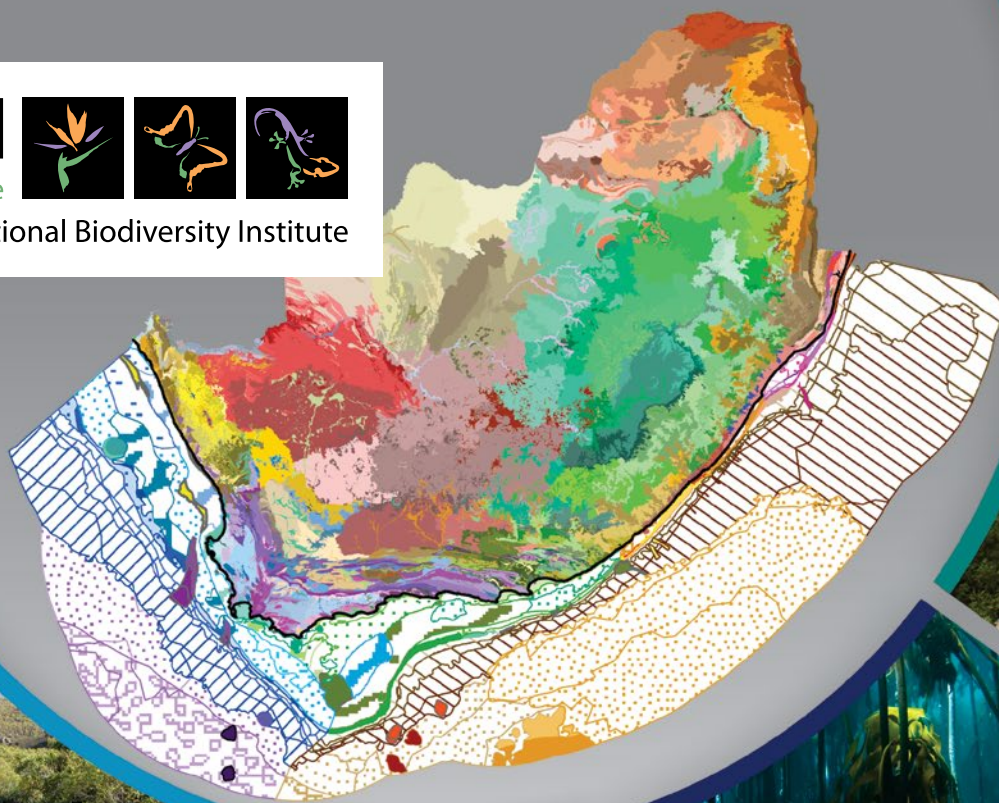


SANBI

Biodiversity for Life

South African National Biodiversity Institute



The South African National Ecosystem Classification System

A system for classifying and mapping ecosystem types across the four realms of the landscape and seascape

An ecosystem classification system is a way of representing the complexity of biodiversity. The South African National Ecosystem Classification System (SA-NECS) is a system for mapping and classifying ecosystem types in South Africa, spanning the terrestrial, freshwater, estuarine and marine realms. It is a nested hierarchical classification, with a comparable set of levels and classes that align across the realms. A common set of principles is applied in all the realms, but flexible methods take into account their unique context. Each realm has a dedicated classification committee to ensure a defensible system that is constantly improving as our understanding of ecosystem types grows. The benefits of a unified system are that all ecosystem types can be treated consistently in assessment, planning, policy and decision-making processes. The SA-NECS allows for national ecosystem indicators and co-ordinated reporting, as well as uptake of ecosystem types into global processes and reporting.



NELSON MANDELA
UNIVERSITY



Unifying principles

The SA-NECS uses a standard set of operational principles to make sure that classifications and maps of ecosystem types align across the four realms of marine, estuarine, freshwater and terrestrial, as well as the cross-realm coastal zone. These include:

Historical extent: As far as possible, the spatial extent of ecosystem types is mapped based on their historical extent, prior to major human modification of the landscape or seascape. The historical extent means that the maps can be used as a stable baseline in ecosystem assessments, against which more recent changes in extent can be measured.

Spatially contiguous: The maps of ecosystem types cover the whole of South Africa's land and marine territory in a 'wall-to-wall' map. Full coverage makes it possible to map and assess all ecosystem types in the country.

Aligned across realms: Efforts are made to align maps of ecosystem types in the different realms to ensure seamless national integration. Alignment means that the concept of an ecosystem type is equivalent across realms and that there are no overlaps or gaps in the maps.

Best available science: The information used to map and classify ecosystem types is based on the best available data and is reviewed by ecosystem scientists with context-specific knowledge to make sure the maps are credible and defensible.

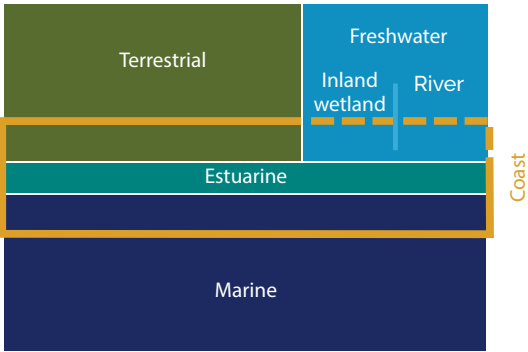
Freely available: All information related to the SA-NECS is made freely available to the public, including the maps, metadata reports, a comprehensive handbook for users and other documentation.

The hierarchical structure of the SA-NECS

Ecosystem types are complexes of organisms and their associated physical environment that share broadly similar ecological composition, structure and function. They can be mapped at a range of spatial scales. The SA-NECS uses a nested hierarchy which means that ecosystem types mapped at lower levels of the classification group together within the higher levels. A hierarchy is useful because it can be used for a wide range of applications at different scales, for example by aggregating to higher levels for national reporting. While there is some variation in levels of the hierarchy across the realms, all realms use the same concept and basic mapping unit of the ecosystem type.

A system of systems

The SA-NECS can be viewed as a 'system of systems' with governance processes in place to achieve conceptual alignment in the classification between realms as well as edge matching and alignment in mapping between realms. Each realm has a dedicated classification committee that helps to decide on mapping and classification changes based on the best available science. All the classification committees are represented on the National Ecosystem Classification Committee that works to ensure co-ordination across the realms.



Terrestrial realm		South Africa's terrestrial realm can be categorised into nine biomes, ranging from fynbos, with its winter rainfall in the west, through arid biomes, thickets and grasslands, to the semi-tropical savannas of the east.	Classification hierarchy <table><tr><td>Biome</td><td>9+2</td></tr><tr><td>Bioregion</td><td>41</td></tr><tr><td>Vegetation type</td><td>458+1+5=464</td></tr><tr><td>Subtype</td><td>23</td></tr></table> Number of classes	Biome	9+2	Bioregion	41	Vegetation type	458+1+5=464	Subtype	23	National Vegetation Map Committee
Biome	9+2											
Bioregion	41											
Vegetation type	458+1+5=464											
Subtype	23											
Freshwater realm Rivers		South Africa is among the most water-scarce countries in the world and has highly variable rainfall, together with varied geology, topography and vegetation. This results in a surprisingly rich variety of rivers and inland wetlands and associated freshwater biodiversity.	Classification hierarchy <table><tr><td>Ecoregion</td><td>31</td></tr><tr><td>River flow</td><td>2</td></tr><tr><td>Geomorphic zone</td><td>4</td></tr><tr><td>River type</td><td>222</td></tr></table> Number of classes	Ecoregion	31	River flow	2	Geomorphic zone	4	River type	222	River Ecosystem Classification Committee
Ecoregion	31											
River flow	2											
Geomorphic zone	4											
River type	222											
Freshwater realm Inland wetlands			Classification hierarchy <table><tr><td>Regional setting</td><td>37</td></tr><tr><td>Hydrogeomorphic type</td><td>4</td></tr><tr><td>Wetland type</td><td>4 (x37)=148</td></tr></table> Number of classes	Regional setting	37	Hydrogeomorphic type	4	Wetland type	4 (x37)=148	Wetland Ecosystem Classification Committee		
Regional setting	37											
Hydrogeomorphic type	4											
Wetland type	4 (x37)=148											
Estuarine realm		South Africa has a high diversity of estuarine ecosystem types because of varied climate and geology. 290 estuaries and 42 micro-estuaries have been classified into 22 estuarine ecosystem and 3 micro-system types.	Classification hierarchy <table><tr><td>Biogeographical zone</td><td>4</td></tr><tr><td>Functional type</td><td>9+1=10</td></tr><tr><td>Ecosystem type</td><td>22+3=25</td></tr><tr><td>Other</td><td>332</td></tr></table> Number of classes	Biogeographical zone	4	Functional type	9+1=10	Ecosystem type	22+3=25	Other	332	Estuarine Ecosystem Classification Committee
Biogeographical zone	4											
Functional type	9+1=10											
Ecosystem type	22+3=25											
Other	332											
Marine realm		South Africa's marine realm includes the Atlantic, Indian and Southern Oceans with contrasting cold and warm currents. Such diverse oceanography drives exceptional marine biodiversity.	Classification hierarchy <table><tr><td>Ecoregion</td><td>6+4=10</td></tr><tr><td>Bathymetry</td><td>15</td></tr><tr><td>Substratum</td><td>59</td></tr><tr><td>Ecosystem type</td><td>150+29=179</td></tr></table> Number of classes	Ecoregion	6+4=10	Bathymetry	15	Substratum	59	Ecosystem type	150+29=179	Marine Ecosystem Classification Committee
Ecoregion	6+4=10											
Bathymetry	15											
Substratum	59											
Ecosystem type	150+29=179											
Cross-realm coastal zone		The coast is the interface between the terrestrial, estuarine and marine realms. It is made up of all ecosystem types that are influenced by both land and sea.	Classification hierarchy <table><tr><td>Terrestrial</td><td>79</td></tr><tr><td>Estuarine</td><td>25</td></tr><tr><td>Marine</td><td>85</td></tr></table> Coastal Ecosystem types	Terrestrial	79	Estuarine	25	Marine	85	Coastal Ecosystem Classification Committee		
Terrestrial	79											
Estuarine	25											
Marine	85											

Applications of the SA-NECS

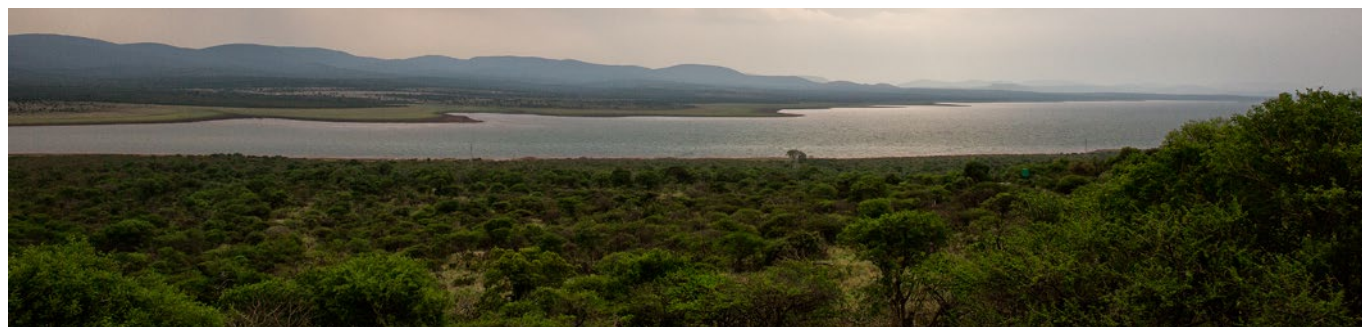
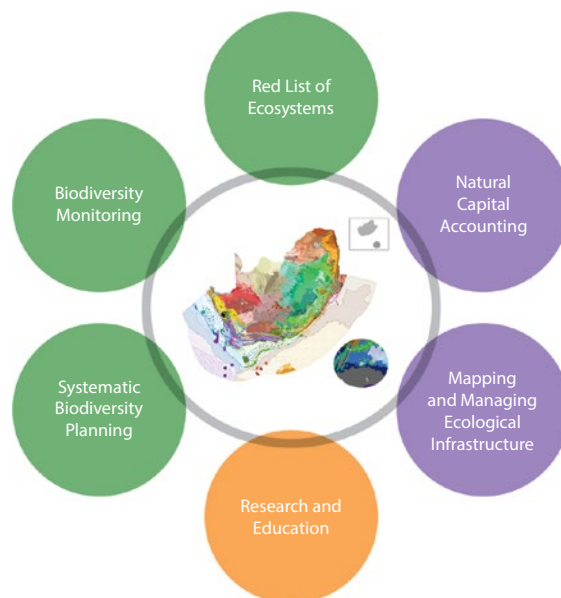
The need for the SA-NECS was driven by concerns over changes in the extent and ecological condition of ecosystems. National ecosystem types are a powerful unit of reference that can be used to better quantify these changes. They can be used in research, spatial assessment and planning, policy development, resource allocation, management, regulation and decision making.

Unit of assessment and planning for biodiversity: Ecosystem types are increasingly used as units in national and global assessments of biodiversity, and are fundamental to monitoring and reporting on status and trends in biodiversity at the ecosystem level. Without nationally consistent, agreed ecosystem types, it is difficult to meaningfully assess and report on status or trends over time. Ecosystem types provide the basis for headline indicators in the National Biodiversity Assessment, including ecosystem threat status, the assessment of which follows the internationally accepted methods of the International Union for Conservation of Nature (IUCN) Red List of Ecosystems. Threatened ecosystems are part of the process for identifying Key Biodiversity Areas. In addition to assessment, ecosystem types are a primary input into spatial biodiversity planning, which in South Africa is used to identify priorities known as Critical Biodiversity Areas that inform spatial planning and decision making in a range of sectors.

Listing threatened ecosystems: A central motivation for the development of a national ecosystem classification system and map was to list threatened or protected ecosystems in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004). This legislation allows for the listing of threatened ecosystems that must then be considered in a range of planning and decision-making processes. The latest list of threatened terrestrial ecosystems was published in 2022. The SA-NECS is a prerequisite if South Africa is to move forward with similar listings in the marine, freshwater and estuarine realms.

Units for Natural Capital Accounting: Ecosystem types form the basis for accounting for a country's ecosystem assets and the services that flow from them, using the internationally recognised System of Environmental-Economic Accounting (SEEA).

International processes: Multilateral environmental agreements increasingly use ecosystem-level approaches for reporting and implementing biodiversity-related actions, with international efforts underway to standardise ecosystem classifications. The classification approaches within the SA-NECS have been maturing over several decades, tailored to suit national needs. More recently, the SA-NECS is being aligned with the IUCN Global Ecosystem Typology, adopted as a global framework in 2020, with the experience of South African experts also influencing international thinking.



For more information:

Dayaram, A., Skowno, A.L., Driver, A., Sink, K., Van Deventer, H., Smith-Adao, L., Van Niekerk, L., Harris, L.R., Job, N. & Nel, J.L. 2021. The South African National Ecosystem Classification System Handbook: First Edition. South African National Biodiversity Institute, Pretoria, South Africa. <http://hdl.handle.net/20.500.12143/7150>,

Interactive story map: <https://arcg.is/88LqK0>

SA-NECS project page: <http://bgis.sanbi.org/Projects/Detail/1237>

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