The Comments and Responses documents for each Module must be retained on file in case there are ever any complaints or disputes about the NBA process.

The **Summary of Findings & Key Messages** (see Section 7.2) is primarily authored by the NBA Component Leads with contributions from the NBA Module Leads, and the overall responsibility for the coherence of this summary lies with the NBA Scientific Lead and Project Manager. The Summary of Findings & Key Messages draft then undergoes various reviews with stakeholders, likely as follows:

Stakeholder group	Timeframe (as for NBA 2025 as an example)
NBA Core Reference Group are the first people to provide a peer-review to draft key messages – especially on those messages where they were not involved directly in the analyses	Drafting during first writing workshop in November 2024. Near-final drafts of as many key messages as possible available by end March 2025
Draft key messages tabled with relevant Working Groups and NBA Strategic Advisory Committee	Approximately April/May 2025
Draft key messages tabled with SANBI Biodiversity Assessment and Planning Cross Functional Steering Committee	Approximately May 2025
Draft key messages tabled with MINTECH and MINMEC for noting	Approximately June/July 2025
Full SFKM booklet (laid out version) to SANBI Board RD&I Committee, Minister's office, DFFE leadership, etc.	September or October 2025

7. THE FORM (PACKAGING) OF THE NBA AND COMMUNICATING RELEASES

The NBA has a varied audience each with different needs, and it is vital that the products through which the NBA is presented fulfil this required function.

The NSBA 2004, NBA 2011 and NBA 2018 are in the form of detailed technical reports and a synthesis report, served as PDF files via a simple, static web page. There was a trend of increasing detail and depth of information between 2011 and 2018 with some realms producing very substantial and detailed technical reports (more than 500 pages). Selected spatial and non-spatial datasets referred to from the reports are available for download.

Careful consideration went into the scope and approach of the NBA post the release of NBA 2018.

Therefore, the current form of the NBA 2025 is envisaged to be two key products:

- a. a website taking users to what they want most via menus and search functions; and
- b. a Summary of Findings & Key Messages booklet that is released at a launch event.

Each of these is discussed individually in the sections below, followed by a separate section about datasets.

Several other popular products should be created from NBA results, and may depend on the audience – e.g. press releases, films, pre-recorded PowerPoint presentations for people to watch in their own time, fact sheets for educators, social media posts, conference presentations, etc. These items form part of the NBA Communication Plan, which is a separate document that is developed with SANBI's experts on science communication.

Due to the form of the NBA being a mixture of a 'living' assessment where key Modules are updated when relevant and a stand-alone assessment at a point in time, the NBA Communication Plan must allow for communication initiatives relating to the release of a new version/findings of a particular module and for a high-level launch event.

7.1 A website with updates at relevant time points

It is envisaged that the NBA website will allow the different users to access the information and products they most need. Search functions will allow users to immediately access the webpage or product (e.g. dataset) they are most interested in. There will also be an overall NBA landing page, and a menu will be structured off the main NBA landing page so that users entering from the 'short url' (<http://nba.sanbi.org.za/>), which is utilised on popular materials and at the launch function, will still be able to drill down to their items of interest without using the search facilities.

Structuring the NBA website takes careful consideration and planning of how the pages link to each other – e.g., a page with the overall summary of marine findings would need to link to the page on the Red List of Ecosystems findings for the marine realm as well as a page on pressures in the marine realm. Figure 8 is a rough mock-up of how the main pages of the NBA 2025 website could link to each other. Each Component would have several sub-pages.

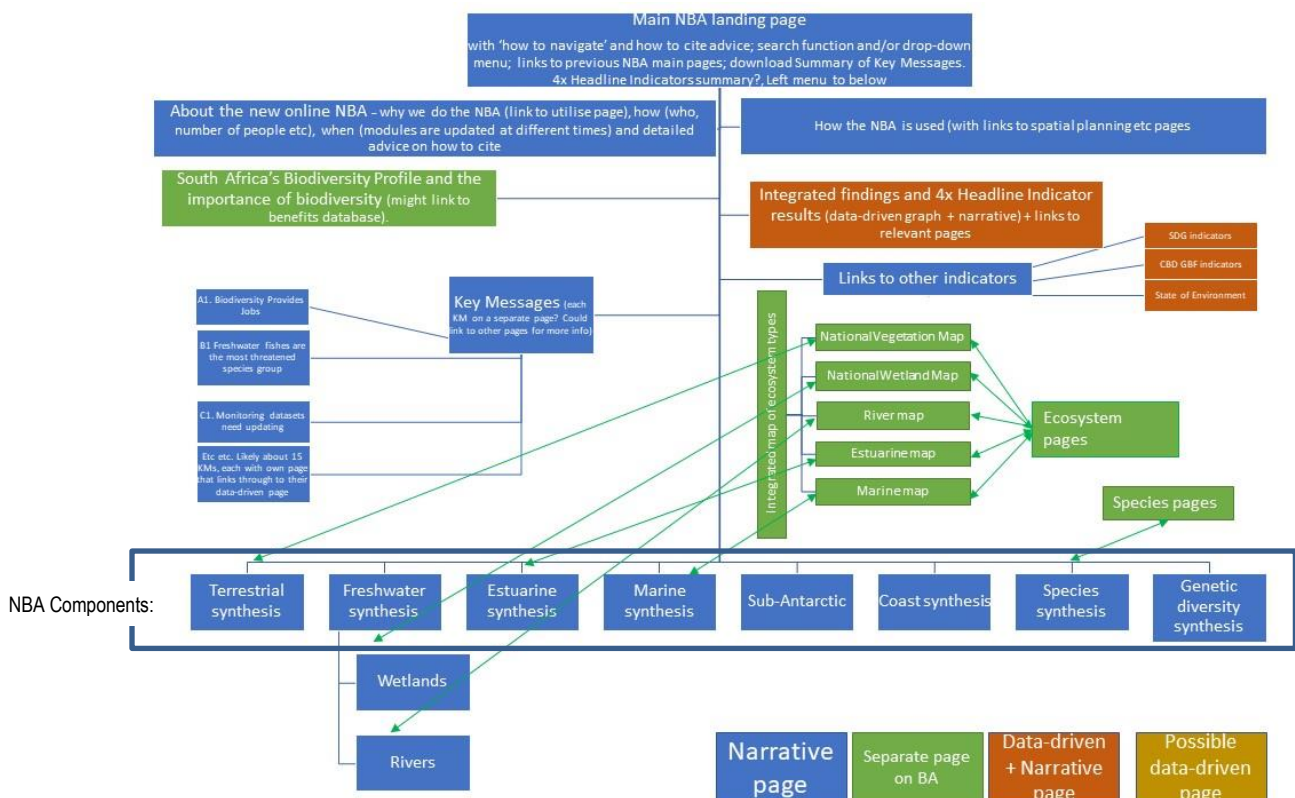


Figure 8: Rough mock-up of how the main pages of the NBA 2025 website link to each other, each Component would have several sub-pages (each Module would be a sub-page)

Each webpage would have summary text and an image/graph/map. Guidance on the specific aspects of a webpage (e.g., how many words fit suitably next to a graph or map of a particular size) is important.

Different users would then be directed to additional resources depending on their needs – e.g., to a longer technical report, to a journal paper articulating the results, to download the relevant spatial datasets, or to the specific code used for the analyses. Each webpage will have a citation so that users know how to cite the findings and what version they are using.

Having each Module of NBA work (see Section 6.1) result in its own webpage means that the Module can be updated at relevant timeframes for that Module (i.e., when a relevant update is available) rather than waiting for a release of the Summary of Findings & Key Messages at a launch event. Some Modules may only be updated on a ten-year timeframe, while others may be much more frequent. More Modules may become more automated over time as tools and capabilities improve. The website allows for this rolling update process, and users will become familiar with citing the correct version of information.

7.2 ‘Summary of Findings & Key Messages’ booklet released at a launch event

For NBA 2011, a summary book titled ‘Life: the state of South Africa’s biodiversity 2012’ (SANBI 2013) was printed. It was aimed at a broad, non-technical audience including policy makers and other members of the public, and had an accompanying compact disc of all the technical reports and key figures that could be reproduced. For NBA 2018, a booklet titled ‘NBA 2018 Facts, Findings and Messages’ was printed alongside the official synthesis report book and users were instructed to cite the synthesis report.

Research via surveys, consultations and a systematic review after NBA 2018 revealed that few users want a full printed synthesis book and that most users want to search for exactly what they are interested in – and they usually conduct such a search using the PDF files of the synthesis or technical report. The move to the online website with regular updates is accommodating user needs.

However, the value of a shorter less-technical printed booklet is still recognised for several reasons – including:

- it is a tangible product for high-level officials to showcase at a launch function;
- it provides media personnel with a colourful summary that may entice them into exploring certain NBA results more deeply;
- it is a short one-stop summary – which is possibly all that some audiences will read; therefore, it is similar to the ‘Summary for Policy Makers’ recommended through the IPBES assessment processes.

The ‘**Summary of Findings & Key Messages**’ (**SFKM**) **booklet** (which could be named differently) is therefore the primary glossy printed product of the NBA and focuses on the main findings and key messages across all NBA components.

It is valuable to have an event at which the Summary of Findings & Key Messages (and other products as relevant) are launched. High-level political participation is encouraged for this kind of event, which usually attracts media personnel. A launch event provides an opportunity for a presentation to be given of the key messages, and the event usually encourages media interviews with key experts (e.g. radio, television and social media exposure) and/or articles writing by journalists being published to broaden exposure after the event.

The time between each launch of the SFKM booklet is called the ‘NBA Cycle’. Having a specific time period for each iteration of the NBA is important for tracking contributions – see Sections 9.1 and 10.

Box 2: Version control and recommended citations

Each NBA has traditionally been named after the year of the data used in the assessment – e.g. NBA 2011 was launched in 2012, but used 2011 data. Due to the move to the website with more regular updates of certain indicators, a recommended citation will need to be provided on each Module webpage (see Section 7.1) so that it is clear about the version of the data and/or analyses being cited. Similarly, the Summary of Findings & Key Messages booklet must provide a recommended citation. Any accompanying technical documents must clearly indicate which version of the foundational data was used as an input. Within a NBA Cycle, not all datasets or results of national headline indicators will be versioned at the same timepoint. For example, NBA 2025 may use a 2023 marine map of ecosystem types, a 2024 map of terrestrial ecosystem types, and the spider Red List assessment from 2022. Hence good version control and clear recommended citations are essential to ensure users are informed.

7.3 Datasets

All four national headline indicators can only be calculated if the ecosystem types have been surveyed, mapped and classified, and the species have been identified and classified – and this information is as up-to-date as possible and on a national scale. Similarly, other indicators (e.g. genetic indicators) have their own underlying datasets.

The NBA therefore acts as a stimulus for updating and releasing datasets that inform the NBA analyses. Each updated national headline indicator is therefore accompanied by an update in these relevant datasets (with the version being specified, see Box 2), which are then served via links off the NBA website to be available for users who wish to undertake their own analyses using NBA data.

In summary, the following **essential spatial data layers** underpin the work of the NBA:

Agreed and aligned national maps of ecosystem types for each realm, developed through the South African National Ecosystem Classification System (SA-NECS). South Africa has some of the best ecosystem mapping and classification in the world, with huge advances since NSBA 2004. The NBA 2018 resulted in aligned marine, estuarine and terrestrial ecosystem maps to form an integrated national map of ecosystem types. Together with the rivers and inland wetland ecosystem types, the integrated map for the NBA 2018 included a total of 1 025 distinct ecosystem types covering South Africa and its subantarctic territory. This national ecosystem classification system is an essential underpinning of the assessments going forward and will continue to be improved.

Data for assessing the condition of ecosystems, which includes land cover data (used for condition assessments in the terrestrial and freshwater realms) and flow modification data (a key input into ecological condition maps for rivers, wetlands, estuaries and coastal ecosystems). Ideally this assessment of ecosystem condition should include various forms of degradation (e.g. desertification, bush encroachment, alien invasive plant density) and fragmentation indices where appropriate. More than two time points for these data layers allows for national level trend analysis for habitat loss, and changes in threat status and protection level.

Maps of distribution and levels of pressure on biodiversity in the marine environment is used as a key input in determining ecological condition in the marine realm, as cumulative pressure mapping is utilised for condition assessments in this realm.

A comprehensive **protected area spatial layer** is fundamental for assessing protection levels of ecosystems and species.

Similarly, South Africa has **robust species data**, some of which is spatial, including a good taxonomic backbone and data on distribution, abundance and richness. These allow for comprehensive species Red List assessments of multiple taxonomic groups, and also continue to be improved.

Data management was not a significant focus of the NSBA 2004 or the NBA 2011, but the NBA 2018 served to put processes and systems in place to ensure that each of the above layers (and others that were identified as part of the NBA 2018) were developed and available, with clear version control in place.

Future improvements will be made in subsequent NBAs to ensure that users can access any datasets they need, providing that such does not contain sensitive information (e.g. sensitive species location data).

8. IMPLEMENTATION: PEOPLE AND GOVERNANCE

8.1 The voluntary nature of the NBA and the Network of Partners model

While it is SANBI's mandate to monitor and report on the status of South Africa's biodiversity, SANBI cannot do this mammoth task alone. The breadth and scope of the NBA dictate that collaboration between multiple institutions and individuals is an essential part of the process. SANBI operates in the Network of Partners Model, acknowledging that it is impossible to achieve this highly technical and scientific mandate with such a broad scope without substantial support from many partners. This model is important not only for completing the work, but also for the collective ownership of the NBA by the biodiversity science community in South Africa. The co-production of knowledge for the NBA also assists scientists, practitioners and decision makers to work towards a common vision for action following the assessment.

There are many ways that individuals can become involved in the NBA; from simply contributing data to helping write a section or providing advice. The degree of involvement by contributors can vary dramatically, where some give minutes of their time while others effectively contribute the fruits of entire careers of research.

SANBI utilises data and staff time from any institutions with relevant research interests aligned to the NBA scope, and the NBA team navigates and negotiates the multiple contributions from partners. SANBI plays the leading coordination role and facilitates contributions by a large pool of experts through the various governance structures (see Section 8.4). For NBA 2018, over 470 individuals from 90 institutions contributed – the vast majority on a volunteer basis without any financial compensation from SANBI. Without these voluntary contributions from experts and institutions outside of SANBI, the NBA would not be possible.

Occasionally, the NBA requires intellectual property or assistance via short-term paid contracts with other institutions – and these are only possible if funding is available to motivate for a Sole Source or procurement process.

For the leadership of the Estuarine and Coastal Components of the NBA, SANBI builds strategic and long-term relationships with specific institutions (the CSIR and the Institute for Coastal and Marine Research (CMR) at Nelson Mandela University respectively) because SANBI does not have capacity to lead these components and it is essential that each main component of the NBA has clear and experienced leadership. Therefore, only these two partners are considered 'Brand Partners' to the NBA with SANBI, and require a small financial contribution from SANBI for participating in the collective work required before the Summary of Findings & Key Messages booklet is finalised for each NBA Cycle. These 'Brand Partners' bring significant co-financing to the NBA process.

Encouraging experts to contribute voluntarily significantly expands representivity in the NBA processes. It can, however, present some risks. The risks of volunteerism can mean that not all experts who wish to be involved are able to do so (e.g. other work commitments preclude their involvement; or their work for a non-profit organisation cannot spare their time for other endeavours). Additionally, the process may not allow for full engagement with potential non-scientific contributors – e.g. indigenous and local knowledge holders may not be able to engage with the NBA processes due to unfamiliarity of how to engage and limited technology that might prevent them from engaging. Whenever possible, innovative solutions are put in place to mitigate these risks, including: flexible deadlines to allow experts to contribute in their personal time, workshops being held via virtual meeting platforms, the use of Microsoft SharePoint or similar technology for experts to comment on draft documents remotely, open calls to workshops and for reviewers advertised on relevant fora, and the presentation of the NBA processes and explanation of opportunities to engage at as many conferences as financially possible.

It is hoped that these contributions of data, expertise, co-funding and enthusiasm continue so as to make future NBA work possible. Every effort is made to ensure that all contributions are recognised: the authors of each Module are clearly indicated and acknowledged; and the source of the data and information used in the NBA is clearly attributed wherever possible (sometimes embedded in the input data itself).

8.2 Leadership positions

An **NBA Scientific Lead** at SANBI provides overall direction to the work, ensures alignment between realms and themes, and creates a coherent synthesis of the results for the Summary of Findings & Key Messages and other materials. It is important for the Scientific Lead to engage actively and substantially with the content of all Components of the NBA. This person also has a direct connection with the National Biodiversity Monitoring Framework and reporting to national and international indicator processes.

The NBA Scientific Lead is supported by a **Project Manager** at SANBI who is likely allocated to the NBA on a part-time basis as such a person is usually managing assessment-related projects with external funding as well as the NBA. The project manager ensures that the many workshops and meetings involved in the NBA run smoothly in terms of logistics, manages the budget, arranges and monitors all collaborations and consultancies required, coordinates all NBA-related communication, documents the project process, reports to the relevant oversight bodies of the NBA, and likely also assists with writing and editing the various non-technical NBA outputs such as the Summary of Findings & Key Messages. The Project Manager is likely supported by an **Administrator or Assistant Director** for logistics such as travel, catering and procurement; as well as reporting requirements (see Section 9).

Each NBA Component (see Section 6.1) has a **Component Lead**, as per the table below – in most cases a senior SANBI staff member. **8.3 Component leaders** need to be credible experts with technical depth in their field, who can provide direction and leadership to the work. If there is no one in SANBI who can lead a particular Component, it may be necessary to contract an external person as a leader and twin them with someone in SANBI with a view to developing capacity in SANBI for the subsequent NBAs.

NBA Component	Leadership
Terrestrial	There is no 'terrestrial programme' at SANBI, so this component is typically led by the most senior terrestrial ecologist in the Biodiversity Research, Assessment and Monitoring (BRAM) Division
Freshwater	Led by the most senior freshwater scientist in the BRAM Division
Estuarine	There is no estuarine scientist at SANBI, and therefore this Component is led by a SANBI partner: the Council for Scientific and Industrial Research (CSIR)
Marine	Led by the most senior marine scientist in the BRAM Division
Subantarctic territory	There is no specialist in the subantarctic at SANBI, and therefore this Component is usually led by a student or postdoctoral research fellow supported by the terrestrial, freshwater and marine leads
Coastal cross-realm zone	There is no coastal scientist at SANBI, and therefore this Component is led by a SANBI partner: the Institute for Coastal and Marine Research (CMR) at Nelson Mandela University
Genetic diversity	Led by a senior specialist in genetic diversity work – usually in the Foundational Biodiversity Science Division
Species	Led by a senior specialist in threatened species in BRAM Division
Pressures on biodiversity: climate change*	Led by a senior specialist in climate change in BRAM Division (often with a shared responsibility to the Adaptation Policy and Resourcing Division)
Pressures on biodiversity: biological invasions*	Led by a senior specialist in biological invasions in BRAM Division
Mainstreaming and uptake	Led by a senior specialist on mainstreaming and policy advice in the Biodiversity Information and Policy Advice Division

*Note that these two pressures are not the only pressures on biodiversity, however they have separate programmes of work at SANBI and therefore are each a Component as they have leadership at SANBI.

A **Module Lead** (see Section 6.1) is someone who takes responsibility for a specific piece of work for NBA 2025 (a piece of work that will ultimately have its own webpage on the site), convenes a group of experts/contributors for that Module, and ensures that the Module is completed within the NBA timeframe. Module Leads can be SANBI staff members or external people. The Module Lead has lead authorship rights for their Module and will be listed as an author in the recommended scientific citation of the Summary of Findings & Key Messages. More information on a Module Leads' responsibilities is contained in the NBA Core Reference Group Terms of Reference.

8.3 Shared responsibilities between Divisions at SANBI

The NBA as a quintessential SANBI product that spans the entire SANBI Value Chain (see Figure 9)

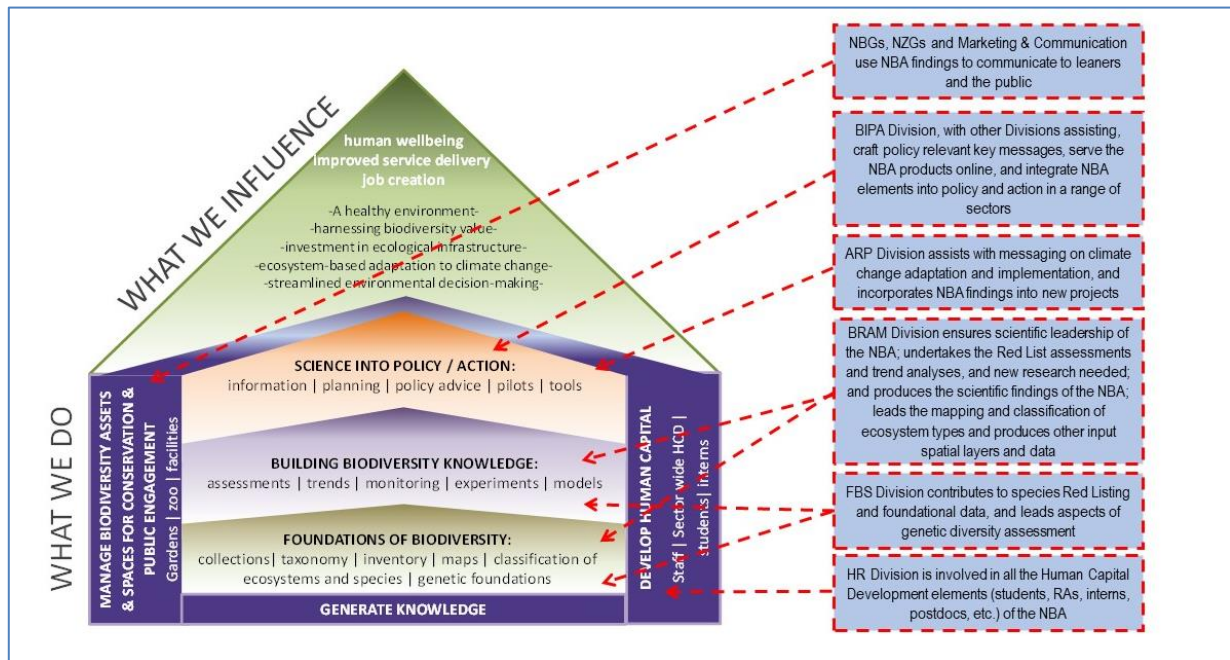


Figure 9: The NBA spans the entire SANBI Value Chain

Many lessons were learned from the previous NBAs with regards to the inter-divisional nature of the NBA, and the Core Reference Group (see Section 8.4) was expanded for NBA 2025 to encompass all Modules of work. The NBA requires substantial data management, spatial analysis and mapping expertise; as well as a broad range of scientific expertise. This entails dedicated time from many other staff members at SANBI from the other Divisions within the Biodiversity Science & Policy Advice Branch.

In addition, the large scale of the NBA in terms of students, interns, research assistants, collaborators, consultants, workshops, data storage and communication means that the NBA is indeed an inter-divisional output that requires input from Human Resources, Information Technology, Supply Chain Management, and the Marketing, Communication & Commercialisation Directorate.

8.3.1 Biodiversity Research, Assessment and Monitoring Division

Within SANBI, the NBA is led by the Biodiversity Research, Assessment and Monitoring (BRAM) Division. BRAM Division leads on the following work:

- Ensuring scientific leadership and the co-production of scientific outputs (journals papers, datasets, etc.)
- Chairing the Core Reference Group, and ensuring that all the other governance structures are run smoothly;
- Mapping and classification of ecosystem types for the terrestrial, marine and freshwater realms, and alignment between realms (also liaising with key partners producing and refining maps of ecosystems types for estuaries and coastal ecosystem types);
- Producing other input layers needed for the NBA – e.g. Protected Areas, ecological condition, etc.;
- Undertaking Red List assessments for both species and ecosystems, and associated trends; as well as the models and research that might go into these assessments;
- Undertaking all the cross-realm analyses and writing up the findings;
- Producing the Summary of Findings & Key Messages booklet and arranging the launch event (with SANBI Marketing, Commercialisation and Communication team).

8.3.2 Foundational Biodiversity Science (FBS) Division

The FBS Division undertakes the following work for the NBA:

- Leading Modules on the status of genetic diversity;
- Resolving taxonomy and contributing to fieldwork records (both of which are needed for Species Red List assessments);
- Contributing species knowledge to Terrestrial Map of Ecosystem Types (the VegMap);
- Contributing genetic data to map of marine ecosystem types (e.g., SeaMap Project)
- Undertaking certain species Red List assessments if the staff in the Division are experts in the species group – e.g. FBS Division usually has plant taxonomists with the relevant expertise who can undertake the Red List assessments for their species group;
- Checking species statistics in NBA summaries (i.e., make sure that there is alignment between numbers of species assessed and numbers on FBS's datasets);
- Review of Key Messages on species findings.

8.3.3 Adaptation Policy and Resourcing (APR) Division

The APR Division assists with key messages for the NBA relating to its remit of expertise on climate change adaptation and mitigation. APR Division often facilitates the design of donor-funded projects that can incorporate results of the NBA – i.e. the Division facilitates uptake of the NBA findings. The projects may also include work that supports the future iterations of the NBA, and that may allow for research components and/or staff members to focus on key climate change indicators and/or research.

8.3.1 Biodiversity Information and Policy Advice (BIPA) Division

The relationship between BRAM and BIPA Divisions is of paramount importance for the NBA, and involves all BIPA Directorates and expertise (policy advice, information management and planning, and mainstreaming). There is a two way relationship between producing the science outputs of the NBA and SANBI's policy engagement and mainstreaming priorities, with these anchored in BRAM and BIPA divisions respectively but closely interrelated. Part of the power of the NBA is that its science is undertaken within the understanding of the policy and implementation context (see Section 3). The NBA is co-produced by scientists, practitioners and technical staff who contribute to development and implementation of policy and ensure its multitude of uses (see Section 4). This aspect is now also recognised in international literature: that the science is not enough, and that assessments must be undertaken through interacting with government representatives and other stakeholders to ensure legitimacy, relevance and credibility (IPBES 2018).

It is also important to recognise the different skills needed for the roles that BIPA Division staff play during and after the NBA releases. Although many have the skills and are involved, it may be onerous to expect all the BRAM Division scientists who do the analyses and write up of the NBA to also manage stakeholder engagements about uptake and mainstreaming. Many of the scientists involved, especially junior scientists, do not have the necessary skillset that is required. It is essential that the BIPA Division's expertise in stakeholder engagement, mainstreaming and uptake into policy and practice is involved from early in the NBA process.

BIPA staff need to be very familiar with more than just the national headline indicators and key messages of the NBA in order to know when and how to draw on information from the NBA to support mainstreaming efforts and policy advice. This requires engagement of key BIPA staff members throughout the NBA production processes, and post the launch event.

The role of BIPA Division during and after each NBA release is complex, and may include (likely not limited to) the following:

- Serving NBA products and datasets via the SANBI biodiversity information portals such as the Biodiversity Advisor to ensure their availability to all users and stakeholders. The Biodiversity Information Management and Planning Directorate in BIPA is responsible for the NBA website. They work very closely with the BRAM NBA Project Manager and NBA Scientific Lead to ensure that the functionality required is possible and available. This requires ongoing interactions and occasional consultations with the broader Core Reference Group to ensure all Module Leads are aware of necessary information.
- Participating in Core Reference Group meetings so as to ensure that BIPA Division is contributing to and aware of decisions being taken for the NBA. For example, if the Core Reference Group takes a decision that a certain Module of work will not be ready (for whatever reason) for the upcoming Summary of Findings & Key Messages and launch event, it is essential that BIPA Division is part of that decision-making process due to their ongoing engagements in various communities of practice.
- Participate in the crafting and wordsmithing of NBA key messages. This is a vital function of the CRG, and it is essential that BIPA experts in 'making the case for biodiversity', mainstreaming and uptake are involved in the development of key messages from the NBA, as they have the experience of what resonates with audiences and a good sense of the policy priorities and language/lexicon of key sectors that could be users of NBA outputs. The process of concluding which key messages are most relevant, through creating first drafts, to final wordsmithing usually takes place at CRG meetings, with separate writing retreats a possibility.
- Proof reading and presenting drafts on the Summary of Findings & Key Messages to key stakeholder groups. It is the NBA Project Manager's responsibility to draft text, source images, and ensure graphic design, layout and printing; and the NBA Scientific Lead's responsibility to ensure that the content is correct for the Summary of Findings & Key Messages booklet. However, it is essential that BIPA experts are involved in the production of this booklet too, particularly in terms of sharing drafts with relevant stakeholders to ensure engagement and buy-in of this important product.
- Undertaking necessary briefings to various government structures, such as the Working Groups, MINTECH and MINMEC. While several BRAM scientists are involved in these structures, it is best to ensure that there are several people able to engage about the detail of the NBA fundings at these levels. The BIPA role may involve:
 - o Ensuring the NBA is on the appropriate agendas
 - o Drafting the briefing documents (to be checked by NBA Scientific Lead or Project Manager as needed)
 - o Presenting at the meetings and recording any comments and questions
 - o Providing feedback to NBA Scientific Lead, Project Manager, and other governance structures as necessary.
- Participating in the other governance structures of the NBA, as needed – including the Cross Functional Steering Committee and the Strategic Advisory Committee. While it is BRAM Division's responsibility to convene and provide secretariat support for these structures, key BIPA officials present at these meetings.
- Considering, discussing and interpreting the NBA findings jointly with the BRAM staff involved in the analyses, so that all BIPA staff engaged in policy advice, the development or revision of national strategies, uptake into implementation, and mainstreaming into different sectors can make use of opportunities and so that relevant knowledge products can be produced. Mainstreaming, uptake and policy advice opportunities are often difficult to predict, and often require a customised response in terms of what information is provided in what form. Opportunities could also be considered from two perspectives:
 - o BIPA staff who are already working with a range of sectors (e.g. because of an existing project or programme), should have sufficient understanding of the NBA outputs, indicators, products to use them in any relevant process and encourage their integration into policy and practice in these sectors. Knowledge of the policy and implementation context in different sectors should help to inform how information from the NBA is distilled and what form NBA knowledge products that may be produced post the NBA release take so that the findings can be taken up by different sectors.

- The findings of the NBA should also provide information that helps to identify the key pressures and priorities for focusing mainstreaming and policy advice attention – this should help to determine which sectors BIPA Division should plan to engage or re-engage proactively. Given limited resources in SANBI, the NBA findings can tell us which sectors are impacting and/or depending on biodiversity the most, and hence where resources should be prioritised (e.g. should the Mining and Biodiversity Guidelines be revised, or would resources be better spent on agricultural sector engagements?). Along with other factors and the results of other work, the NBA should be informing BIPA mainstreaming and policy advice priorities.
- Working with the BRAM scientists and specialists as needed to ensure that NBA findings or the results of indicators are fed into various national and international reports as required (see Section iv).

8.4 Governance structures for the NBA

The NBA is a multi-author and multi-stakeholder process (see Section 8.1), and as a result several committees and reference groups exist for governance and to ensure input from the relevant stakeholders (Figure 10).

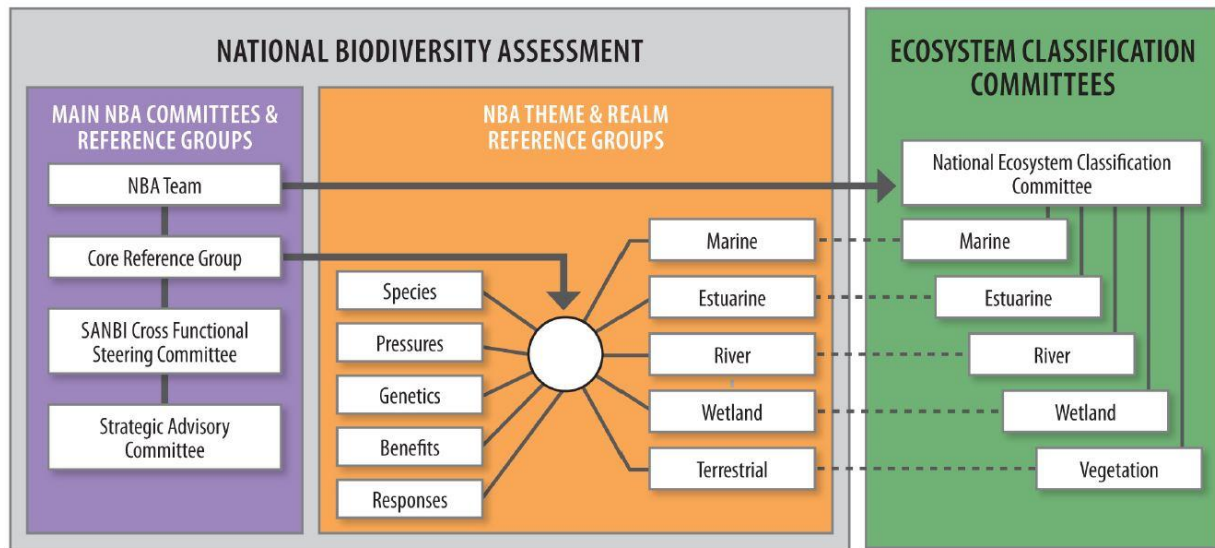


Figure 10: Governance structures of the NBA and ecosystem classification processes

Author and contributor groups for each Module of work should exist where necessary. These may or may not have a formal Terms of Reference, and are usually the subject experts convened by the Module Lead.

Reference groups for each Component must exist and consist of technical and scientific experts in the area of work concerned, from a range of partner organisations. These reference groups strive to meet at least twice a year between releases of the NBA Summary of Findings & Key Messages booklet, but also hold other specialist consultative workshops on a needs basis to bring in further expertise from a range of people within the relevant sector or sub-sector. The reference groups include leaders (or other representatives) from other realms or themes where appropriate, to support integration and alignment (e.g. the estuary leader is a member of the marine reference group and vice versa). These reference groups may exist for other purposes outside of the NBA and are utilised during the NBA process as a technical and scientific peer-review system – for example, in the terrestrial realm, the Biodiversity Planning Technical Working Group is the primary reference group for NBA results because this group consists of the primary users of terrestrial NBA findings (they are the provincial planners).

A **Core Reference Group** (the primary technical committee of the NBA) made up of all Module Leads as well as key technical and mainstreaming/uptake experts. It is chaired by the NBA Scientific Lead, and meets at least biannually in the final few years leading up to the release of the NBA Summary of Findings & Key Messages booklet, with regular virtual meetings and correspondence in the intervening months.

An internal **SANBI Cross Functional Steering Committee** engages with senior management from the different Divisions and Directorates and ensures efficient inter-divisional work and collaboration.

A **Strategic Advisory Committee** is recommended for the few years leading up to a release of a NBA Summary of Findings & Key Messages booklet and consists of senior officials from various government departments, non-governmental organisations and research institutes. The rationale for this external committee is to encourage institutional engagement beyond SANBI and to provide a mechanism to present results and obtain buy-in from key national experts, including scientists, non-profit organisation champions, and officials with technical or science-into-policy expertise. Membership of the strategic advisory committee is based on individual expertise as well as the need to include organisations with a direct interest in the NBA process and outcomes. Membership includes (but is not limited to) representatives from the national

departments²¹ of Environment, Forestry and Fisheries; Water and Sanitation; Agriculture, Land Reform and Rural Development; Science and Innovation; Planning, Monitoring and Evaluation; National Treasury and Tourism; as well as national entities such as South African National Parks, Council for Scientific and Industrial Research and the South African Environmental Observation Network. A few renowned scientists and a representative from conservation-related NGOs may also be invited to be individual members. The Strategic Advisory Committee meets annually or as necessary, with potentially more meetings in the year before a launch event.

SANBI published an Ecosystem Classification Concept Note in 2013, proposing the establishment of a **National Ecosystem Classification (and mapping) Committee, and subsidiary committees for the marine, terrestrial, freshwater and estuarine realms**. Subsequently, this governance structure was formally published in the South African National Ecosystem Classification System Handbook (Dayaram et al 2021). The role of the ecosystem classification committees is to provide oversight and guidance for national scale ecosystem classification and mapping in each realm, in order to strengthen the NBA and bioregional planning process. The committee for each realm meets on a regular basis (preferably at least once a year). The freshwater realm was split for this process into the Wetlands Ecosystem Classification Committee and the River Ecosystem Classification Committee. A National Ecosystem Classification Committee (NECC) exists to oversee alignment between the realms, and consists of the Chairs of each realm committee and any invited experts. The NECC meets and corresponds on a regular basis. Facilitating the maintenance and improvement of a national ecosystem classification and mapping system is an on-going SANBI goal that continues irrespective of NBA deadlines.

The following is a list of the principles for the establishment and management of governance structures for the NBA:

1. Each governance structure should have a Terms of Reference that includes:
 - Background, aim, definitions, etc.
 - Composition and the minimum requirements of qualification, experience, skills, competencies, expertise, and professional registration; ideally including some opportunities for younger people too (ex officio or as an 'emerging researchers' team under the official group if necessary).
 - How membership is considered for the group – e.g. open calls to 'apply'; contact details on webpage; present at relevant conferences; seeking of expertise that is lacking; etc.
 - Appointment period (usually finite to ensure that there can be regular influx of new expertise, with the option to stay on for numerous cycles to ensure consistency and succession planning).
 - No expectation of employment or long-term or full-time appointment to the governance structure
 - Governance issues – e.g. how Chair is selected, how incidents are managed, etc.
 - Duties – including any possible skills transfer if needed.
2. Appointments to any governance structure should be done in a transparent way to promote openness, inclusivity, transformation and to provide opportunities for diverse role players to contribute to SANBI's work. Leaders of governance structures must reflect carefully on whether there could be any criticism about cliques or whether there is an 'open door' policy.
3. If members request such, the leader of a governance structure can sign Appointment Letters (ideally these letters should be signed at Deputy Director level or above from SANBI).

²¹ This report uses the names of the government departments confirmed in June 2019. Please refer to www.gov.za to see all the changes in government departments and ministries.

9. TRACKING TOOLS AND REPORTING

9.1 Required reporting

The progress and findings of each NBA, and sometimes elements of NBA work, are reported as follows (note that this is in addition to the use of the NBA findings and indicators in sub-national, national and international reporting as described in Section iv):

To	When	Depth of report content
SANBI EXCO	Ad hoc, sometimes Monthly	BRAM Chief Director provides feedback to EXCO as needed so as to keep EXCO abreast of NBA progress. The NBA Scientific Lead and Project Manager provide information as needed for these updates.
SANBI Annual Performance Plan (APP)	Every quarter	The NBA forms part of reporting on one target of the SANBI APP together with the reports on biological invasions and the impacts of genetically modified organisms. These three reports, and preparation for their release, make up the quarterly APP targets – often with one report reporting on all four targets during a particular year. The NBA Scientific Lead and Project Manager undertake this reporting and may involve other Module Leads if needed.
SANBI Board's Research, Development and Innovation (RD&I) Committee	Every quarter	The NBA is considered a 'Mandate Deliverable' and there is a specific template to use every quarter that updates the RD&I Committees with progress. The NBA Scientific Lead and Project Manager complete this report; Director: Biodiversity Assessment finalises for submission.
SANBI Board and/or CEO's letter published in the SANBI Gazette (internal newsletter)	Every quarter	The NBA is mentioned as needed in the CEO's report to the Board (which is often then edited to also appear in the SANBI Gazette); as well as in any international travel reporting needed if NBA-related travel has taken place. NBA Scientific Lead and Project Manager complete this report; Director: Biodiversity Assessment finalises for submission.
Working Groups (usually 1, 5, 8, but possibly others), MINTECH and MINMEC	In the year leading up to the release, and post release	These structures are provided with NBA progress for noting, and ideally draft key messages are tabled before they are finalised into the Summary of Findings & Key Messages booklet. BIPA Division is responsible for this reporting, in consultation with the NBA Scientific Lead and Project Manager.

Other reporting on NBA progress or findings is done on an ad hoc basis to relevant stakeholder groups – e.g. through presentations at conferences, or the participation by various NBA Module Leads in meetings or workshops. The above table is meant to capture all the required reporting, not that which is done as part of general stakeholder engagement.

9.2 Tracking tools

To undertake the above reporting, the following tracking tools are in use (listed here specifically for NBA 2025, and it is noted that these may change as reporting needs evolve):

1. **NBA 2025 Modules List** tracks progress on all Modules of work and parties responsible. This is a Microsoft List and is attached to the NBA 2025 Core Reference Group's SharePoint (Teams) site so that all Module Leads can update it when needed. The Modules List is all Modules of work for NBA 2025 linked to their relevant Component. Each Module has the following fields:
 - a. Component
 - b. Module Lead
 - c. Contributors
 - d. A brief summary of the work (building blocks) needed to finish the Module
 - e. Deadline
 - f. Relationship with other Modules
 - g. Priority, with options: high, medium or low
 - h. Tag, with options: Not ready by early 2025, but has a Lead and plan for post-2025; Achievable by early 2025, but not confirmed or entirely organised; Ready by early 2025, SANBI Lead; Gap, needs resources (person and/or funding).
 - i. Status, with options: 'Completed', 'Ahead of schedule', 'On Schedule', 'Behind schedule'
 - j. A narrative to explain this status in a separate field.

The Microsoft List enables various graphs and visual representations to be drawn for reporting purposes (e.g. the number of Modules by Status), and enables Component and Module Leads to filter the List to reflect only those items they are responsible for. The Microsoft List also allows for reminders to be set.

2. A spreadsheet called **Calculating Contributions to NBA 2025** is the primary mechanism for:
 - a. Counting the number of contributors for each NBA Cycle along with their institution, race, gender, and approximate years of experience. Various statistics can be reported on using this Contributors List – including the number of institutions involved in the NBA, the number of contributors from historically disadvantaged groups, and youth involvement.
 - b. Roughly estimating the Person Hours/Years that go into each NBA Cycle. This calculation is done by counting all the hours of official NBA-related meetings per person, and adding this to an estimation of either percentage time (used for people working on the NBA for substantial portions of their working time) or an hourly sum (for minor contributors). The rationale for estimating Person Hours/Years is that the actual monetary cost of undertaking the NBA is unknown, and this is a proxy for effort required.
3. The **NBA actual cash funding** that funds all workshops, communication and governance processes during the NBA Cycle is counted from the launch event of a previous SFKM booklet to the launch of the next SFKM booklet. This is primarily the operational funding that is allocated to the NBA management team as part of SANBI's government grant. The operational grant funding is compared to leveraged co-funding (i.e. projects being funded by donors) during the same period. Note: it is impossible to estimate the total in-kind co-financing that is leveraged during the entire NBA process. Such contributions are not only the staff time, but should also cover travel, office space, computer equipment and internet connectivity for all the NBA experts. Suffice to say, the co-financing of the NBA by other entities beside SANBI is substantial and far higher than SANBI's actual budget allocation. The only way to represent the co-financing is through the Person Hours calculation mentioned above.

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APPENDIX A. DIFFERENCES BETWEEN SA'S THREE NATIONAL BIODIVERSITY ASSESSMENTS TO DATE

	NSBA 2004	NBA 2011	NBA 2018
Products released	Main report (with an executive summary containing recommended strategies and actions) Technical reports: - Vol 1: Terrestrial Component (+ appendices) - Vol 2: River Component - Vol 3: Estuary Component - Vol 4: Marine Component (+ appendices) Spatial datasets and spreadsheets	Synthesis report (with both an executive summary and a section containing 12 'highlights') Life: The State of South Africa's Biodiversity (popular version for a wide audience) Technical reports: - Vol 2: Freshwater Component - Vol 3: Estuary Component - Vol 4: Marine and Coastal Component National Estuary Biodiversity Plan for South Africa Spatial datasets and spreadsheets Note: Technical report Vol 1: Terrestrial was not published	Synthesis report (without an executive summary, but with a section containing 19 Key Messages) Facts, Findings & Messages booklet (popular, short version) Technical reports: - Vol 1: Terrestrial Realm - Vol 2a: Inventory of Inland Aquatic Ecosystems - Vol 2b: Inland Aquatic (Freshwater) Realm - Vol 3: Estuarine Realm - Vol 4: Marine Realm - Vol 5: Coast - Vol 6: Sub-Antarctic Territory - Vol 7: Genetic Diversity Compendium of Benefits of Biodiversity Spatial datasets and spreadsheets Provincial level extracts Static url: http://nba.sanbi.org.za/
Components	Terrestrial Rivers Estuarine Marine	Terrestrial Rivers Wetlands Estuarine Marine (split benthic and pelagic) Taxonomic groups: plants, inland mammals, birds, amphibians, reptiles, freshwater fish, butterflies	Terrestrial Rivers Wetlands Estuarine Marine (combined benthic and pelagic) Coast (cross-realm zone) Subantarctic territory (all realms) Taxonomic groups additional to NBA 2011: sharks, corals, selected linefish, selected estuarine invertebrates, dragonflies
National headline indicators featured	Ecosystem threat status Ecosystem protection level	Ecosystem threat status Ecosystem protection level Species threat status	Ecosystem threat status Ecosystem protection level Species threat status Species protection level
People involved	14 lead authors plus data contributors	More than 200 individuals (no specific demographic information collected)	478 individuals, of which 148 are credited as an author on a technical report (demographic information collected: gender, race, years of experience)
Institutions involved	8 Institutions and a few independent people	Around 30 institutions	93 institutions and 29 independent people

	NSBA 2004	NBA 2011	NBA 2018
Time taken to conduct the assessment	Undertaken over a one-year period (no accurate count of hours was undertaken)	Took three years to complete (no count of hours was undertaken)	Took 136 199 person hours (~75 person years) to complete over 4.5 years
Highlights / important innovations in each	- First systematic and spatial NBA for South Africa - Established ecosystem types as the key unit of assessment and showed that it was possible to classify and map these in all realms - Highlighted the need for better ecosystem data especially on wetlands and marine ecosystems. - Identified three key strategies and 33 priority actions to guide biodiversity sector - Highlighted that many ecosystem types were under protected (which provided the impetus for the first National Protected Area Expansion Strategy published in 2008)	- Wetlands included for the first time. - Refinements in classification of ecosystem types. - Refinements in methods for assessing headline indicators. - Presented a new national map of areas important for climate change resilience. - Discussed the state of harvested marine species and medicinal plants. - Included the state of invasive alien species.	- Major advances in mapping and refinements in classification of marine, estuarine and inland wetland ecosystem types. - Seamless integration of ecosystem types across realm boundaries made possible by the new and highly detailed delineation of coastal ecosystem types. - Formalising of the South African National Ecosystem Classification System post this NBA (Dayaram et al 2021). - First map of marine ecosystem types for the subantarctic territory, allowing for the inclusion of South Africa's subantarctic territory in the NBA for the first time. - Adoption of the IUCN's Red List of Ecosystems assessment framework (guidelines first published in 2016) for terrestrial, marine and estuarine realm assessments of ecosystem threat status. - New assessments for Red List of Species across all realms, including several species groups assessed for the first time: sharks, corals, linefish (including all seabream species; members of the Sparidae), selected estuarine invertebrates and endemic fish, and dragonflies. - First Red List Index (RLI) to track species threat status over time for reptiles, amphibians, mammals, birds, freshwater fishes, plants, dragonflies and butterflies. - Development of a new indicator for species protection level applied to selected terrestrial and inland aquatic taxa (reptiles, amphibians, mammals, birds, freshwater fishes, plants and butterflies). - New indicators to track and monitor the status of genetic diversity – the first time the NBA had considered genetic work in addition to species and ecosystems. - A Compendium of Benefits of Biodiversity as supplementary material to the NBA providing a wealth of information across a range of “benefit clusters” to assist with making the case for biodiversity. - A new indicator of the rate of habitat loss using land cover change data (1990–2014) to compute the rate of habitat loss for each terrestrial ecosystem type. - New trend analysis for protection level made possible by better time series data on the declarations of protected areas.

	NSBA 2004	NBA 2011	NBA 2018
Public awareness (e.g. media, outreach, launch event)	There was no formal launch event for this NBA, however it was presented to national Parliament in April 2005. It was presented at various biodiversity-related fora and conferences during 2005.	NBA 2011 was launched at the International Biodiversity Day event that the then Department of Environmental Affairs organised on 22 May 2012 at iSimangaliso Wetland Park. Some media attention resulted from the launch event, and several presentations were given at conferences during 2012 and 2013.	The NBA 2018 was launched by the Minister of Forestry, Fisheries and the Environment on 3 October 2019 (with a strict embargo until then) at the Pretoria National Botanical Garden, and had 30 known instances of media coverage during October 2019 including television, radio, newspapers and one magazine. The NBA findings were presented at numerous conferences and public speaking occasions subsequently (although many in-person conferences were cancelled during 2020 due to the Covid-19 pandemic).