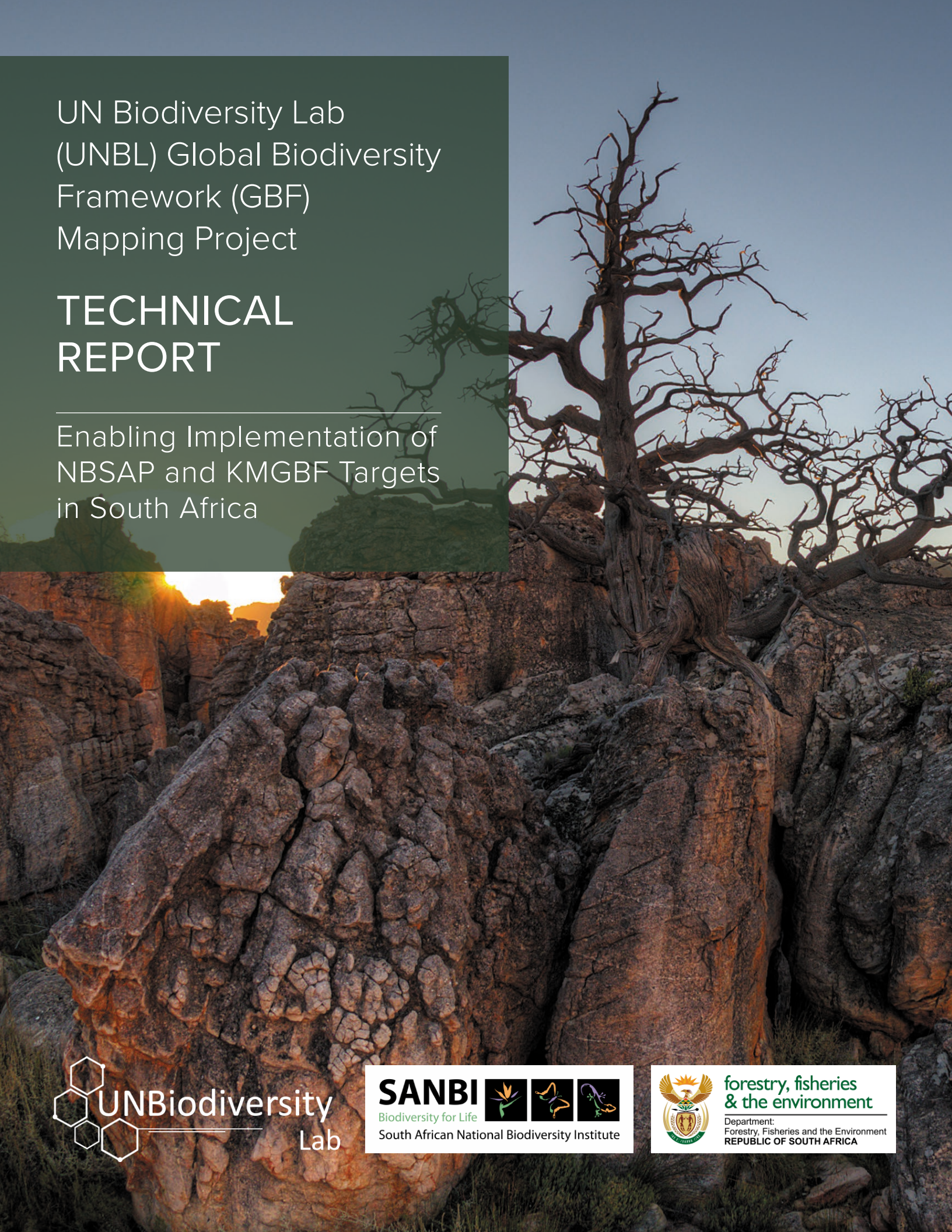

UN Biodiversity Lab (UNBL) Global Biodiversity Framework (GBF) Mapping Project

# TECHNICAL REPORT

## Enabling Implementation of NBSAP and KMGBF Targets in South Africa

UNBiodiversity Lab

SANBI
Biodiversity for Life
South African National Biodiversity Institute

forestry, fisheries & the environment
Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA

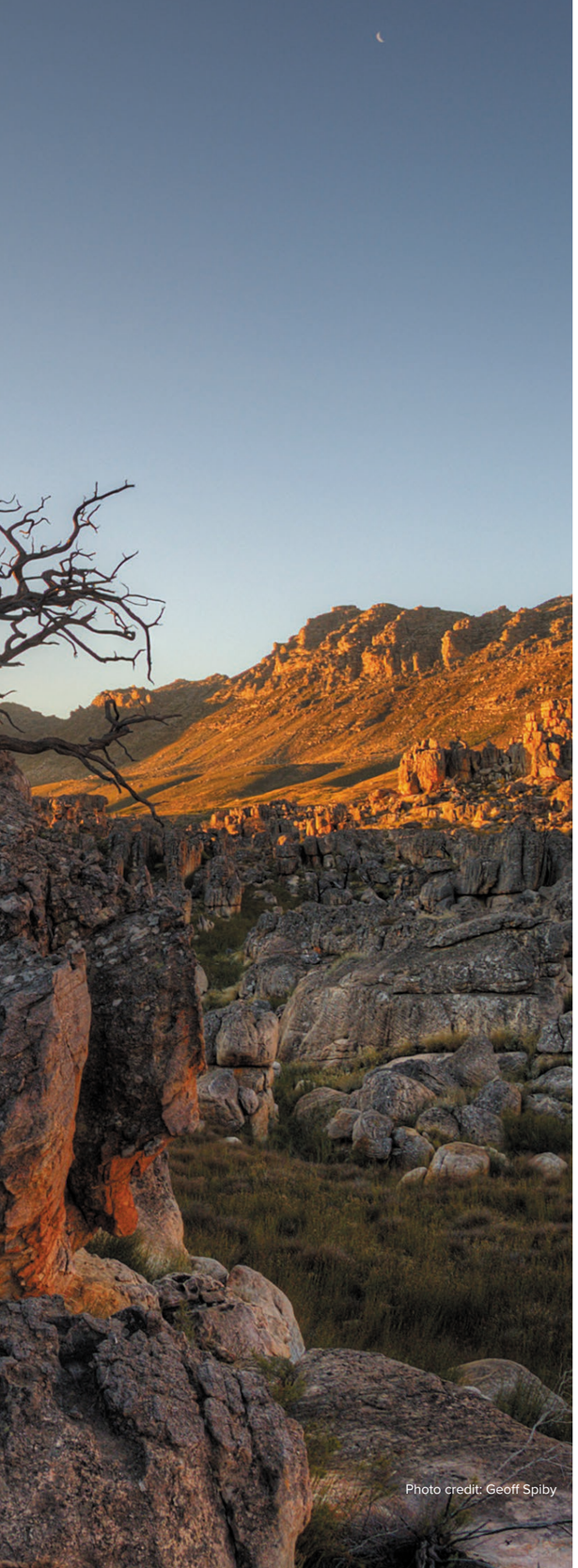

Photo credit: Geoff Spiby

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# Factsheet for decision makers

Photo credit: Angus Burns

# Acronyms

| | |
|---|---|
| **7NR** | Seventh National Report |
| **CBA** | Critical Biodiversity Areas |
| **CBD** | Convention on Biological Diversity |
| **DFFE** | Department of Forestry, Fisheries and the Environment |
| **ELSAA** | Essential Life Support Action Areas |
| **GIS** | Geographic Information System |
| **IUCN** | International Union for Conservation of Nature |
| **KBA** | Key Biodiversity Areas |
| **KMGBF** | Kunming-Montreal Global Biodiversity Framework |
| **LDN** | Land Degradation Neutrality |
| **NBES** | National Biodiversity Economy Strategy |
| **NBSAP** | National Biodiversity Strategy and Action Plan |
| **SANBI** | South African National Biodiversity Institute |
| **SCP** | Systematic Conservation Planning |
| **UNBL** | United Nations Biodiversity Lab |
| **UNCCD** | United Nations Convention to Combat Desertification |
| **UNDP** | United Nations Development Programme |
| **UNEP-WCMC** | United Nations Environment Programme World Conservation Monitoring Centre |
| **UNFCCC** | United Nations Framework Convention on Climate Change |

Photo credit: Suvarna Parbhoo

# 1. Introduction

South Africa's biodiversity is globally recognised. It is one of the world's 17 megadiverse countries and contains more than two-thirds of the world's biodiversity. It has almost 1,000 distinct ecosystem types encompassing terrestrial, freshwater, and marine, and is home to an estimated 67,000 animal species and 20,204 indigenous plant species (60.5% of which are endemic). South Africa is home to three of the 36 globally recognized biodiversity hotspots, namely the Cape Floristic Region, the Succulent Karoo ecoregion, and the Maputaland–Pondoland–Albany hotspot[1].

South Africa's natural wealth is central to the wellbeing of its people and provides a critical foundation for livelihoods and economic growth. Protecting this exceptional biodiversity delivers multiple benefits, supporting water and food security, providing medicines, protecting communities from natural disasters, enriching cultural and recreational practices, enabling climate change adaptation, and driving innovation through bioprospecting and biomimicry.

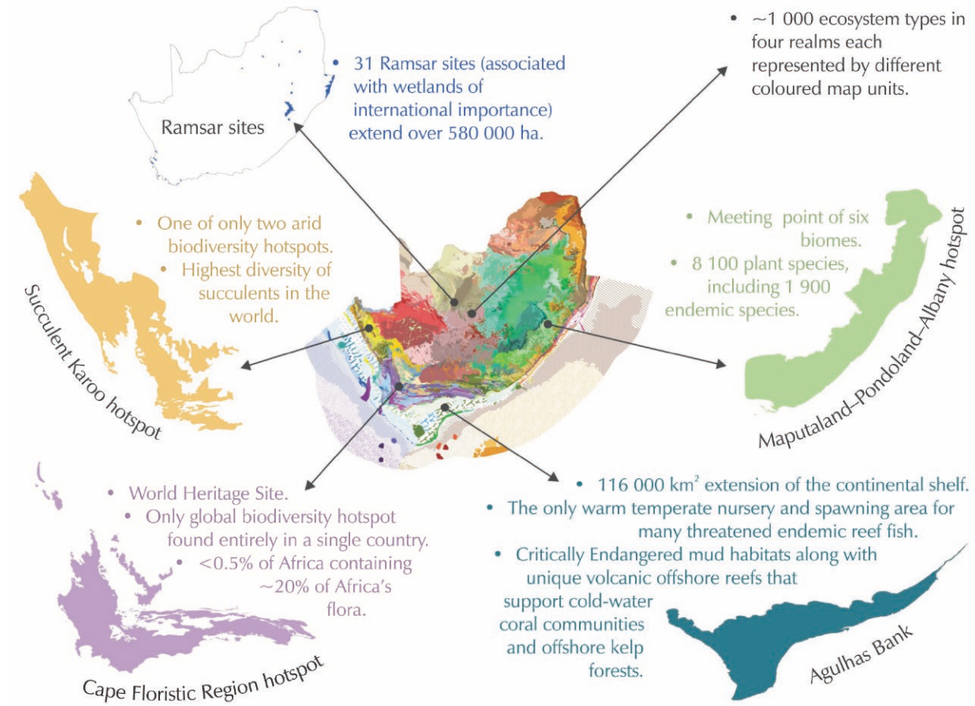



**Figure 1.** South Africa's exceptional biodiversity is globally recognised[2]

1 https://nba.sanbi.org.za/content/context/biodivprof.html
2 Dayaram, A., Van der Colff, D., Mtshali, H., Klopper, R., Le Roux, M., Poole, C., Dlamini, T., Sink, K., Currie, J., Skowno, A., Jones, G., Khatieb, S., Mogajane, K., Hamer, M., Truter, M., Jacobs, A., Venter, F., & Seymour, C. 2025. South Africa's biodiversity profile. National Biodiversity Assessment 2025. South African National Biodiversity Institute. http://nba.sanbi.org.za/.



South Africa is signatory to several Multilateral Environmental Agreements, including the Convention on Biological Diversity (CBD) and its Kunming-Montreal Global Biodiversity Framework (KMGBF), the United Nations Convention to Combat Desertification (UNCCD), the UN Framework Convention on Climate Change (UNFCCC), and Ramsar Convention on wetlands, to mention a few. The KMGBF, which aims to live in harmony with nature, is critical for South Africa. One of the KMGBF targets (Target 1) highlights the importance of biodiversity-inclusive spatial planning, including the importance and recognition of spatial biodiversity into various sectoral planning. There is an important opportunity for South Africa as a Party to the CBD to mobilize, to contribute towards this global target and to safeguard its unique biodiversity, strengthen climate resilience, and ensure that future generations continue to benefit from the rich natural capital that underpins the country's identity and prosperity.

Spatial data is essential for the implementation of the KMGBF targets as well as for monitoring and reporting on progress to achieve these targets: 41% of the headline indicators and 36% of the component indicators have methodology encouraging the use of spatial data. In particular, KMGBF Targets 1, 2 and 3 – which aim to spatially plan and manage all areas to reduce biodiversity loss; restore 30% of all degraded ecosystems; and conserve 30% of land, waters and seas – depend on the use of geospatial data for identifying areas for sustainable management, restoration and protection. Implementation of KMGBF Targets 4-12 and 14 can also be bolstered by spatial planning, according to a report released by the International Union for the Conservation of Nature (IUCN) in October 2024 (Table 1).

**Photo credit: Anisha Dayaram**

**Table 1.** Targets of the KMGBF that can be supported by spatial data

| | | | |
|---|---|---|---|
| **Target 1** Plan and Manage all Areas to Reduce Biodiversity Loss | **Target 2** Restore 30% of all Degraded Ecosystems | **Target 3** Conserve 30% of Land, Waters, and Seas | **Target 4** Halt Species Extinction, Protect Genetic Diversity, and Manage Human-Wildlife Conflicts |
| **Target 5** Ensure Sustainable, Safe, and Legal Harvesting and Trade of Wild Species | **Target 6** Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact | **Target 7** Reduce Pollution to Levels That Are Not Harmful to Biodiversity | **Target 8** Minimize the Impacts of Climate Change on Biodiversity and Build Resilience |
| **Target 9** Manage Wild Species Sustainably To Benefit People | **Target 10** Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry | **Target 11** Restore, Maintain, and Enhance Nature's Contributions to People | **Target 12** Enhance Green Spaces and Urban Planning for Human Well-being and Biodiversity |
| **Target 13** Increase the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge | **Target 14** Integrate Biodiversity in Decision-Making at Every Level | **Target 15** Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts | **Target 16** Enable Sustainable Consumption Choices To Reduce Waste and Overconsumption |
| **Target 17** Strengthen Biosafety and Distribute the Benefits of Biotechnology | **Target 18** Reduce Harmful Incentives by at Least $500 Billion per Year, and Scale Up Positive Incentives for Biodiversity | **Target 19** Mobilize $200 Billion per Year for Biodiversity From all Sources, Including $30 Billion Through International Finance | **Target 20** Strengthen Capacity-Building, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity |
| **Target 21** Ensure That Knowledge is Available and Accessible To Guide Biodiversity Action | **Target 22** Ensure Participation in Decision-Making and Access to Justice and Information Related to Biodiversity for all | **Target 23** Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action | |

South Africa is currently undertaking the third revision of its National Biodiversity Strategy and Action Plan (NBSAP), the primary instrument for implementing the Convention on Biological Diversity (CBD) at the national level. This update aims to align the NBSAP with the Kunming-Montreal Global Biodiversity Framework (KMGBF). The revised NBSAP is expected to be finalised and approved by the Department of Forestry, Fisheries and the Environment (DFFE) of the Ministry of Environment in 2026.

The NBSAP serves as an integrated national strategy and framework that ensures biodiversity considerations are systematically embedded within national development planning and sector-specific strategies for the management of biodiversity assets. Its vision is to conserve, manage, and sustainably use biodiversity to ensure equitable benefits for the people of South Africa, both now and in the future. To implement the vision, spatial information plays a critical role in identifying, managing, and securing areas of biological significance.

South Africa employs a range of indicators, including Terrestrial Habitat Loss and the Terrestrial Ecosystem Protection Index, to mention a few, to monitor the state of the environment. These indicators are derived from spatial datasets sourced from multiple departments, organisations, and institutions. The compiled information also contributes to national reporting obligations, including the development of the Seventh National Report (7NR) to the CBD.



In line with the principles of a “whole-of-society” approach, South Africa has developed and refined its NBSAP targets through extensive multi-stakeholder engagement. In the thematic area “Mainstreaming biodiversity” the following spatial planning targets are articulated:

*By 2035, 100%* of terrestrial, freshwater and estuarine areas are covered by relevant Spatial Development Frameworks or Estuarine Management Protocols that incorporate systematic biodiversity plans not older than 10 years.

*By 2035, 50%* of marine territory is covered by marine spatial plans that incorporate biodiversity spatial plans not older than 10 years.

## Previous initiatives

South Africa is a global leader in the use of spatial data and planning for conservation action. In 2021-2022, DFFE, the South African National Biodiversity Institute (SANBI) the Biodiversity Finance Initiative, and the United Nations Development Programme (UNDP) collaborated to develop novel scientific approaches to map Essential Life Support Action Areas (ELSAA) in South Africa. The resulting ELSAA Map shows where actions can be taken to achieve national policy targets related to biodiversity, climate change and human well-being. The ELSAA process in South Africa was based on a UNDP initiative to help countries prioritize where to take action to protect, restore, avoid loss and reduce pressures on nature and adapt to climate change. South Africa was one of 13 pilot countries that tested the ELSAA method, which is now available to all countries on UN Biodiversity Lab to support national action to achieve the KMGBF.

In South Africa, the initial ELSAA process involved identifying the top ten national policy commitments, gathering spatial data to map them, and then running a spatial prioritisation process. The main purpose of the initial ELSAA Map in South Africa (Figure 2) was to mobilise resources for nature-positive action to achieve the country’s top policy commitments. The initial map has been used by a wide range of national stakeholders to support policy and project development as well as implementation. More information on the ELSAA 1.0 process can be found in the ELSAA Factsheet, Video Trailer, Science Brief, and Consultation Reports (1 | 2).

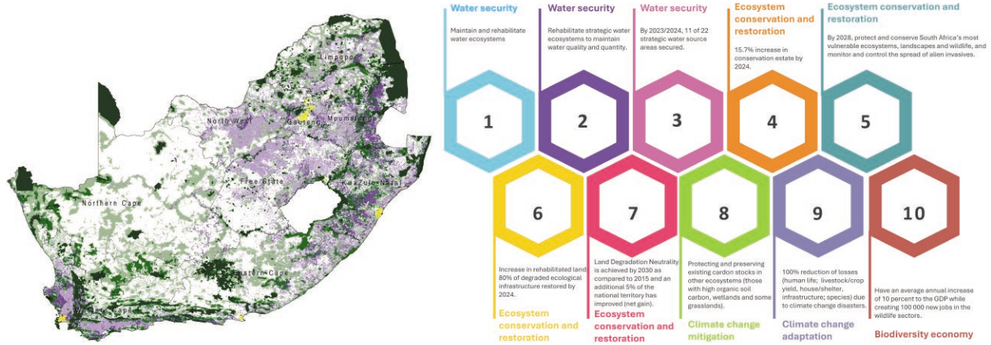



**Figure 2.** First version of the Essential Life Support Action Area (ELSAA 1.0) Map showing areas identified for nature-based action that can best contribute to the achievement of South Africa’s 10 priority commitments, jointly identified by stakeholders

# Use of the Essential Life Support Action Areas Map

The ELSAA Map was developed for strategic planning purposes, with the aim of identifying and prioritising interventions needed to meet national policy commitments at the national level. Following the publication of the ELSAA Map for South Africa, numerous projects, initiatives, and programmes leveraged its outcomes to develop a range of products. These products span across multiple scales, from local and national to global levels (Figure 3).

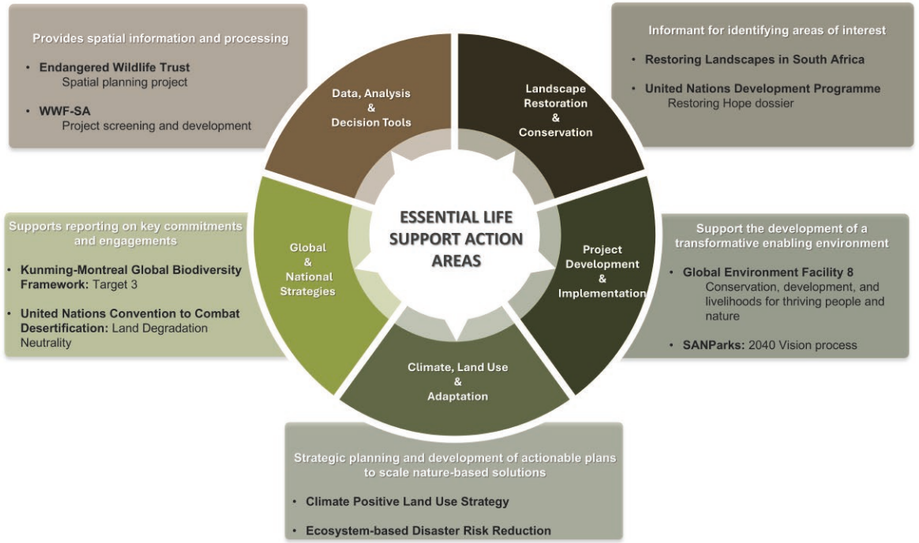



**Figure 3.** Applications of the Essential Life Support Action Areas (ELSAA 1.0) Map in South Africa

In 2023, the ELSAA 1.0 results were updated with a focus on supporting restoration efforts, resulting in a dossier on restoration opportunities in South Africa. The Restoring Hope dossier for South Africa, focuses primarily on the 'recovery of ecosystems', to reflect current policy objectives, targets and definitions, as well as to seek alignment with global conventions.

# ELSAA Update

Since the production of the original ELSAA Map and its accompanying restoration dossier, several important developments have created an opportunity to refresh and strengthen the analysis, reconceptualise its applicability, and reengage with national stakeholders to support continued use and uptake of the ELSAA Map. These developments include the adoption of the KMGBF, the gazetting of South Africa's Climate Change Act 22 of 2024, the introduction of the White Paper on Conservation and Sustainable Use of South Africa's Biodiversity (2023), the release of the 2025 National Biodiversity Assessment (NBA) and its associated national datasets, along with several additional new national input datasets.

In response to the availability of new and emerging data, as well as the changed policy environment, SANBI led an update of the ELSAA map in 2025, with support from DFFE, to support ongoing national efforts to



use spatial data in advancing biodiversity, climate, and human well-being priorities. This update provides important support for implementation of the 3rd NBSAP and for South Africa's contributions to the delivery of KMGBF Targets 1-12. This work was undertaken with the support of the SANBI Subregional Technical Support Center (TSC), UNDP, and the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), as well as the broader UN Biodiversity Lab (UNBL) partnership.

As with the initial ELSAA work, this update was undertaken collaboratively with key national stakeholders (Figure 4).

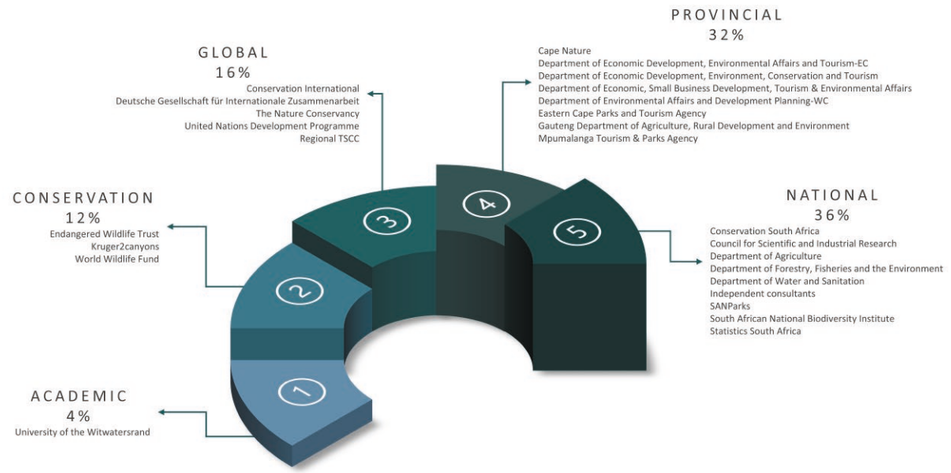



**Figure 4.** Representation of stakeholders across various departments and sectors that participated in the ELSAA Map update

These partners participated in two major workstreams: (1) update of the ELSAA Map to meet current national needs; (2) training on utilization of UN Biodiversity Lab as a resource to iterate the ELSAA Map, share national data, support monitoring efforts, and contribute to the development of the revised NBSAP.

For the first workstream, national stakeholders provided critical input to an **integrated spatial planning process** designed to support the country to identify and evaluate potential nature-based action areas that would support the achievement of national environmental, climate, and socio-economic priorities, as defined by the policy priorities highlighted in the ELSAA 1.0 process as well as the newly adopted KMGBF targets. The process was led by SANBI, with outreach to relevant stakeholders to solicit for input and identify how extensively they wanted to be involved in the process. The resulting ELSAA Maps can also support the implementation of the Land Degradation Neutrality (LDN) response hierarchy under the UN Convention to Combat Desertification (UNCCD). The LDN response hierarchy is a structured approach to achieve neutrality by prioritizing prevention, minimizing ongoing degradation, and restoring degraded land.

For the second workstream, national stakeholders took part in various ad-hoc activities designed to enhance the use of the UNBL platform in their country. These activities included: (1) creating a **central repository for national data in South Africa's UNBL workspace**, and (2) executing **capacity building and training on UNBL** to enable national stakeholders to utilize features most relevant to action around the KMGBF.

This work led to recommendations to achieve the priority policy commitments identified by South Africa, including KMGBF Targets 1-12, and to support relevant policy development, implementation, monitoring, and reporting. The capacity building offerings provided to technical experts were designed to support handover of South Africa's workspace on UNBL and the ELSAA spatial prioritization data, tool, and outputs to facilitate ownership and use throughout the implementation period of the NBSAP and the KMGBF.

In this technical report, we describe in detail the methodological steps and results for the spatial analysis products and tools created through the ELSAA update process. The final list of outputs generated in partnership with national stakeholders through the project include:

1. **ELSAA Map** scenarios that identify where protection, avoiding loss, reducing pressures, restoration, and urban adaptation efforts should be focused to lead to the best national outcomes for national priority policy commitments and KMGBF Targets 1-12 (summarized in section 2 of this report).

2. **Factsheet** to support national use and uptake of UNBL and the ELSAA Maps in the context of national policy and KMGBF implementation (summarized in the factsheet).

3. **National secure UNBL workspace** for South Africa (summarized in section 3 of this report).

4. **ELSAA Integrated Spatial Planning Tool** configuration available through the national workspace for South Africa on UNBL to support updates and iteration of the spatial prioritization analysis (described in the ELSAA Integrated Spatial Planning Tool User Guide).

5. **Capacity development and training materials on UN Biodiversity Lab** to support national efforts around NBSAP development and implementation (summarized in section 3 of this report).

Please see Annex 2 for a full list of project documents and reports related to these products, and Annex 3 for all relevant user guides, including guidance on accessing South Africa's UNBL workspace and using South Africa's ELSAA Integrated Spatial Planning Tool configuration on UNBL.



# 2. ELSAA Map to support national policy priorities

The ELSAA Map scenarios to support actions to achieve spatial national policy priorities and KMGBF targets was developed through five distinct project steps (Figure 5). The steps are designed around a holistic, community-centered, context-specific, and adaptive approach to integrated spatial planning.

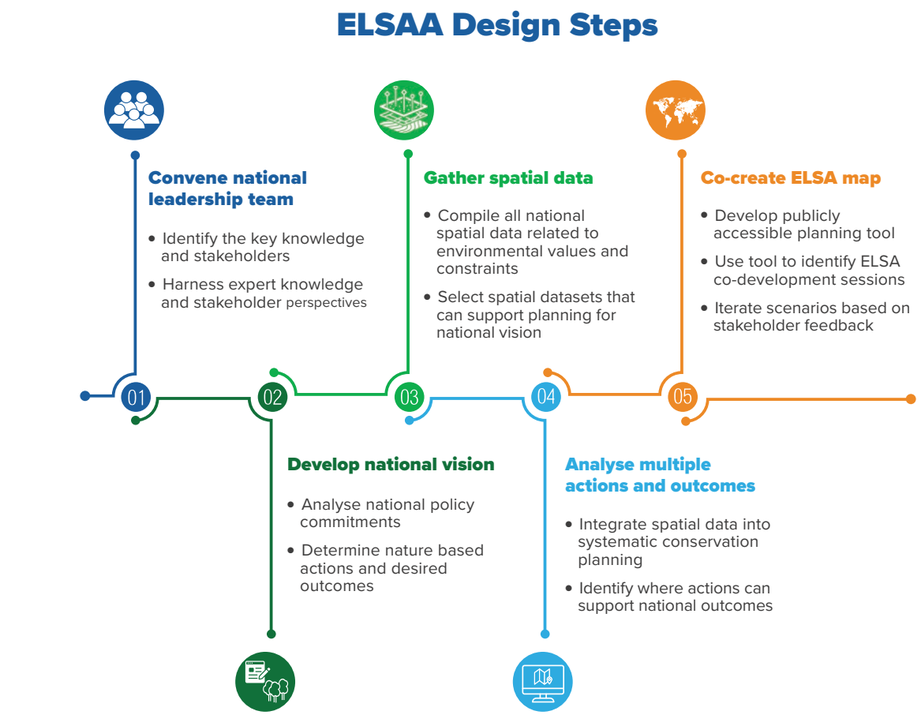



**Figure 5.** Five steps for creating an ELSAA priority action map to support action towards national policy priorities and KMGBF targets (Images adapted from Rice et al.[3])

3 Rice, W.S., Sowman, M.R., and Bavinck, M. (2020). Using Theory of Change to improve post-2020 conservation: A proposed framework and recommendations for use. Conserv Sci Pract 2, e301. https://doi.org/10.1111/csp2.301.

Step 1

## Convene national leadership team

The first step of the integrated spatial planning process involves engaging experts with relevant knowledge and stakeholders with vested interest or influence in the outcome. Engaging these groups to become leaders in the co-design and application of the spatial planning process is essential, because it ensures that the resulting spatial plan is credible, trusted, and applicable in policy making. The engagement of stakeholders was done through a core stakeholder working group in charge of advancing specific questions in a timely manner, and a broader involvement of stakeholders to disseminate the results and ensure the process is understood and used moving forward. Broad participation also helps develop a community of practice around the common objective of data-driven environmental decision-making while nurturing champions to help integrate the outputs of this spatial planning process into national and subnational policy and action.

In South Africa, SANBI acted as the convening partner to identify members of the core working group undertaking the spatial prioritization mapping exercise, building on the group of stakeholders engaged through the ELSAA 1.0 process. Together with the UNBL team, the core working group met regularly to ensure the project's implementation.

To implement the spatial planning component of the project, a structured series of interactive technical sessions was conducted. The initial phase focused on the systematic identification of relevant stakeholders and interested parties. Building on the established mailing list from ELSAA version 1.0, a formal communiqué was circulated to inform stakeholders of the methodology and scope of the ELSAA map update.

Using an online platform (Google form), a stakeholder survey was designed whereby interested participants were given an opportunity to indicate their interest in the current update process. The participants given an option to:

- participate throughout the full sequence of technical sessions, or
- receive periodic updates and the final outputs upon completion of the map update.

The survey also invited respondents to identify the availability and relevance of additional datasets considered critical for inclusion in the spatial analysis.

Based on this input, a core working group at SANBI proceeded with updating input data and ELSAA analysis, in collaboration with the UNBL team. This included a revision of the previous 10 priority policy commitments and a mapping of them to the KMGBF. In December 2025 and January 2026, broader meetings were held with experts across SANBI to co-create the updated ELSAA Maps. During these sessions, SANBI experts co-created the spatial prioritization analysis used to develop the ELSAA Maps by reviewing and weighting the data layers used for developing the ELSAA Maps, assessing tradeoffs, and collectively agreeing on a map showing where nature-based actions could best achieve national policy priorities, with key benefits for KMGBF Targets 1-12. Finally, a results-sharing workshop was held on 3 February 2026 to introduce and review the updated results with key stakeholders and discuss next steps for implementation with high-level policymakers and experts.



Step 2

## Develop a national vision

Spatial biodiversity plans, using the systematic biodiversity planning approach (known outside of South Africa as systematic conservation planning, SCP), are available for each of South Africa's nine provinces. Known as maps of Critical Biodiversity Areas and Ecological Support Areas (CBA Maps), they identify biodiversity priority areas that are important for conserving a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole. While each of these plans are conducted individually by the relevant provincial conservation authority, technical guidelines developed by SANBI provide an appropriate degree of consistency across the plans. This consistency allows the plans to be combined into an Amalgamated National CBA Map for the whole country. Each year, SANBI sources updated plans from the different provincial conservation authorities, and releases an updated amalgamated layer for the country, along with a technical report. The ELSAA analysis complements these detailed regional plans by offering a broadscale national planning analysis that can support prioritization of interventions at the national level. The updated amalgamated CBA layer is used in the ELSAA analysis to define the avoid loss zone and the protected area expansion layer.

The national vision for the UNBL-GBF Mapping Project in South Africa was developed through stakeholder engagement sessions focusing specifically on national policy commitments aligned with the KMGBF. These sessions emphasized national goals to develop a priority area map to identify where areas to protect (Target 3), restore (Target 2), reduce pressure (Target 10), support urban adaptation (Target 12), and avoid loss of nature could best contribute to achieving not only the 10 priority national policy commitments identified through the ELSAA 1.0 process, but also KMGBF Targets 1-12. To guide the spatial prioritization process, specific area-based constraints (also called 'area-based targets') were identified for the proportion of South Africa's land area within the priority area map that should be identified for 1) protection, 2) restoration, 3) reducing pressure, 4) urban adaptation, and 5) avoiding loss. Following consultations, the default area-based constraints were set as follows. Two different scenarios were prepared, reflecting current ambition for protection as well as the global ambition of the KMGBF:

**Photo credit: Steve Kirkman**

**Table 2.** Area-based Targets for the ELSAA Map

| | | | Policy rationale |
|---|---|---|---|
| **Protect** | **Scenario 1** | 20% of land and freshwater | Double the 2023 protected area extent and reflects the draft NBSAP target |
| | **Scenario 2** | 30% of land and freshwater | Reflects the global KMGBF Target 3 |
| **Avoid loss** | **Scenario 1** | 18.5% | Based on South Africa's CBAs. CBAs are priority sites identified in provincial and metropolitan systematic biodiversity plans that should be protected and maintained in a natural condition in order to ensure the persistence and representation of ecosystem types, ecological processes and species. Under scenario 1, this % represents the total coverage of CBAs not selected for protection |
| | **Scenario 2** | 12.7% | Based on South Africa's CBAs. CBAs are priority sites identified in provincial and metropolitan systematic biodiversity plans that should be protected and maintained in a natural condition in order to ensure the persistence and representation of ecosystem types, ecological processes and species. Under scenario 2, this % represents the total coverage of CBAs not selected for protection |
| **Reduce pressure** | | 9% | In the range of the National Biodiversity Economy Strategy (NBES) target of 10M ha, and KMGBF Target 2 as it pertains to production landscapes |
| **Restoration** | | 7% | In the range of the sum of all biome-specific Land Degradation Neutrality (LDN) targets for degraded areas in South Africa, as well as KMGBF Target 2 as applied to non-production degraded areas. *South Africa is currently reviewing and updating its LDN targets, which will be completed by March 2026.* |
| **Urban adapt** | | 0.25% | In the range of South Africa's LDN target for addressing 'ártificial' areas (~350,000 ha), as well as KMGBF Target 2 as applied to urban areas |

Note: The actions referenced here are the functional equivalent of actions of the LDN response hierarchy supported under UNCCD, ensuring alignment across global biodiversity frameworks. The ELSAA protect and avoid loss categories represent a 'prevention' planning principle and are priority actions in the mitigation hierarchy, followed by actions to reduce pressure, and then to restore degraded lands and waters. For more information on each KMGBF Target, please see the CBD website. For more information on the LDN response hierarchy, see the UNCCD website.



Step 3:

## Gather spatial data

Datasets were identified to support the qualitative elements of the10 national priority policy targets and KMGBF Targets 1-12 that could be spatially mapped with available national and global data. When identifying datasets, national data took precedence over global data as they tend to better reflect national conditions, be viewed as more accurate by national users, and are more likely to be formally recognized for official use by governments.

Spatial data was compiled to meet two basic needs: 1) delineation of where nature-based actions – termed 'zones' – for protection, avoiding loss, reducing pressure, restoration, and urban adaptation can occur, and 2) spatial proxies for national policy priorities and KMGBF targets, termed 'planning features'. The ELSAA 1.0 input data served as the foundation for the process, enabling the team to focus specifically on updating existing data and, where relevant, adding new data.

The identification of relevant national data updates was led by technical experts at SANBI. Once the national datasets were identified, the core team engaged national data owners and relevant national institutions to secure permission to use these data. In addition to the updated CBA layer, South Africa has updated its national land cover data, protected area coverage, invasive alien plant survey data, and has had its final Key Biodiversity Areas officially approved by the KBA Secretariat. Additionally, the recently launched 2025 National Biodiversity Assessment produced updated ecosystem maps, condition data, protection levels, and threat status indicators. All of these updated input data strengthen South Africa's ability to identify priority areas for protection, restoration, and other land and resource management actions, and have been included in the update of the ELSAA.

All national datasets were screened by the core team to ensure they were spatially explicit with area-based information, contained sufficient metadata, and were consistently mapped at the national level. Datasets were then further filtered to retain only datasets that could serve at least one of the two data needs, which were either: a) mapping possible locations for zones, or b) serving as planning features.

A total of 24 national datasets compiled into 13 composite maps for the data needs of the 10 priority policy commitments from ELSAA1.0 and KMGBF Targets 1-12 were selected to map priority action areas in South Africa. The primary dataset used to restrict the potential location of each nature-based action zone was a national layer on terrestrial condition and land cover. Datasets to map planning features spanned coarse filter proxies for biodiversity (e.g., Strategic Water Source Areas (SWSA) for surface water and groundwater, priority subcatchments for rehabilitation) and fine filter maps (e.g., Key Biodiversity Areas, amalgamated Critical Biodiversity Areas, under-protected ecosystems and species) important to achieving KMGBF Targets 1 through 4. Other datasets represented important spatial proxies for opportunities to either mitigate or adapt to climate change (e.g., soil organic carbon, priority areas for invasive alien plant control) important for the achievement of KMGBF Targets 8 and 6, whereas additional datasets represented ecosystem services important for sustainable development and human well-being (e.g., high priority agricultural areas, high risk settlements, wildlife sector current extent) important for KMGBF Targets 5, 7, 9, 10, 11, and 12. To evaluate trade-offs among broad conservation goals, each dataset was identified as supporting particular national policy priorities and KMGBF targets, as well as one of biodiversity, climate change, or human well-being (Figure 6). A full list of input data used in the spatial prioritization analysis is included in Annex 1.

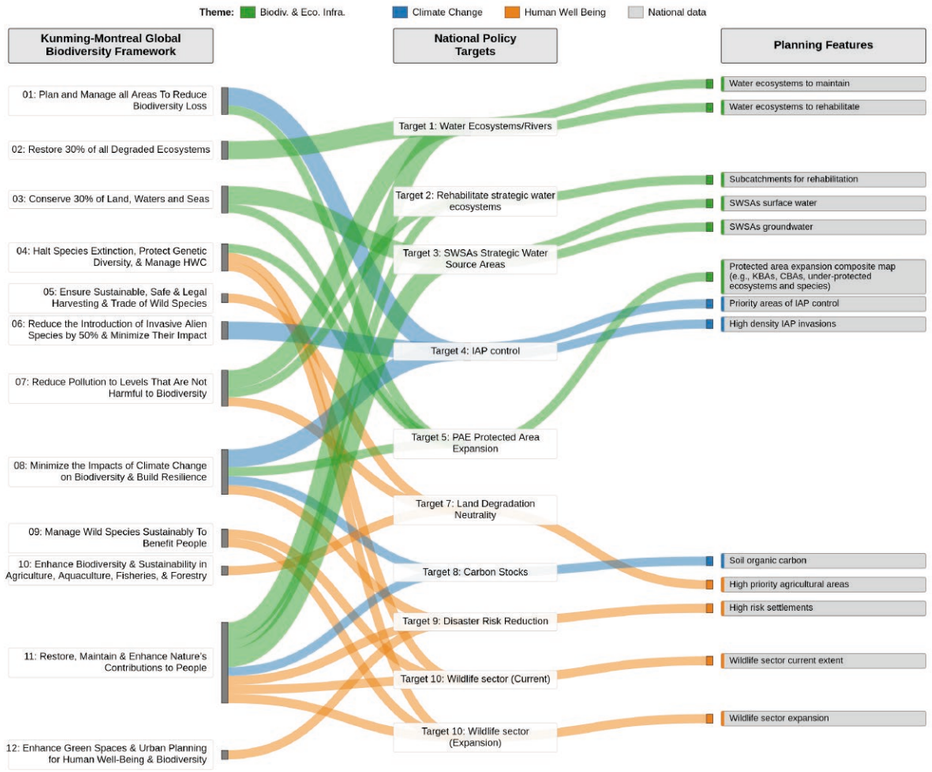



**Figure 6.** National policy priorities, related KMGBF targets, and planning features selected for inclusion in the analysis to map priority action areas in South Africa

All spatial data was summarized into planning units, which are the individual spatial units that are evaluated for protection, avoiding loss, restoration, reducing pressure, or urban adaptation actions within the ELSAA Maps. Planning units are akin to individual pixels in a raster image. For South Africa, the planning unit size was 1km by 1km. Therefore, a 1km primary resolution was used as it balances computational time against mapping precision. With this planning unit size, there are 1,224,935 planning units at the national scale, which is a number that results in the ELSAA Integrated Spatial Planning Tool taking roughly 2 minutes to run an optimization to create an ELSAA Map, which allows for near-real time scenario analyses. 1km is also a likely sufficient resolution for national level planning of protected areas and other land management actions. Moreover, for any input datasets that were received at a higher resolution in the native form , these data are summarized into the planning units at that native resolution. By doing so, this ensures that no finer resolution spatial information is overlooked when downsampling to a 1km resolution. For ad-hoc subnational planning and implementation, it might be necessary to identify a finer planning unit resolution.



Step 4

## Analyze multiple actions and outcomes

The fourth step is to use systematic biodiversity planning to analyze spatial priorities for protection, avoiding loss, reducing pressure, restoration, and urban adaptation, as well as the outcomes of these actions for all planning features. Systematic biodiversity planning is used to optimize spatially explicit conservation actions to promote the persistence of biodiversity and other natural features in situ. Systematic biodiversity planning involves a transparent and objective process of setting clear goals and objectives, and subsequent planning for conservation actions that meet them. Systematic biodiversity planning was originally developed to identify alternative proposed networks of protected areas. More recently it has evolved to consider multiple nature-based actions and objectives beyond biodiversity, making it suited for engaging with the complexity of integrated spatial planning across landscapes and nations. Systematic biodiversity planning was used to run a spatial prioritization analysis to analyze all nature-based action zones and planning features at once, thus capitalizing on spatial synergies across all national policy priorities and related KMGBF targets when identifying priority areas for national action. In addition to integrating multiple commitments, systematic biodiversity planning enables diverse stakeholder groups to weigh the relative importance of the various planning features, view trade-offs that result from conflicting priorities, and foster dialogue around cross-sectoral collaboration and implementation.

The ELSAA Integrated Spatial Planning Tool uses the *prioritizr* software library to run the systematic biodiversity planning spatial prioritization analysis. The *prioritizr* package is conceptually similar to the widely used planning software Marxan but differs in its implementation of integer linear programming techniques instead of simulated annealing as the solving algorithm. The linear programming approach can solve large problems (>1 million planning units) faster than other approaches, allowing for real-time analysis with stakeholders. Moreover, it supports a broad range of objectives, constraints, and penalties that can be used to customize conservation planning problems to the specific needs of a conservation planning exercise.

The maximum utility optimization function within *prioritizr* is used for its ability to find locations for the nature-based actions that maximize the total representation of planning features, accounting for zone contributions, with the relative importance of each planning feature controlled through a weighting parameter. To promote equity in representation across planning features, the core team conducted a pre-calibration process in which a script: 1) weights all planning features equally, evaluating how well each feature is represented in the solution (e.g., its maximum utility); 2) weights each feature as 1 while setting all other features to 0, and again solving the problem to see the impact of that feature's weight on the overall solution (e.g., its maximum representation); and 3) finally, enters a calibration loop where it iteratively adjusts the weights based on the difference between the maximum utility and maximum representation for each feature, aiming to minimize the difference (delta) between these values and leading to a more equitable representation across all features. These pre-calibration weights then serve as our starting weights in the ELSAA Integrated Spatial Planning Tool's server backend for the priority area map co-creation sessions.

Step 5

## Co-create the ELSAA Map scenarios to support national policy priorities and related KMGBF targets

The final step is to use the ELSAA Integrated Spatial Planning Tool to co-create the ELSAA Maps through real-time iterative scenario analyses with stakeholders. As the spatial prioritization process integrates multiple, often competing, priorities in a given country, leadership from national experts and stakeholders is key for evaluating trade-offs across scenarios and iterating maps to identify a final product that best meets the diverse objectives of the national vision.

To allow full involvement of the core team and broader stakeholder group within the integrated spatial planning process, the ELSAA Integrated Spatial Planning Tool configuration for South Africa was preloaded with all relevant spatial data and used to run spatial prioritization analyses during live co-creation sessions with a core group of experts at SANBI. The tool allows data visualization, setting targets and weights, real-time (~2 minutes) optimization runs, display of the resulting ELSAA Maps, and tabular analysis of the results. The co-creation of the ELSAA Maps was done using this tool through two sessions. See Annex 3 for detailed guidance on accessing the tool and creating iterative ELSAA priority action maps.

In the first co-creation session, weights for each planning feature were assigned by national technical experts. During this weighting session, each planning feature – represented by a spatial dataset - was shown to stakeholders, and its source, characteristics, and meaning were discussed. Stakeholders were then asked to give each dataset two different weights:

- The first weight was a score between 0 and 10, where 0 indicated very low importance and 10 indicated very high importance, reflecting how strongly the planning feature should factor in guiding the identification of priority action areas in the resulting maps and supporting national environmental commitments.

- The second weight consisted of a discrete value of 0, 0.5 or 1, where stakeholders evaluated whether they: a) did not trust the reliability of the dataset's source at all, b) were uncertain in its reliability, or c) were confident in the reliability of the dataset's source, respectively.

The overall weight for each dataset, per stakeholder, was obtained by multiplying each importance score by each confidence score. These overall weights were then averaged across all stakeholders for each dataset. The final average weights were then configured as default weights for each planning feature in the ELSAA Integrated Spatial Planning Tool. The tool, now preloaded with default weights set by stakeholders, was then used to create and iterate the final ELSAA Maps, as well as associated ELSAA Heatmaps, in the second live co-creation session.

The updated ELSAA Map scenarios (Figure 7) serve to identify areas for each action (protection, avoiding loss, reducing pressure, restoration, and urban adaptation) to achieve area-based constraints in a way that maximizes the representation of all planning features, given their weights. To evaluate the trade-offs of integrated spatial planning for the first map, the representation of each planning feature in the initial ELSAA Map was measured. All planning features with a representation lower than 85% or lower in the ELSAA Map were then flagged and this 'trade-off' of integrated planning was discussed as a group. A voting exercise was undertaken to determine if the weights should be further adjusted to increase the representation of each or certain planning features that experienced this drop in representation. The final average weight across all stakeholders following this exercise has been included as the default weight for each planning feature in the ELSAA Integrated Spatial Planning Tool configuration.

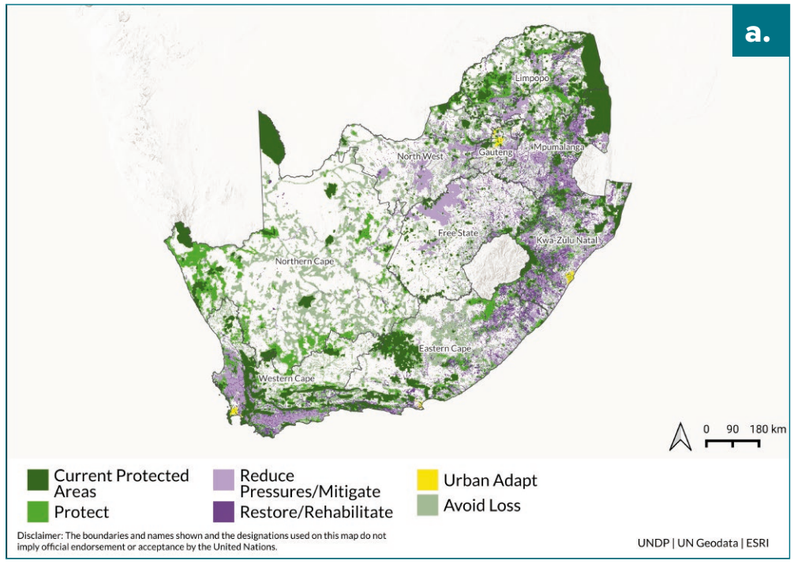


After the second co-creation session, a results-sharing meeting was held on 3 February 2026 to present the final ELSA Maps and give opportunities for validation and further iteration of the scenarios to key national stakeholders. The meeting also focused on identifying ways to move forward with the implementation and use of the ELSAA Maps. The project team will hand over the final ELSAA Maps that came out of the results-sharing meeting to South Africa's government focal points, including the associated spatial datasets, through official correspondence that shares this technical report and a policy brief for high-level decision makers.

The ELSAA Maps identified through this process reflect the parameters set in the ELSAA Integrated Spatial Planning Tool by national experts, as well as the national configuration of the ELSAA Tool based on current national targets and current national data. The decision to have two protection scenarios (20% and 30%), representing current national ambitions under discussion for the NBSAP and also KMGBF Target 3, respectively, was borne from experience in how ELSAA has been used in the country previously. The integrated spatial planning process supported by ELSAA is not a 'one and done' process, but rather a foundation that should be built upon as new policy commitments emerge and new and improved data are developed. Hence, this update from earlier versions of the ELSAA Map to new versions to support national planning and implementation going forward. The capacity building conducted through the project enables for continued re-evaluation of ELSAAs to ensure their relevance for guiding landscape planning and resource allocation. National stakeholders may wish to use the ELSAA Integrated Spatial Planning Tool with stakeholders across sectors, including changing input parameters and creating further scenarios that could be collectively assessed to broaden ownership of the final product.

The SANBI and UNBL teams are available past the close of the project to support limited annual updates to the data included in the ELSAA integrated spatial planning tool for South Africa. This includes: (1) updating national data layers used as planning features when a new version is released; (2) adding a new data layer that maps an important biodiversity, climate, or human well-being value for South Africa as a planning feature to the tool. To request an update, please reach out to support@unbiodiversitylab.org.

In addition, the configuration of the ELSAA tool could be updated to reflect additional national targets, more extensive new/updated national data, and/or customized to a subnational area in the country. These services are available at cost from the UNBL team following the closing of the project. In addition, the UNBL team can support or lead the production of derivative maps based on the ELSAA priority action map that can directly support policy implementation (e.g., efforts to focus on a particular goal like climate adaptation, water security or land degradation neutrality). To explore further, please reach out to support@unbiodiversitylab.org.



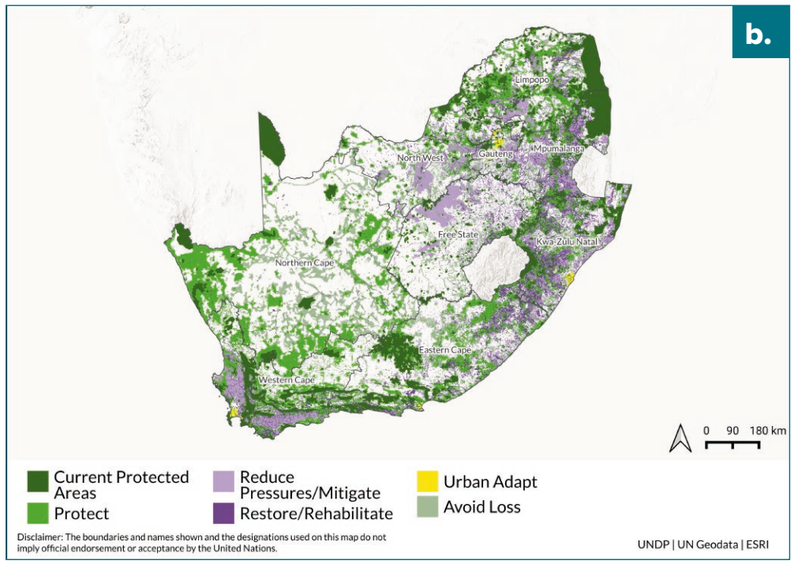




**Figure 7.** The ELSAA Map scenarios created by South Africa identify two scenarios for protection, 20% (a), based on the draft NBSAP III Target 3) and 30% (b), based on the global KMGBF Target 3). Both scenarios also identify priority areas for targets of 9% restoration, 7% reducing pressure, and 0.25% urban adaptation in South Africa that will maximize the combined representation across all planning features. Planning features are mapped using 13 national spatial composite datasets for biodiversity, climate change, and human well-being, which were selected using guidance from the qualitative elements of the KMGBF. This map has been produced at a 1km resolution.



**MAP APPLICATION:** These nationally endorsed ELSAA Map scenarios to support national policy priorities and the related KMGBF Targets 1-12 show where actions can most effectively achieve the greatest impact across all planning features while minimizing unacceptable tradeoffs of integrated spatial planning. They can also support the implementation of the Land Degradation Neutrality (LDN) response hierarchy under the UN Convention to Combat Desertification (UNCCD). The LDN response hierarchy is a structured approach to achieve neutrality by prioritizing prevention, minimizing ongoing degradation, and restoring degraded land. These spatial prioritization maps outline an ambitious expansion of protected areas, from 12.2% of the land area covered by existing protected areas to 20% (Scenario 1) or 30% (Scenario 2). This enhancement in protection could come from new protected areas or recognition of other effective area-based conservation measures (OECMs). They also outline critical areas to avoid loss (18.5% or 12.7% of land area in Scenarios 1 and 2, respectively), reduce pressure (7% of land area), restore ecosystems (9% of land area), and foster urban adaptation (0.25% of land area) to achieve multiple biodiversity, climate, and sustainable development outcomes. These maps show a strategic, national-level perspective on important places to take action to protect, manage, restore or urban green. Before implementing actions, however, further ground truthing and engagement with local rights holders and relevant stakeholders is needed.

**MAP ACCESS:** Both the image files for the final maps and the underlying GIS files (geotiffs) can be accessed at Scenario 1 and Scenario 2. These maps should be cited as:

DFFE, SANBI, and UN Biodiversity Lab 2025. Technical Report for the UNBL-GBF Mapping Project in South Africa. ELSAA Heatmaps created using spatial data and the UNBL Essential Life Support Action Area Integrated Spatial Planning Tool on 30 January 2026.

**MAP UPDATES:** These maps can be further updated, and complemented with additional optimization runs for different scenarios, through use of the ELSAA Integrated Spatial Planning Tool configuration for South Africa. Please see Annex 3 for detailed guidance on accessing and using the tool.

An important supplementary component of the ELSAA Maps is the contribution across zones to representation of planning features (Figure 8). Some planning features are only represented within a single zone - for instance, High Risk Settlements is only represented within the urban adapt zone, while Protected Areas Expansion is only represented within the protect zone. However, most planning features are represented across multiple zones, highlighting the importance of considering a range of zones for achieving the diversity of national policy priorities and related KMGBF targets around biodiversity and ecological infrastructure, climate change, and human well-being. Put simply, often one action -- whether protection, reducing pressures and mitigation, restoration and rehabilitation, urban adaptation, or avoiding loss -- can contribute to achieving multiple national policy priorities and KMGBF targets. It is also important to note that the new protect, reduce pressure/mitigate, restore/rehabilitate, urban adapt, and avoid loss zones would lead to a major increase in the representation of all planning features beyond their current representation in existing protected areas.

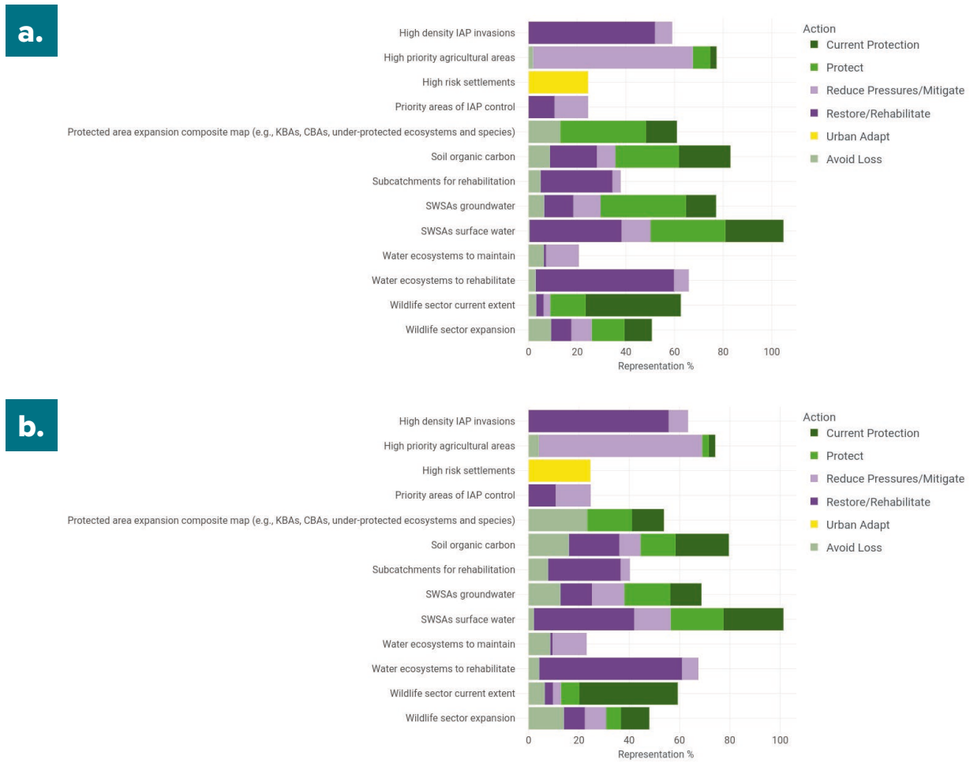



**Figure 8.** The contribution of existing protected areas, as well as of each priority action zone to the representation of planning features in the ELSAA Maps for (a) Scenario 1 (20% protection) and (b) Scenario 2 (30% protection).

Representation measures how well each planning feature is captured across the priority action zones in an ELSAA solution. The representation across zones R_f (%) is calculated as:

$$R_f = \sum_{z=1}^{Z} \left( \frac{\sum_{i=1}^{I} x_{i,z} r_{i,f,z} v_{i,f,z}}{T_f} \times 100 \right)$$

where:

$$T_f = \sum_{z=1}^{Z} \sum_{i=1}^{I} r_{i,f,z} v_{i,f,z}$$

Here, $x_{i,z}$ is the decision variable (e.g., whether a planning unit $i$ has been included (1) in a specific zone $z$ or not (0)), $r_{i,f,z}$ is the total amount of feature $f$ in planning unit $i$ in zone $z$, and $v_{i,f,z}$ is the impact value of feature $f$ in planning unit i in zone $z$.

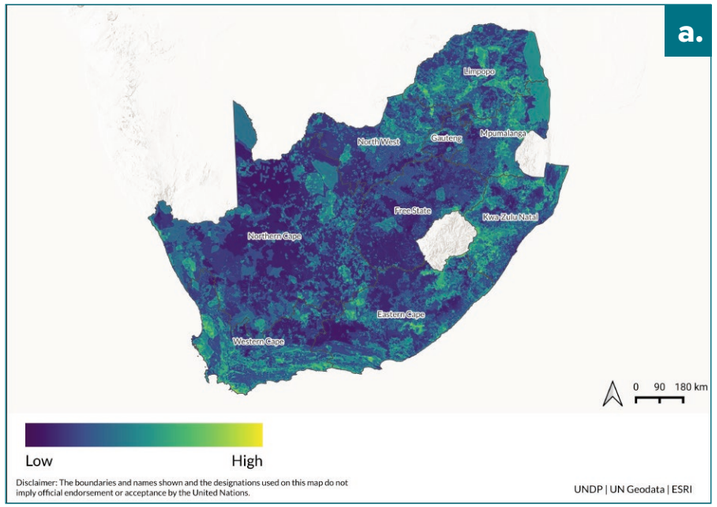
The zone impact value ($v_{i,f,z}$) specifies how each action (protect, restore, manage, urban greening) impacts each planning feature in that zone. A value of 1.0 indicates a neutral impact, values >1 indicate enhanced impacts, and values <1 indicate reduced impacts relative to simple spatial coverage.

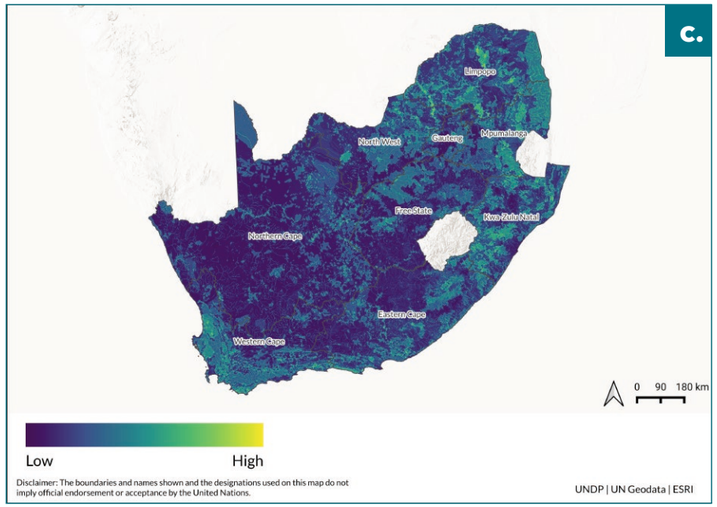
Representation reflects both spatial coverage and action impact — a feature may achieve high representation through either extensive coverage or through placement in zones where actions provide higher impact to that feature.

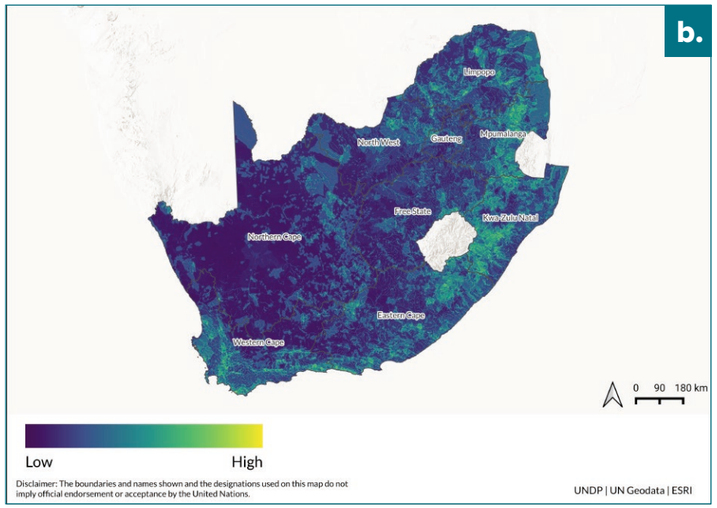


In addition to the ELSAA Maps, ELSAA Heatmaps disaggregated by each nature-based action (protection, avoiding loss, reducing pressure, restoration, and urban adaptation) were produced (Figure 9). These heatmaps identify important locations for achieving the national policy priorities and related KMGBF Targets 1-12. They are the normalized sum of planning features' values in each planning unit, multiplied by the user weights given to each planning feature. Important areas (where more planning features occur, adjusted for weighting) are shown in a range of colors from green to yellow, with those in bright yellow being the most important. Heatmaps can be used to identify areas where the overall contribution of planning features to the national policy priorities and related KMGBF Targets 1-12.

By evaluating heatmaps, national experts can view the aggregated user-weighted planning feature data to determine if the patterns for each nature-based action match their expectations and personal knowledge of the region. If a particular region which national stakeholders believe is particularly important for the implementation of protected areas is showing up as 'cold' within the heatmap relating to the protect action, then stakeholders could utilize the ELSAA Integrated Spatial Planning Tool to increase the weight of planning features affected by the protect action that are present in this region to reflect a 'warmer' presence in the heatmap, and therefore increase the likelihood of this region being allocated the 'Protect' action in future spatial prioritization scenarios yielding ELSAA Maps (Figure 7).



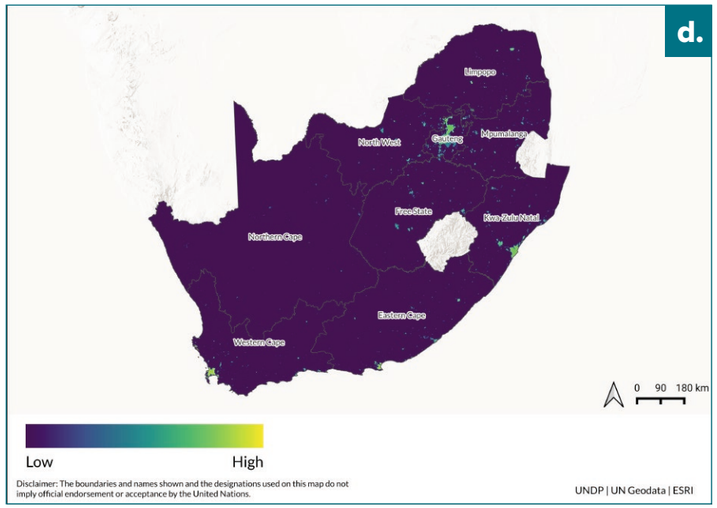




**Figure 9.** ELSAA Heatmaps for a) protection, b) restoration/ rehabilitation, c) reducing pressures/ mitigation, and d) urban adaptation, depicting cold areas (dark purple) where the summed value of planning features applying to that that action is smallest, and hot areas (yellow) where the summed value of planning features applying that that area is greatest.

**MAP APPLICATION:** National stakeholders in South Africa could use these ELSAA Heatmaps to compare the extent to which areas identified as important for achieving the national policy priorities and KMGBF Targets 1-12 reflect their understanding of particular regions and therefore use these heatmaps as tools to evaluate the accuracy of the ELSAA priority action map (Figure 7) and iterate additional, well-informed spatial prioritization scenarios using the ELSAA Integrated Spatial Planning Tool.

**MAP ACCESS:** The image files for the heatmaps, and their underlying GIS files (geotiffs), can be accessed here. These maps should be cited as:

DFFE, SANBI, and UN Biodiversity Lab 2025. Technical Report for the UNBL-GBF Mapping Project in South Africa. ELSAA Heatmaps created using spatial data and the UNBL Essential Life Support Action Area Integrated Spatial Planning Tool on 30 January 2026.

**MAP UPDATES:** These maps can be further updated, and complemented with additional optimization runs for different scenarios, through use of the ELSAA Integrated Spatial Planning Tool configuration for South Africa. Please see Annex 3 for detailed guidance on accessing and using the tool.

# 3. Additional support for South Africa on use of UN Biodiversity Lab to support the NBSAP and KMGBF

In addition to co-creating the ELSAA Heatmaps and ELSAA Maps, several ad-hoc activities were undertaken through workstream 2 to support South Africa's around NBSAP and KMGBF targets.

The activities selected as most important for national efforts around the NBSAP and KMGBF in South Africa included:

1. **Creating a central repository for national data in South Africa's UNBL workspace:** centralizing key national datasets on biodiversity, climate, and human well-being in South Africa's secure UNBL workspace. This provides a central repository to review national data relevant to NBSAP implementation, filter by KMGBF target and/or national target, and support visualization in tandem with global datasets on the UNBL platform. It also enables different actors to work better together, and synergize their efforts towards conservation and sustainable development.

2. **Executing capacity building and training on UNBL:** inviting decision makers and key stakeholders to take part in a series of lectures and hands-on training sessions around the various functionalities of the UNBL public platform, secure UNBL workspaces, and the ELSAA Integrated Spatial Planning Tool, which supplied stakeholders with relevant knowledge and practical experience related to leveraging UNBL for action around the KMGBF.

**Photo credit: Anisha Dayaram**



Activity 1

## Central repository for national data in South Africa's UNBL workspace

UNBL workspaces provide a secure work area where national or subnational data can be added and shared with a set of specified users. They offer users with any level of GIS expertise the ability to collaborate on important work to use spatial data as part of the development of a national monitoring plan and/or system for the Global Biodiversity Framework. Government policymakers and technical specialists can use a UNBL workspace to:

- Invite a community of users relevant to the development of a national monitoring plan for the KMGBF.
- Connect to existing national spatial data repositories, enabling all relevant data to be consolidated in one location and ensuring automatic updates from the original source.
- Upload national/subnational datasets and areas of interest.
- Tag national data to clearly identify the goal, target, and indicator type that it will be used to calculate.
- Visualize national/subnational datasets alongside any of the global data layers available on UNBL.
- Calculate any UNBL metrics using the official national boundary layer or official sub-national boundary layers.

Through the UNBL-GBF Mapping Project, national datasets identified as important for priority national policy commitments and KMGBF implementation were added to South Africa's national workspace on UNBL and made available for external viewing and sharing. The goal was to provide a stable central repository to review national data relevant to NBSAP implementation, increase the visibility of South Africa's national data used around reporting on national policy priorities and KMGBF targets, and bolster its effectiveness by allowing it to be viewed in tandem with over 1,000 global-scale data layers on biodiversity, climate change, and human well-being available on UNBL. Each national dataset was tagged using the format 'KMGBF Target X' 'National Policy Target Y' to allow users and stakeholders to easily filter and view national datasets based on the relevant policy target which they are used as proxies for. In total, 20 national data layers were uploaded to UNBL.

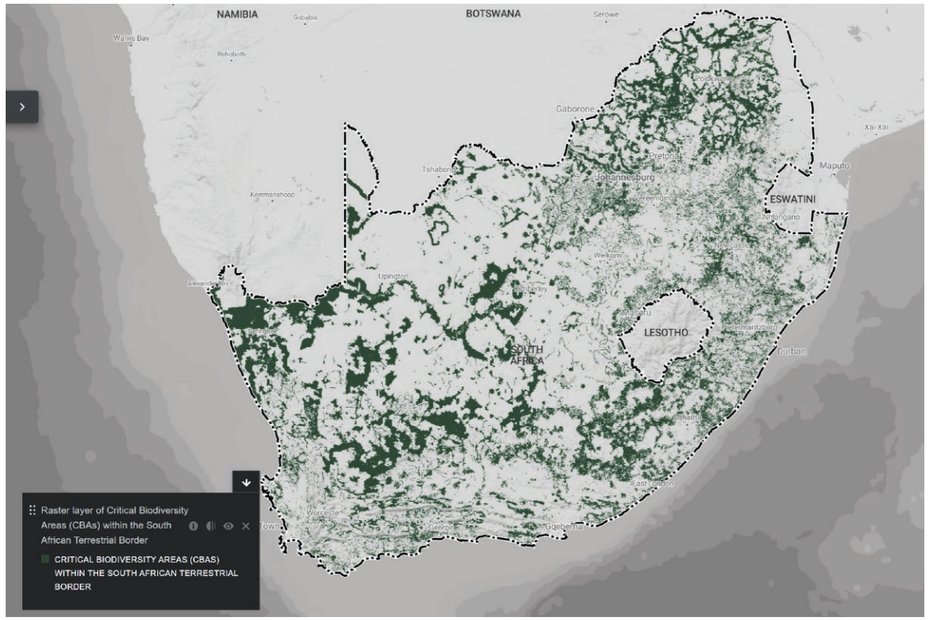



**Figure 10.** National datasets for South Africa on UNBL. The map shows the national South Africa Critical Biodiversity Areas Map, uploaded to South Africa's secure workspace

When setting up the UNBL workspaces, government policymakers and technical specialists can assign roles to individuals or user groups to determine their level of access. These roles include:

- **Owners:** Nominated by the country to take control of the workspace. The owners will be responsible for inviting and granting access to other users, as well as adding other administrators.
- **Admins:** Can add and manage users, assign roles to users as editors and viewers, manage workspace assets via the admin tool, and view all workspace assets in the map view.
- **Editors:** Can manage workspace assets via the admin tool and view all workspace assets in the map view. Editors should have experience using GIS software to enable them to upload and edit data layers.
- **Viewers:** Can view all workspace assets on the map view. Viewers cannot access the admin tool.

**The owners for the South Africa workspace on UNBL are: Carol Lefakane** (c.lefakane@sanbi.org.za)**, Nokutula Mhene** (nokutula.mhene@undp.org)**, and Shae-Lynn Hendricks** (s.hendricks@sanbi.org.za)**. To request access to the workspace, please contact them directly.**



Activity 2

## Capacity building and training on UNBL

A series of UNBL lectures and training sessions were held in October and November 2025 for national stakeholders to acquaint them with all functionalities and applications of the platform. Through two lecture sessions and two training sessions centered around UNBL's public platform and secure workspaces, national stakeholders gained key knowledge and hands-on experience around viewing UNBL datasets, calculating dynamic metrics and viewing headline indicators for their country, managing their national workspace, and using the ELSAA Integrated Spatial Planning Tool configuration for their country. Stakeholders that were present in the sessions should now be equipped with the practical knowledge and tools necessary to provide training to other interested groups around utilizing UNBL to support planning and implementation of key national policy priorities and the KMGBF (see Table 1 for relevant UNBL functionalities covered during the trainings).

**The recordings and presentations are available here. In addition, user guides for UNBL are available in Annex 3.**

UNBL features relevant to NBSAP implementation and the 7NR included in the training series included:

- Secure workspaces for non-commercial users to upload and manage national spatial data, tag by NBSAP target and indicator, and share privately with a curated group of users. UNBL secure workspaces have been further enhanced through the UNBL-GBF Mapping Project with user-friendly features to seamlessly connect to data from diverse national and global repositories.
- Push-button calculation of dynamic metrics at the national level and display of select headline indicators. New metrics will continue to be added for display of select KMGBF indicators and additional metrics.
- Access to over 1,000 global spatial data layers, including data referenced in the metadata of the KMGBF monitoring framework, curated for national use on biodiversity, ecosystem services, and human well-being to fill national data gaps, as needed.
- Curated data collections for policymakers that could be used to calculate indicators to monitor implementation of the KMGBF at national level as well as on objectives related to protected areas (Target 3), restoration (Target 2), and nature-based solutions for climate change (Target 8).
- Extensive documentation and guidance to enable new users to easily apply UNBL for their needs.
- Ability to develop prioritized spatial plans for KMGBF Targets 1, 2 and 3, that provide powerful co-benefits for Targets 4-12 using the ELSAA Integrated Spatial Planning Tool.

# 4. Project's Outcomes and Recommendations

Through the UNBL-GBF Mapping Project, a series of stakeholder engagement sessions and spatial analyses were undertaken with SANBI on spatial planning with the central objective of providing actionable science to support planning and implementation for ten priority national policy commitments and related KMGBF targets. Our specific objectives, guided by national stakeholders and the national priorities of the country, were to develop national ELSAA Map scenarios that identify priority areas to protect, avoid loss, reduce pressure, restore, and urban adapt in South Africa. The results are presented through figures with associated 'map application' insights through this report. Here we provide some further insights that span these results, with a focus on applicability for the KMGBF.

KMGBF Target 3 to protect 30% of land, sea, and freshwater areas represents the goal of ensuring enough areas of particular importance for biodiversity are protected to contribute (alongside other goals and targets) to reversing the extinction crisis and stabilizing the global climate system, and do so in an inclusive and participatory way. The integrated spatial planning tools and maps provided as a result of this project respond to the ambition outlined in KMGBF Target 1 around biodiversity-inclusive spatial planning and could inform strategic development planning processes and protected area expansion and OECM recognition in optimal locations, ensuring that these new conservation areas lead to significant conservation of important ecosystems and species, prioritizing those with additional ecosystem service co-benefits. Moreover, KMGBF Target 2 represents the most ambitious target within the Framework to restore native and essential ecosystems at the national and global levels. Targets 10 and 12 likewise raise ambition around sustainable management practices and urban greening.

The maps provided by this project are a response to help government increase the necessary efforts around protection, avoiding loss, reducing pressure, restoration, and urban adaptation and help decision makers to identify where to take appropriate actions in locations that will maximize environmental outcomes to deliver on priority national policy commitments, as well as qualitative elements of KMGBF Targets 1-12. The actions referenced here are the functional equivalent of actions of the LDN response hierarchy supported under UNCCD, ensuring alignment across global biodiversity frameworks. The ELSAA protect and avoid loss categories represent a 'prevention' planning principle and are priority actions in the mitigation hierarchy, followed by actions to reduce pressure, and then to restore degraded lands and waters. For more information on each KMGBF Target, please see the CBD website. For more information on the LDN response hierarchy, see the UNCCD website.

The ELSAA Maps that are derived from this project combine the best available national spatial data with novel, state-of-the-art technology and a robust spatial planning methodology in systematic biodiversity planning, thereby enabling national experts, practitioners and decision makers to undertake interactive spatial prioritization activities to support South Africa's national priorities. The resulting maps are useful for identifying the most critical regions and ecosystems to focus conservation, restoration, sustainable management, and urban greening efforts. This information could be used by SANBI, DFFE, and other relevant ministries or equivalent entities, to identify the most critical subnational districts to engage. For example, ELSAA could be used to inform the prioritisation of areas for expansion of South Africa's terrestrial protected area estate, as well as to identify areas requiring resource mobilisation for ecological restoration. Much of the data is relevant at the subnational scale, but further ground truthing will be needed, such as incorporating more accurate subnational data or undertaking field campaigns to validate national maps in the local context. For restoration in particular, the resource guide to Target 2 of the KMGBF could be helpful to identify site-specific practices for implementation of restoration activities.



This report presents maps that were created through an extensive consultation process with national experts, yet they should not be viewed as static products that are inflexible to future updates. Since the methodology enables decision makers to undertake new iterations of the process through the ELSAA Integrated Spatial Planning Tool (Annex 3), new alternate and updated scenarios going beyond those explored in this project could be developed. This may include updating datasets and running new scenarios using the ELSAA Tool. For instance, during and following the co-creation session, national experts flagged that a concerning proportion of South Africa's high priority agricultural lands were being prioritized for restoration, and that transferring these lands out of food production could cause untenable food security issues. As such, the decision was taken to alter the impact score of restoring high priority agricultural lands to equal zero, and also increase the impact score of reducing pressures on invasive alien plants. These changes ensured that while high priority agricultural lands were not fully precluded from being prioritized for restoration, they were not prioritized for this action nearly as frequently. Further capacity-building activities on these approaches were facilitated through a series of lectures and hands-on trainings with relevant national focal points on the use of the UNBL platform and the ELSAA Integrated Spatial Planning Tool. The aim of these sessions was to cultivate national trainers that would continue strengthening capacities at national and subnational levels with additional relevant stakeholders.

In parallel, activities undertaken with national stakeholders on responding to national needs with relation to the NBSAP and KMGBF. These activities, selected by national stakeholders, focused on important foundational elements around the use of spatial data, (1) including supporting the identification of key national data and consolidating them in South Africa's national workspace on UNBL and (2) providing capacity building and training on features of UNBL that could be useful to support national needs. Due to timing, these activities were not directly applied in the production of the 7NR; however, they provide an enabling foundation for future monitoring and reporting, including tracking progress against updated NBSAPs and related KMGBF commitments. Further collaboration with the UNBL team through future projects could additionally support the development of custom features on UNBL based on national needs.

**Photo credit: John Donaldson**

# 5. Next steps

Science-based, data-driven decision-making plays an important role in advancing strategic national initiatives and dialogues. The ELSAA process is a powerful, national-scale tool that can complement South Africa's well-developed provincial, district, and sector-specific spatial planning products. The optimized action map can help to inform future strategic discourse and resource mobilization. The participatory and dynamic nature of the ELSAA process provides opportunities to explore trade-offs and scenarios, including tangible spatial outputs that can represent national and international policy commitments.

Over the next phase, efforts will focus on enhancing the use of the ELSAA Map to support policy, planning, and implementation. Key next steps include targeted capacity building and awareness-raising in order to:

- **Guide resource mobilization and investment planning** for nature-based solutions, improving coordination, aligning investments, and strengthening policy implementation.
- **Inform project design, development, and implementation** by providing reliable baseline data and spatially explicit information for government departments, organizations, and partners.
- **Support national and international reporting obligations** by tracking and demonstrating progress toward policy commitments and environmental targets.
- **Strengthen technical collaboration** through the CBD Subregional Technical and Scientific Cooperation Centre.

**Photo credit: Pauline Rowles**



# Annexes

## Annex 1: Input data list

This table depicts all data layers used in the integrated spatial planning process to identify priority action areas in South Africa and support implementation of the 10 priority national policy targets and KMGBF Targets 1-12. Data from the ELSAA 1.0 process was used as the foundation of the datastack. We note where data has been updated or added in the layer name column.

| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| Planning features | Biodiversity | Water ecosystems to maintain (New data) | National | KMGBF Target 1 | The latest NBA (2025) wetlands and river layers were used in the creation of this dataset. River features that were classified as 'good' condition and wetlands labelled as either A, B or DD condition, were classified as needing to be maintained in that condition.<br>Job, N., Grenfell, S., Ollis, D., Kotze, D., Collins, N.B., Awuah, A., & Sieben, E. 2025. Wetland ecosystem types: Freshwater (inland aquatic) realm. National Biodiversity Assessment 2025. South African National Biodiversity Institute. http://nba.sanbi.org.za/.<br>Job, N., Grenfell, M., Petersen, C., Smith-Adao, L., & Graham, E. 2025. River ecosystem types: Freshwater (inland aquatic) realm. National Biodiversity Assessment 2025. South African National Biodiversity Institute. http://nba.sanbi.org.za/. | View |
| | Biodiversity | Water ecosystems to rehabilitate (New data) | National | KMGBF Target 1 | The latest NBA (2025) wetlands and river layers (cited above) were again used in the creation of this dataset. River features that were classified as 'poor' condition and wetlands labelled as either C condition, were classified as needing restoration. | View |
| | Biodiversity | Subcatchments for rehabilitation | National | KMGBF Target 2 | G. Pence created per expert consultation; based on Freshwater Ecosystem Priority Area data (FEPA, 2011), Strategic Water Source Areas (SWSA), & National Biodiversity Assessment freshwater data (NBA, 2018) to identify deteriorating conditions at the subcatchment scale. | View |
| | Biodiversity | Strategic Water Source Areas (SWSA) surface water | National | KMGBF Target 3 | Lötter, M.C. & Le Maitre, D. (2021) Fine-scale delineation of Strategic Water Source Areas for surface water in South Africa using Empirical Bayesian Kriging Regression Prediction: Technical report. Prepared for the South African National Biodiversity Institute (SANBI), Pretoria. 33 pages. | View |

| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| | Biodiversity | Strategic Water Source Areas (SWSA) groundwater | National | KMGBF Target 3 | Water Research Commission. 2017 SWSA Groundwater [Vector] 2017. Available from the https://bgis.sanbi.org/SpatialDataset/Detail/661 | View |
| | Biodiversity | Protected Area expansion composite layer (Updated data) | National | KMGBF Target 5 | Composed of the following datasets:<br>■ Key Biodiversity Areas (KBAs)<br>■ Critical Biodiversity Areas (CBAs) unioned with SANParks expansion priorities<br>■ Under-protected ecosystems,<br>■ Under-protected species,<br>■ Climate Resilience Layer (cc_resil_vocc_1km.tif)<br>■ Each input layer was weighted and then summed to create the composite layer.<br>Assigned weighting:<br>■ 40% CBA Union<br>■ 25% KBA<br>■ 15% Under-protected Ecosystems<br>■ 15% Under-protected Species<br>■ 5% Climate Resilience | View |
| | Climate | Priority areas of invasive alien plants control | National | KMGBF Target 4 | Le Maitre, D.C., Forsyth, G.G. and O'Farrell, P. (2012). Development of generic species and area-based prioritization models for use by Working for Water in prioritizing alien plant control operations in South Africa. Report number CSIR/NRE/ECO/ER/2012/0028/B, CSIR, Stellenbosch. | View |
| | Climate | High density invasive alien plants (New data) | National | KMGBF Target 4 | Based on SANBI's Terrestrial Condition layer where high density invasive alien plant occurrences were extracted after having been compiled from a range of recent datasets: National Invasive Alien Plant survey data (Kotze et al., 2025); Western Cape Invasive Alien Tree survey (Rebelo et al. 2024); MAPWAPS invasive alien plant surveys for four catchments: Mzimvubu (Skosana et al., 2024), Tugela (Cogill et al., 2024), Sabie-Crocodile (Skosana et al., 2024) and Luvuvhu (Cogill et al., 2024); & uMngeni catchment invasive alien plant density map (EI4WS, 2024). | View |



| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| | Climate | Soil organic carbon | National | KMGBF Target 8 | A combination of 2 top expert-recommended datasets:<br>Zander S. Venter, Heidi-Jayne Hawkins, Michael D. Cramer, Anthony J. Mills, Mapping soil organic carbon stocks and trends with satellite-driven high resolution maps over South Africa,Science of The Total Environment, Volume 771, 2021, 145384, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2021.145384.<br>(https://www.sciencedirect.com/science/article/pii/S0048969721004526) and<br>CSIR Smart Places: Total Soil Organic Carbon for 2018 in t/ha. Published by Department of Environment, Forestry and Fisheries (2020). Data available from: https://catalogue.saeon.ac.za/records | View |
| | Human well-being | High priority agricultural areas | National | KMGBF Target 7 | Department of Agriculture, Land Reform and Rural Development, 2021. High potential agricultural areas, 2021– Spatial data layer, per each province in South Africa. 2021. Pretoria. | View |
| | Human well-being | High risk settlements | National | KMGBF Target 9 | Le Roux, A., Van Niekerk, W., Arnold, K., Pieterse, A., Ludick, C., Forsyth, G., Le Maitre, D., Lötter, D., du Plessis, P. & Mans, G. 2019. Green Book Risk Profile Tool. Pretoria: CSIR. Available at: https://riskprofiles.greenbook.co.za/ | View |
| | Human well-being | Wildlife sector current extent | National | KMGBF Target 10 | Malatji, N., Nelwamondo, P., Child, M., and Selier, J. 2021. SANBI Working Lands Version 2. Unpublished GIS dataset prepared for "Digitizing working lands of South Africa" Project. South African National Biodiversity Institute: Pretoria, South Africa. | View |

| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| | Human well-being | Wildlife sector expansion | National | KMGBF Target 10 | Model comprised of several expert-recommended datasets:<br>Birss, C., Rushworth, I., Collins, N.B., Peinke, D. & Buijs, D. 2015. Inferred Natural distribution ranges of large mammals in South Africa, Version 1. Unpublished GIS coverage.<br>Department of Environment, Forestry and Fisheries (DEFF), 2019. Ecosystem based adaptation Action Plan and Priority Areas Mapping report. Pretoria, South Africa. https://www.sanbi.org/wp-content/uploads/2020/10/Action-Plan-Priority-Maps-Full-Report-Digital-High-res.pdf<br>Department of Agriculture Forestry and Fisheries (DAFF). 2018. Long-term grazing capacity map for South Africa developed in line with the provisions of Regulation 10 of the Conservation of Agricultural Resources Act, Act no 43 of 1983 (CARA), available https://agis.nda.agric.za/portal/sharing/rest/content/items/ea297a78937e48a9a53547ca4befd664/data<br>Department of Agriculture, Forestry and Fisheries, 2017. National land capability evaluation raster data layer, 2017. Pretoria.<br>Department of Environmental Affairs, 2020. Refinement and Mapping of Biodiversity Economy Nodes. Mapping report and vector data layer, 2020. Pretoria, South Africa. | View |
| Locking options | Lock-in restrictions | Existing Protected Areas (Updated data) | National | N/A | DFFE. 2024. South African Protected Areas Database (SAPAD), Version 2024_Q3 (modified by SANBI). DFFE, Pretoria. Available at: https://www.dffe.gov.za/egis. Accessed: 25 August 2024. | View |
| Zones | Zones | Protect Zone (Updated data) | National | N/A | Features classified as natural, secondary natural, invasive and severely degraded in SANBI's Terrestrial Ecosystem Condition Layer. (terr_cond_100m.tif), were extracted to define the protect zone. | |
| | | Avoid Loss Zone (Updated data) | National | N/A | Features classified as natural, secondary natural, invasives and severely degraded based on SANBI's Terrestrial Ecosystem Condition Layer (terr_cond_100m.tif) were extracted from the CBA layer. | |



| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| | | Rehabilitate Zone (Updated data) | National | N/A | Secondary natural, dense Invasive Alien Plants, and severely degraded areas were extracted from the Terrestrial Ecosystem Condition Layer. This output was combined with the gully erosion dataset, the bush encroachment dataset and water ecosystems in need of rehabilitation (i.e. wetlands and rivers that were in poor condition or occurred in croplands, plantations or plantations). | |
| | | Mitigate/ Reduce Pressures Zone (Updated data) | National | N/A | Based on SANBI's Terrestrial Ecosystem Condition layer where the following classes: secondary natural, artificial water, cropland, plantation were extracted to delineate the mitigation zone. | |
| | | Urban Adapt Zone (Updated data) | National | N/A | Based on SANBI's Terrestrial Ecosystem Condition layer where the built-up areas were extracted. | |
| Additional Input datasets | Datasets used to create the various zones and/ or planning feature composite maps | Amalgamated Critical Biodiversity Areas | National | | South African National Biodiversity Institute. 2025. Amalgamated National CBA and ESA Layer: Technical report. March 2024. South African National Biodiversity Institute, Pretoria. | |
| | | SANParks expansion priorities | National | | South African National Parks (SANParks) 2025. Protected Areas Expansion Footprint layer.<br>Identifies areas that are important and for biodiversity conservation but are not yet formally protected. | |
| | | Key Biodiversity Areas (KBAs) | National | | South African KBA National Coordination Group (NCG). 2024. South African KBAs 2024. [Vector]. Available from the<br>https://www.dropbox.com/scl/fi/539tw4yh5dqcspyh70v11/South_African_KBAs_2024.zip?rlkey=xt6yz08f5l68n8q06ysfcvyg9&e=1&dl=0<br>For more information on KBAs, see World Database on KBAs<br>https://wdkba.keybiodiversityareas.org/ | |

| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| | | Under-protected ecosystems | | | Excel spreadsheet containing the protection level of each terrestrial ecosystem (ter_results_type_rle_epl.csv) was obtained from Dr Andrew Skowno in 2025. The following page explains how ecosystem protection level is calculated: https://nba.sanbi.org.za/content/terrestrial/ter_epl.html<br>The terrestrial ecosystem protection level spreadsheet was joined to the 2024 National Vegetation Map (NVM2024final.gdb).<br>South African National Biodiversity Institute . 2024 Final National Vegetation Map (File geodatabase) [Vector] 2024. Available from https://bgis.sanbi.org/SpatialDataset/Detail/7734, downloaded on Wednesday, December 17, 2025.<br>Two shapefiles were created based on the 'Not Protected' and 'Poorly Protected' classes. These shapefiles were converted into one raster, with the 'not protected' ecosystem types weighing twice as much as the 'poorly protected' ecosystems. | |
| | | Under-protected species | | | Updated species protection level data (2025) was not available at the time of conducting this analysis, thus the data used in ELSAA 1.0 were retained:<br>Van Der Colff, D. and von Staden, L. 2019. Summary of Species Assessments Terrestrial and Inland Aquatic Technical Report Species Section 2018. South African National Biodiversity Institute (SANBI): Pretoria, South Africa. http://hdl.handle.net/20.500.12143/6720 | |
| | | Terrestrial Ecosystem Condition Layer | | | Terrestrial ecosystem condition raster available from SANBI. Based on national land cover data 2022, invasive alien plant data from various sources (2024-2025), rangeland condition data from various sources (2003-2023) and ecosystem data from selected metros (2018-2024). | |
| | | Gully Erosions in South Africa (RSA_Gullies) | | | Mararakanye, N. & Le Roux, J.J. 2011. Manual Digitizing of Gully Erosion in South Africa Using High Resolution SPOT 5 Satellite Imagery at 1: 10 000 Scale. Department of Agriculture, Forestry and Fisheries, Directorate Land Use and Soil Management, Pretoria. | |



| Type | Theme | Layer name | Data scale | KMGBF Target | Data Source(s) and Reference(s) | UNBL map view |
|---|---|---|---|---|---|---|
| | | Climate Resilience Layer (cc_resil_vocc_1km.tif) | | | Two input datasets were used: a log transformation was performed on the first dataset, and then both datasets were normalized and combined:<br>Velocity of multivariate climate change for Africa output produced as part of the SPARC Project using the nearest forward analog method implemented as described in Hamann et al. 2014. Provided by Dr. P. Roehrdanz.<br>Holness, S. (2008) SANBI Ecosystem-based Adaptation layer representing climate resilience at the biome scale. Unpublished GIS dataset prepared for South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria. See also Driver et al. 2012 NBA | |

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# Annex 2: Links to relevant project documents

Key project links (scoping reports, workshop reports, capacity building materials, and all other relevant materials)

**ELSAA Update 2025**

- Factsheet
- Resource guide to Target 2 of the KMGBF
- UNBL Lecture 1 on the Public Platform: EN
- UNBL Hands-on Training 1 on the Public Platform: EN
- UNBL Lecture 2 on Workspaces: EN
- UNBL Hands-on Training 2 on the Public Platform: EN
- UNBL National Workspace for South Africa (*see Annex 3 to access*)
- ELSAA Integrated Spatial Planning Tool User Guide: EN
- UNBL Secure Workspaces User Guide: EN
- UNBL Public Platform User Guide: EN

**Restoring Hope (2023)**

- South Africa Dossier on Restoration Opportunities

**ELSAA 1.0 (2021-2022)**

- ELSAA 1.0 Factsheet
- Video Trailer
- Science Brief
- Consultation Reports (1 | 2)



# Annex 3: User's guide to using the UNBL public platform, accessing [country's] secure workspace on UNBL and using the ELSAA Integrated Spatial Planning Tool on UNBL

Users who want to explore the UNBL platform and accustom themselves to its basic functions should see the UNBL Public Platform User Guide. Users who want to gain access to South Africa's secure workspace on UNBL and the ELSAA Integrated Spatial Planning Tool used to undertake spatial prioritization scenarios in South Africa need to request access to the workspace by undertaking the following steps:

1. Contact the national administrators of this workspace at c.lefakane@sanbi.org.za, nokutula.mhene@undp.org, and s.hendricks@sanbi.org.za, with a copy to support@unbiodiversitylab.org with the subject "UNBL-GBF project workspace request for South Africa" and the e-mail address which the user registered an account on UNBL with. If the user has not yet registered an account on UNBL, they should follow instructions outlined here: 'How do I register or log-in'?

2. After contacting the national administrator of South Africa's workspace, the UNBL team will reach out with an e-mail to confirm when the user has been added to the workspace.

3. To access South Africa's national workspace on UNBL, see 'How do I access my workspace(s)'?

4. To access and use the ELSAA Integrated Spatial Planning Tool for [country], as well as all other functionalities of [country's] national workspace on UNBL, see the ELSAA Integrated Spatial Planning User Guide and UNBL Secure Workspaces User Guide.

# Annex 4: Glossary of key terms

| Term | Definition | Application in [country] |
|---|---|---|
| **Boundary Penalty Factor (BPF)** | Solutions are penalized based on the total outer boundary or edge of the zones. By penalizing solutions with large edge length, this BPF can be used to promote spatial cohesion or clustering in the spatial prioritization zones of priority areas for the 10 priority national targets and KMGBF implementation. | A BPF was explored but deemed unnecessary in producing the final priority area map. |
| **Area-based constraint** | The maximum area (expressed as a % of the total area of the country) that can be assigned to a specific action zone (protect, restore/rehabilitate, reduce pressures/mitigate, or urban adaptation). | The maximum area (expressed as a % of the total area of the country) that can be assigned to a specific action zone (protect, restore / rehabilitate, reduce pressures / mitigate, or urban adaptation). Avoid loss zone does not have a budget and is not used in the prioritization, as is allocated post-prioritization.<br>**Scenario 1**<br>Protect: 20%<br>Restore: 7%<br>Reduce pressures: 9%<br>Urban adapt: 0.25%<br>**Scenario 2**<br>Protect: 30%<br>Restore: 7%<br>Reduce pressures: 9%<br>Urban adapt: 0.25% |
| **Planning feature** | A spatial dataset used to map spatial elements of KMGBF Targets 1-12. Each KMGBF target may be mapped by one or more planning features depending on its complexity. Planning features may include ecological classifications, habitat types, species, physical objects, processes, or any element that can be measured in a planning unit. | The ELSAA tool configuration for South Africa contains 13 total planning features, of which 13 are national datasets. These planning features map to KMGBF Targets 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12. |
| **Decision support software** | A computer application that uses information about possible actions and the limitations of those actions to assist the decision-making process in achieving a stated objective. | The ELSAA tool configuration for South Africa uses the prioritizr R package in the backend. Prioritizr is designed to build and solve conservation planning problems. No knowledge of R is required to use it. |
| **Geographic Information System (GIS)** | Computer system consisting of hardware and software necessary for the capture, storage, management, analysis and presentation of geographic (spatial) data. | The ELSAA tool configuration for South Africa uses GIS software through UNBL's front-end display to present spatial data to users. No GIS knowledge is required to use it. |
| **Planning units** | Planning units are the basic elements of a reserve system. A study area is divided into planning units that are smaller geographic parcels of regular or irregular shapes. Examples are squares, hexagons, cadastral parcels and hydrological units. | Coordinate reference system for the UNBL-GBF Mapping Project in South Africa: RSA_BSU_ Albers (Albers Equal Area)<br>Pixel resolution or pixel size: 1000x1000m |



| Term | Definition | Application in [country] |
|---|---|---|
| **Representation** | In Systematic Conservation Planning, a representative system captures the full range of planning features (species, ecosystems, and ecosystem services) occurring in the planning region, not just iconic species. | In the UNBL-GBF Mapping Project for South Africa, the representation measures how well each planning feature is captured/represented by the priority protection, restoration, sustainable management, and urban greening areas in the final priority area map of an executed analysis. |
| **Systematic Biodiversity Planning** | A formal method for identifying potential areas for conservation management that will most efficiently achieve a specific set of objectives, commonly some minimum representation of biodiversity. The process involves a clear and structured approach to priority setting, and is now the norm for both terrestrial and marine conservation. The effectiveness of systematic conservation planning lies in its ability to make the best use of limited fiscal resources to achieve conservation objectives and to do so in a way that is defensible, accountable, and transparently recognizes the needs of different resource users. Systematic Biodiversity Planning is known as Systematic Conservation Planning (SCP) outside of South Africa. | Systematic biodiversity planning is the science that allows the identification of spatial prioritization areas to assist the implementation of national policy priorities and KMGBF targets in South Africa. |
| **User interface** | The means by which people interact with a given computer application. A Graphical User Interface (GUI) presents information in a simple way using graphics, menus and icons. | The ELSAA Integrated Spatial Planning Tool on UNBL is a graphical user interface that offers stakeholders the possibility to run the spatial prioritization analysis themselves. |
| **Weights** | The weights allow users to set relative priorities within their priority policy outcomes. Values typically range from "0" (no importance) to "10" (extremely high importance). | The default weightings for the UNBL-GBF Mapping Project in South Africa were developed collaboratively through stakeholder engagement sessions. Stakeholders can modify these weightings through the ELSAA tool based on changes in priorities. |
| **Action Zones** | A land use zone, equivalent to a nature-based action, which serves to enhance specific planning objects. Zones are determined by restrictions that define where an action may or may not absolutely occur. For example, these hard restrictions limit protection to intact areas (e.g., low human footprint values) and protection/restoration to areas that are moderately impacted by human activity, but not totally dominated by humans (e.g., low and medium human footprint values). | For the UNBL-GBF Mapping Project in South Africa, the zoning analysis maps four different actions: protect, restore/rehabilitate, reduce pressures/mitigate, urban adapt, and avoid loss. Data used for zoning restrictions comes from a variety of hand-picked national sources, and includes degraded areas, protected areas, urban areas, built areas, and agricultural areas. |

Photo credit: Angus Burns

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GORDON AND BETTY MOORE FOUNDATION

UN environment programme

WCMC

UNDP