

**Higher Council for Environment and
Natural Resources**

**Sudan's National Biodiversity
Strategy and Action Plan
2025-2030**



2025

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Table of Contents

Item	Page
Executive Summary	15
Part I. Background on the Process and the Biodiversity Baseline Conditions	20
Chapter 1. Introduction: The Process and Approach to update the NBSAP	21
1.1 How the work has been accomplished?	21
1.2 Plan of work	21
1.3 Approaches and mode of work	22
1.4 Technical working group meetings	22
1.4.1 First Meeting	22
1.4.2 Second Meeting	23
1.4.3 Third Meeting	23
1.4.4 Fourth Meeting	23
1.5 Validation Workshop	24
1.6 End Note	24
Chapter 2. Sudan: Geography and Environment	25
Chapter 3. State of Biodiversity	28
3.1 Cultivated Plant Agrobiodiversity	28
3.2 Range Plant Agrobiodiversity	34
3.2.1 Desert and Semi- Desert Rangelands	35
3.2.2 The Savannah Rangeland Biodiversity	36
3.2.3 Mountains Vegetation Biodiversity	36
3.2.4 Unique rangeland areas and rare species	37
3.3 Farm Animal Agrobiodiversity	38
3.3.1 Livestock species and breeds/types	38
3.3.1.1 Cattle	39
3.3.1.2 Sheep	39
3.3.1.3 Goats	39
3.3.1.4 Camels	39
3.3.2 Equines	40
3.3.2.1 Horses	40
3.3.2.2 Donkeys	40
3.3.3 Pigs	40
3.3.4 Poultry	40
3.4 Forest Biodiversity	40
3.4.1 Forests in the Semi-Desert Zone	41
3.4.2 Forests in the Savannah Zones	41
3.4.3 Mangrove Forests	41
3.4.4 Level of Threats to Forest Biodiversity	42
3.5 Wildlife Biodiversity	43
3.5.1 Wildlife in Protected Areas	43
3.5.2 Status of Wild Animals	45
3.5.2.1 Mammals	46

Item	Page
3.5.2.2 Birds	46
3.5.2.3 Reptiles and Amphibians	47
3.6 Marine Biodiversity	48
3.6.1 Coastal Vegetation (Flora)	48
3.6.1.1 Mangroves	48
3.6.1.2 Halophytes	49
3.6.2 Terrestrial vegetation (inland vegetation)	49
3.6.3 Marine vegetation	50
3.6.3.1 Seagrasses	50
3.6.3.2 Seaweeds	50
3.6.4 Marine Invertebrates (Fauna)	50
3.6.4.1 Corals (micro–benthos)	50
3.6.4.2 Invertebrates (Macro–benthos)	51
3.6.5 Marine Vertebrate fauna	52
3.6.5.1 Fishes	52
3.6.5.2 Sharks and rays	53
3.6.5.3 Turtles	53
3.6.5.4 Mammals	53
3.6.5.5 Sea birds	55
3.7 Inland Waters and Wetlands Biodiversity	55
3.7.1 Systems and features	55
3.7.1.1 Lotic water systems	55
3.7.1.2 Lentic inland waters	56
3.7.1.3 Other water features	57
3.7.2 Biotic diversity of inland waters and wetlands	57
3.7.2.1 Aquatic flora	58
3.7.2.2 Aquatic fauna	60
3.8 Insect Biodiversity	62
3.8.1 Insect Pests	63
3.8.1.1 Store Pests	63
3.8.1.2 Agricultural Insect Pests	63
3.8.1.3 Insect-borne Diseases	64
3.8.2 Beneficial Insects	65
Chapter 4. Threats and Causes of Loss of Biodiversity	66
4.1 Cultivated Plant Agrobiodiversity	66
4.2 Range Plant Agrobiodiversity	67
4.3 Animal Agrobiodiversity	68
4.4 Forest Biodiversity	69
4.5 Wildlife Biodiversity	70
4.6 Coastal and Marine Biodiversity	71
4.7 In-land Waters and Wetlands Biodiversity	72
4.8 Threats and Causes of Loss of Diversity due to IAS	73

Item	Page
Chapter 5. Policies, Plans and Legal Frameworks	74
5.1 Cultivated Plant Agrobiodiversity	74
5.1.1 Policies and Plans	74
5.1.2 Legal Frameworks	75
5.2 Range Plant Agrobiodiversity	76
5.3 Animal Agrobiodiversity	76
5.4 Forest Biodiversity	76
5.4.1 Policies and Plans	76
5.4.2 Legal Frameworks	77
5.5 Wildlife Biodiversity	78
5.6 Inland Waters and Wetlands Biodiversity	78
5.7 Insect Biodiversity	79
Chapter 6. Institutional Frameworks and Related Practices for Conservation and Sustainable Use	80
6.1 Cultivated Plant Agrobiodiversity	80
6.2 Range Plant Agrobiodiversity	82
6.3 Animal Agrobiodiversity	82
6.4 Forest Biodiversity	83
6.5 Wildlife Biodiversity	88
6.6 Coastal and Marine Biodiversity	89
6.7 Inland Waters and Wetlands Biodiversity	89
6.8 Insect Biodiversity	91
Part II. Strategy and Action Plan	92
Chapter 7. National Biodiversity Strategy	93
7.1 National Vision	93
7.2 National Mission	93
7.3 National Goals	93
Chapter 8. National Biodiversity Action Plan	95
8.1 National Targets	95
8.2 Component Targets and Actions	99
8.2.1 Cultivated Plant Agrobiodiversity	99
8.2.2 Range Plant and Animal Agrobiodiversity	109
8.2.3 Forest Biodiversity	113
8.2.4 Wildlife Biodiversity	121
8.2.5 Marine Biodiversity	132
8.2.6 Inland Waters and Wetlands Biodiversity	140
8.2.7 Insect and Microorganism Biodiversity	149
8.2.8 Access and Benefit Sharing Aspects related to Biodiversity	154
8.2.9 Pollution Aspects related to Biodiversity	159
8.2.10 Climate Change Impacts on Biodiversity	164
8.2.11 Biosafety and Biotechnology Aspects related to Biodiversity	166
8.2.12 Health Aspects of relevance to Biodiversity	170

Item	Page
Part III. Implementation Matters	175
Chapter 9. Towards Effective Implementation of the NBSAP (2025-2030)	177
9.1 Priority levels	177
9.2 Opportunities	177
9.3 Risks	178
9.4 Challenges	178
Chapter 10. Financial Resources Needs for the Implementation of the NBSAP (2025-2030)	179
10.1 Budgets estimated to attain different goals	179
10.2 Estimated Budgets across different Biodiversity Components and Related Aspects	181
10.3 Possible Sources of Funding	183
Chapter 11. Capacity Building and Development Needs and Implementation Plan within the Context of the NBSAP (2025-2030)	184
11.1 Overview of the set capacity building and development actions	184
11.2 Levels and types of capacity needs	184
11.2.1 Awareness raising and training	185
11.2.1.1 Topics for awareness raising and training activities	185
11.2.1.2 Target groups	185
11.2.2 Policies, strategies, plans and legislations	186
11.2.3 Structures, institutions, systems and equipment	186
11.3 Implementation plan	186
11.3.1 Awareness raising and training	186
11.3.2 Policies, strategies, plans and legislations	187
11.3.3 Structures, institutions, systems and equipment	187
Chapter 12. Proposals to ensure Gender Mainstreaming in the Implementation of the NBSAP (2025-2030)	189
12.1 How to ensure the gender mainstreaming in the NBSAP implementation?	189
12.2 Proposals to ensure gender mainstreaming during implementation	189
12.2.1 Equal opportunities	189
12.2.2 Equal capacities	190
12.2.3 Full, equitable, meaningful and informed participation and leadership	190
Chapter 13. Roles of Indigenous Peoples and Local Communities in the Implementation of the Sudan's NBSAP (2025-2030)	191
13.1 Global Context	191
13.2 Roles of IPLCs within the national context	191
13.3 Overview of the NBSAP actions including roles by the IPLCs	192
Chapter 14. Monitoring Framework for the Implementation of the NBSAP (2025-2030)	193
Literature	194
<i>Appendices</i>	197

List of Tables

Table	Title	Page
3.1	Ecological classification of the rangeland biodiversity in the Sudan	35
3.2	Key species of rangeland biodiversity in the key areas of Sudan	36
3.3	Unique rangeland areas and species in the ecological zones of the Sudan	38
3.4	Livestock breeds in Sudan	38
3.5	Sudan's tree species under threat	42
3.6	Protected areas in the different ecological zones in Sudan	44
3.7	The status of wild animals in Sudan	45
3.8	Native Reptiles of Sudan	47
3.9	List of important common fish species available in the Sudanese Red Sea	54
3.10	Sea bird species common in Sudanese Red Sea	55
4.1	Annual burned area of forest, woodland and range ecosystems in Sudan, 2010–2015	70
6.1	Total Reserved Forests in Sudan till 2017	84
6.2	Afforestation inside forest reserves	86
6.3	Planted area in community forests	86
6.4	Total Protected Areas in Sudan	88
6.5	National designations, number and names of different protected areas in Sudan	88
6.6	Protected areas with significant inland waters component	90
10.1	Total estimated budgets across different national goals and biodiversity components or related aspects	179
10.2	Total estimated budgets across different biodiversity components and related aspects	182

List of Figures

Figure	Title	Page
Fig. 2.1	Map of Sudan vegetation zones	26
Fig. 2.2	The 2020 Sudan National Land Cover Map	27
Fig. 3.1	Regions of Diversity of Agricultural Crops	29
Fig. 3.2	Variations among sorghum heads in Sudan	29
Fig. 3.3	Variations among pearl millet heads collected from Sudan	30
Fig. 3.4	Variation among cowpea seeds collected from Sudan	30
Fig. 3.5	Variations among seeds of faba bean collected from Sudan	31
Fig. 3.6	Variations among sesame seeds collected from Sudan	31
Fig. 3.7	Variations among fruits of okra samples collected from Sudan	32
Fig. 3.8	Variations among fruits of cultivated and wild melons collected from Sudan	32
Fig. 3.9	Variations among fruits of wild and cultivated watermelon in Sudan	33
Fig. 3.10	Variations among calyces of roselle collected from Sudan	34
Fig. 3.11	Sparse vegetation in the semi-arid zone dominated by <i>Panicum turgidum</i>	36
Fig. 3.12	The perennial grass (<i>Andropogon gyanus</i>) in Savannah areas	37
Fig. 3.13	<i>Dactyloctenium aegyptium</i> in mountains areas	37
Fig. 3.14	A riverine forest of Sunt trees (<i>Acacia nilotica</i>) in Khartoum state	41

Figure	Title	Page
Fig. 3.15	Examples of endangered tree species in Sudan due to different reasons	43
Fig. 3.16	Sudan map showing locations of different categories of protected areas	44
Fig. 3.17	Nile crocodile (<i>Crocodylus niloticus</i>), Sai Island, North Sudan	47
Fig. 3.18	Mangroves at the Sudanese Red Sea Coasts	49
Fig. 3.19	Halophytes at the Sudanese Red Sea Coasts	49
Fig. 3.20	Some coastal inland vegetation	50
Fig. 3.21	Sanganeb Atoll Reef Island	51
Fig. 3.22	Some typical types of Corals in the Sudanese Red Sea	51
Fig. 3.23	Some typical types of <i>Molluscus</i> in the Sudanese Red Sea	52
Fig. 3.24	Echinoderms	52
Fig. 3.25	Some coloured reef fishes	53
Fig. 3.26	The two Dariba lakes in the volcanic caldera of J. Marra	56
Fig. 3.27	Nomads' camels watering their livestock in Malha crater in the Maidob hills	56
Fig. 3.28	Nukheila saline oasis	57
Fig. 3.29	<i>Nymphaea micrantha</i> Guill. & Perr	59
Fig. 3.30	<i>Limnophyton obtusifolium</i> (L.) Miq.	59
Fig. 3.31	A mat of <i>Neptunia oleracea</i> trailing from the water edge	59
Fig. 3.32	The Nile Lizard (<i>Varanus niloticus</i>) in Dinder National Park	60
Fig. 3.33	Water bucks in Dinder National Park	61
Fig. 3.34	The pink-backed pelican <i>Pelecanus rufescens</i> in one of Dinder National Parks Mayas	62
Fig. 3.35	Birds in Khor Abu Habil	62
Fig. 3.36	Desert locust	64
Fig. 3.37	Some insects causing diseases	65

List of Appendices

Appendix	Title	Page
1	Actions set to attain different national targets, and their estimated budgets, indicators and implementing bodies	198
2	Priorities, opportunities, risks and challenges to ensure effective implementation of the NBSAP (2025-2030)	266
3	Financial resources needs for implementation of the different national goals and targets of the NBSAP	366
4	Matrix of Capacity Building and Development Needs and Implementation Plan for Biodiversity in Sudan (2025-2030)	372
5	Matrix of Proposals to Ensure Implementation of National Target (23) on Gender Across Relevant NBSAP Actions	416
6	Matrix on Highlighting and Enhancing the Roles of IPLCs in the Implementation of the Sudan's NBSAP Across Relevant Actions	435
7	Matrix of the Monitoring System for NBSAP (2025-2030)	446

Acronyms and Abbreviations

ABS: Access and Benefit Share
APGRC: Agricultural Plant Genetic Resources Conservation and Research Centre
ARC: Agricultural Research Corporation
BLI: Birdlife international
CBD: Convention on Biological Diversity
CGIAR: Consultative Group on International Agricultural Research
CIMMYT: International Maize and Wheat Improvement Centre
CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora
CWR: Crop Wild Relatives
EU: European Union
FAO: United Nations Food and Agriculture Organization
FMSF: Faculty of Marine Sciences & Fisheries at Red Sea University, Port Sudan
FNC: Forests National Corporation
GBFF: Global Biodiversity Framework Fund
GCDT: Global Crop Diversity Trust (Crop Trust)
GCF: Green Climate Fund
GCF: Global Conservation Fund
GEF: Global Environment Facility
GIS: Geographical Information System
GIZ: German agency for international cooperation
GM: Genetically Modified
GMOs: Genetically Modified Organisms
HAWEN: Horn of Africa Wildlife Enforcement Network
HCENR: Higher Council for Environment and Natural Resources
HCNER: Higher Council for Natural Resources and Environment
IAEA: International Atomic Energy Agency

IAS: Invasive Alien Species
ICARDA: International Centre for Agricultural Research in Dry Area
ICIPE: International Centre of Insect Physiology and Ecology
ICPALD: IGAD Centre for Pastoral Areas and Livestock Development
ICZM: Integrated Coastal Zone Management
IFAD: International Fund for Agricultural Development
IFAW: International Fund for Animal Welfare
IGAD: Intergovernmental Authority on Development
IMR: Institute of Marine Research at Red Sea University, Port Sudan
INF: International Monetary Fund
ITPGRFA: International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN: International Union for Conservation of Nature
JICA: Japan International Cooperation Agency
KMGBF: Kunming-Montreal Global Biodiversity Framework
MFA: Marine Fisheries Administration MFA
MPAs: Marine Protected Areas
NAP: National Adaptation Plan
NBSAP: National Biodiversity Strategy and Action Plan
NGOs.: Non-Governmental Organizations
PERSGA: Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
PGR: Plant Genetic Resources
PGRFA: Plant Genetic Resources for Food and Agriculture
PPD: Plant Protection Department
RA: Risk Assessment
RPGD: Range and Pasture General Directorate
RSFRS: Red Sea Fisheries Research Station, Ministry of Animal Wealth

Sida: Swedish International Development Cooperation Agency
SOPs: Standard Operating Procedures
SPC: Sea Ports Cooperation, Port Sudan
UN: United Nations
UNDP: United Nations Development Program
UNDP: United Nations Development Programme
UNEP: United Nations Environment Programme.
UNESCO: United Nations Educational, Scientific and Cultural Organization
UNIDO: United Nations Industrial Development Organization
WB Trust Funds: World Bank Trust Funds
WBG: World Bank Group
WCF: Wildlife Conservation Foundation
WCF: Wildlife Conservation Forces
WWF: World Wide Fund for Nature

Executive Summary

Sudan, as a party to the Convention on Biological Diversity, has become regularly preparing and adopting national strategies and action plans on biodiversity since 2000, when the first National Biodiversity and Action Plan (NBSAP) was adopted. Following that, Sudan has continued to update the NBSAP in response to national and global developments in this regard. In 2015, a new updated NBSAP was developed and adopted to be in harmony with the global Strategic Plan for Biodiversity (2011-2020), which was adopted by the Tenth Conference of Parties to the CBD (COP 10) in 2010. After ten years, in 2025, it becomes necessary to further update the NBSAP of 2015, as a new global development has taken place since 2022 by the adoption of the Kunming-Montreal Global Biodiversity Framework (KMGBF) by the 15th COP to CBD. Therefore, a process was initiated and completed during the year 2025 to update the Sudan's NBSAP in alignment with the KMGBF through "the Programme to Support National Biodiversity Strategy and Action Plan (NBSAP) Update", which has been funded by the Global Environment Facility (GEF), and implemented by the Higher Council for Environment and Natural Resources (HCENR) in Sudan. This process was preceded in 2024 by another process aimed to fast-tracking readiness and early actions to implement the new Kunming-Montreal Global Biodiversity Framework (GBF) under the KMGBF Early Action Support (GBF-EAS) Project in Sudan. Through that process the targets of the NBSAP (2015) were aligned with the targets of the KMGBF, resulting in a set of new national targets and new proposed actions, that formed the basis for the updating process conducted in 2025, resulting in the present NBSAP for 2025-2030. Both processes in 2024 and 2025 have been accomplished by technical working groups led and facilitated by national consultants.

The Sudan's NBSAP for the period 2025-2030, which is included in this document, is composed of three parts, 14 chapters and seven appendices. The first part (Part I) is on Background and Baseline Biodiversity Conditions, the second part (Part II) includes the details of the Strategy and Action Plan, while the third part (Part III) is dealing with a number of Implementation Matters. Part I contains six chapters, while Part II contains only two chapters, and Part III contains six chapters.

Chapters of Part I cover different matters as background information on the process and the biodiversity baseline conditions in Sudan. They consist of Chapter 1; Introduction covering the process and approaches followed to update the NBSAP, Chapter 2; Sudan: Geography and Environment, Chapter 3; State of Biodiversity. Chapter 4; Threats and Causes of Loss of Biodiversity, Chapter 5; Policies, Plans and Legal Frameworks, and Chapter 6; Institutional Frameworks and Related Practices for Conservation and Sustainable Use.

Chapter 1 describes the process and approaches followed to update the NBSAP. It has been a process continued for more than five months since June 2025. It was accomplished through a participatory consultative approach by a national consultant with a technical working (TWG) formed from representatives of different stakeholders, including governmental and non-governmental organizations, with notable representation of women, youth, and national experts. It included holding physical in-person meetings counted to four, with continuous communications among members and the national consultant through social media platforms. The work was accomplished through 14 sub-groups on different biodiversity components and related aspects, which covered Cultivated Plant Agrobiodiversity, Range Plant and Animal Agrobiodiversity, Forest Biodiversity, Wildlife Biodiversity, Marine Biodiversity, Inland Waters and Wetlands

Biodiversity, Insect and Microorganism Biodiversity, Access and Benefit Sharing Aspects related to Biodiversity, Pollution Aspects related to Biodiversity, Climate Change Impacts on Biodiversity, Biosafety and Biotechnology Aspects related to Biodiversity, Health Aspects of relevance to Biodiversity, Gender Mainstreaming in Biodiversity Aspects, and Roles of Indigenous Peoples and Local Communities in the Implementation of the NBSAP. The process was culminated by holding a validation workshop, when the outcomes of the process, including the strategy and an implementable action plan, were presented for consultation with high policy level representatives from different stakeholders, who at the end agreed upon it and provided remarks for consideration, especially during the implementation phase.

Chapter 2 deals with the geography and environment in Sudan. It describes its position as an African country, with vast area, and the ecological zones it covers, which are five that endowed with rich biodiversity in terms of ecosystems, species and genetic diversity. The land cover of Sudan is also described based on a most recent land cover map produced in 2020.

Chapter 3 describes in summary the state of biodiversity in the country based on most recent information, including that has been included in the latest stocktaking report on Sudan's biodiversity, which was prepared during GBF-EAP in 2024. It describes the states of the different biodiversity components at terrestrial, in-land waters and marine ecosystems. Those components, which are seven, consist of the Cultivated Plant Agrobiodiversity, Range Plant and Animal Agrobiodiversity, Forest Biodiversity, Wildlife Biodiversity, Marine Biodiversity, Inland Waters and Wetlands Biodiversity, Insect and Microorganism Biodiversity.

Chapter 4 describes those factors threatening and causing loss of biodiversity in Sudan, including natural factors and human ones. Among those, the current war in Sudan, which erupted in April 2023, and has been still continuing and spreading to different regions of the country during the course of this process for updating the NBSAP, is described among major threats currently causing great dangers to different components of biodiversity and ecosystems in the country. Other factors include climate change and other socio-economic factors. More details are provided on the specific threats and causes of loss under each of the seven biodiversity components mentioned and described in chapter 3.

Chapter 5 covers in brief the status of policies, plans and legislations associated with the different biodiversity components. They have been described under each of the seven biodiversity components covered by this NBSAP. Some of them date back to the early years in the twentieth century, while others are still proposals waiting for final approval by the concerned authorities. However, some of the newly proposed legislations have been developed in order to ensure implementation of some of the international conventions to which Sudan is a party, such as the Convention on Biological Diversity, the United Nations Convention to Combat Desertification, the United Nations Framework Convention on Climate Change, the Convention on the International Trade in Endangered Species of Wild Fauna and Flora, the Nagoya Protocol on Access to Genetic Resources and Fair and Equitable Sharing of Benefits arising from their Utilization, and the International Treaty on Plant genetic Resources for Food and Agriculture.

Chapter 6 includes a description of the different institutions and practices that are currently functioning or being applied in Sudan in relation to conservation and sustainable use of biodiversity. It covers those institutions dealing with *in-situ* or *ex-situ* conservation through gene-

banking, or protected areas and reserves in the country, as with relation to either of the seven biodiversity components mentioned above. It also describes current and past practices associated with documentation and information management of the different biodiversity components like genetic resources documentation systems, information platforms and herbaria.

In Part II, the chapters included are two; Chapter 7 on the Strategy, and Chapter 8 on the Action Plan. Chapter 7 deals with main strategic pillars of the updated NBSAP, including the vision, mission and national goals, all are in alignment with corresponding vision, mission and goals of the KMGBF. While the vision in the updated NBSAP to 2050 is for Sudan to contribute to reaching the global vision of living in harmony with the nature by 2050, the mission is focusing on taking necessary urgent actions to halt and reverse biodiversity loss in Sudan contributing to put nature on a path to recovery for the benefit of the Sudanese people, the country and the planet. Four national goals are then set to be achieved that revolve around four themes, which are the conservation of the biodiversity in Sudan, its sustainable use, fair and equitable sharing of benefits arising from the use of such biodiversity, and ensuring adequate means for the implementation of the NBSAP.

Chapter 8 describes in more details the action plan to be implemented in Sudan up to 2030 to attain the different goals through a set of general national targets, and specific component targets, with specific actions to be conducted under each of the components and related aspects mentioned at the beginning. The national targets are 23 aligning with the 23 global targets of the KMGBF. They covered different aspects such as reducing the rate of ecosystems degradation, and reverse it through restoration processes, as well as conserving the genetic diversity at *in-situ* and *ex-situ* levels. They address some of the issues causing great threats to indigenous biodiversity, such as the invasive alien species and the pollution from hazardous chemicals and plastic, and the climate change. Moreover, a number of targets are also set to ensure sustainable use of wild and domesticated species, while respecting the customary sustainable use by indigenous peoples and local communities (IPLCs). They also address different issues with regard to ensuring the fair and equitable sharing of benefits arising from the use of the Sudanese genetic resources and associated traditional knowledge. Lastly, the national targets deal with ensuring the adequate means and resources for the implementation of the biodiversity related actions, such as capacity building and development, transfer of technology, technical and scientific research and cooperation programmes, as well as securing the necessary financial resources, and ensuring the effective engagement of IPLCs, and the gender equality during the implementation of the NBSAP.

Different sets of component targets, totalling 115, are proposed as specific to twelve different biodiversity components and related aspects, including in addition to the mentioned seven biodiversity components, other five dealing with different aspects related to biodiversity, which are access and benefit sharing, pollution, impacts of climate change, biosafety and biotechnology, and health. A total of 304 actions distributed among the different twelve components and related aspects are set for implementation during 2025-2030. They are briefly described with the timeframes and estimated budgets for implementation, as well as information on the geographical coverage and spatial level where each action will be implemented, if at national, local or area-specific level. Moreover, information on the main agency responsible for implementation and reporting on progress is given per each action. Further details on these actions are given in *Appendix 1*, where all actions are described systematically each of the different national targets

and components, with further information on the indicators to track progress in the implementation of each action, and the main and collaborating implementing agencies.

Part III deals with different issues linked to the implementation of the NBSAP, including the effective implementation, financial resources' needs, capacity building and development needs, gender mainstreaming during the implementation, roles of IPLCs in the implementation, and monitoring system and framework to track progress in the implementation. They are being tackled in different chapters from Chapter 9 to Chapter 14.

Chapter 9 addresses the issue of effective implementation through identification of the priority level of an action, and the potential opportunities for its successful implementation, the risks that might hinder implementation if not removed or managed, and the challenges that must be addressed during the implementation process of an action. Overall description of major findings in this regard is provided in this chapter. In terms of priorities, the majority of the set actions (61%) are ranked at high priority, where around 30% are considered of medium priority, and only 7% have been categorised at low priority level. A number of opportunities are described as available to be exploited for ensuring successful implementation of the different actions. Among them, for examples, are existence of possible sources of funding from different external agencies, as well as existence of qualified national expertise and structures to do the work, if sufficient resources are made available. On the other hand, the current war and instability conditions in the country, together with lack of sufficient funding are some of the risks that might impede the implementation of a number of actions. However, it would be challenging, as well, even if the necessary resources are available, to convince some of the stakeholders such as high policy makers to be effectively supporting and involved in the implementation of some actions, if they are not well aware of the importance of such actions. A number of other challenges have also been described across the different actions. Detailed descriptions of priority levels, opportunities, risks and challenges across different national targets and actions are elaborated in *Appendix 2*.

In Chapter 10, all financial resources' needs and estimated budgets have been shown and amalgamated across different national goals and different biodiversity components and related aspects. A total budget of (US\$ 409,525,000) is needed for the implementation of this action plan, apart from a total of (US\$ 2,355,000), which will be needed to implement the monitoring framework for measuring the progress in the implementation of this NBSAP. The maximum estimated budget is on actions under the national goal A (Reducing threats to and conserving biodiversity), which is (US\$ 283,955,000). On the other hand, estimated budgets needed for either of the biodiversity components and related aspects are also shown, where the maximum budget needed is for conservation and sustainable use of wildlife biodiversity at a total (US\$ 120,550,000), followed by the forest biodiversity (US\$ 74,435,000). Detailed estimated budgets across different goals, targets and components are elaborated in *Appendix 3*.

Chapter 11 contains information on the needs for capacity building and development as proposed in the updated NBSAP for 2025-2030. All actions categorised as capacity building or development are identified and well-illustrated in *Appendix 4*. They are summarised and generally described in this chapter, where they are categorised under three different categories; which are awareness raising and training; policies, strategies, plans and legislations; and structures, institutions, systems and equipment. A total of 152 actions is found to be of capacity building and development nature, counting to 50% of all actions within the whole action plan. They are to be implemented with a total estimated budget of (US\$ 230,195,000), of which the maximum needed is for creating new

structures, institutions or systems, or for acquiring new equipment, with a total estimated budget of (US\$ 168,215,000).

In Chapter 12, a number of proposals are summarised to ensure gender mainstreaming during the implementation processes of this updated NBSAP in response to national target 23, which calls for gender equality along with the implementation processes. Accordingly, 42 actions out of the total actions have been identified as actions, where the gender dimension ought to be considered during implementation. To achieve this, a number of proposals are put forward to be implemented during the implementation of each of these actions, which are fully detailed in *Appendix 5*. These proposals are categorised in a way to ensure either the equal opportunities, equal capacities or full, equitable, meaningful and informed participation and leadership, especially for women and girls. They include, among others, representation of women and/or girls with balanced ratios among participants in different activities, and during decision making and preparation processes for some actions. Selection for participation in different actions should be based on balanced backgrounds and experiences among all participants in order to ensure equal capacities.

Chapter 13 highlights the roles of indigenous peoples and local communities (IPLCs) in the implementation of this NBSAP as required by national target 22 on this issue. These roles are also proposed to be enhanced through some further activities during the implementation of some specified actions. Fourteen actions are identified out of the total actions in this NBSAP as the ones with definite role(s) to be played by the concerned IPLCs during their implementation. They are categorised across eight national targets and six biodiversity components and related aspects. They are also distributed among the three objectives of the CBD *i.e.* conservation, sustainable use, and fair and equitable sharing of benefits. They have been found falling under six elements of the Programme of Work on Article 8(j) and Other Provisions of the Convention on Biological Diversity related to IPLCs, which has already been adopted by COP 16 of the CBD. These elements are conservation and restoration, sustainable use of biological diversity, sharing of benefits, knowledge and culture, and full and effective participation of IPLCs. Further proposed activities are put forward to enhance these roles by the IPLCs in Sudan, such as ensuring representation of IPLCs in the preparation and decision-making processes on some of the designated actions.

Lastly, in Chapter 14, the proposed monitoring framework for the updated NBSAP (2025-2030) is highlighted. It is composed of a set of indicators to be used for tracking progress at the national targets level, as well as national indicators for tracking progress at the actions level. Those indicators at the target levels include headline indicators, binary indicators, component indicators and complementary indicators, which are all well detailed in a matrix shown in *Appendix 7*.

Part I

Background on the Process and the Biodiversity Baseline Conditions

Chapter 1

Introduction:

The Process and Approaches to update the NBSAP

A process was initiated in June 2025 under the umbrella of the Higher Council for Environment and Natural Resources (HCENR) in Sudan through “the Programme to Support National Biodiversity Strategy and Action Plan (NBSAP) Update and the 7th National Report, Component 1: Update and revision of NBSAP”. The purpose was to revise and update Sudan’s National Biodiversity Strategy and Action Plan, in alignment with the Kunming-Montreal Global Biodiversity Framework (KMGBF), “including national targets and goals, action plan, policies, monitoring framework, capacity building plan”.

The result of such process is the new revised updated Sudan’s NBSAP contained in this document, including the following:

- i. The updated NBSAP for the period of 2025-2030, in terms of the major strategic pillars and implementable action plan, with detailed description of financial resources needs for the NBSAP implementation,
- ii. Capacity building and development needs and implementation plan.
- iii. A proposal to ensure gender mainstreaming in the NBSAP implementation.
- iv. Roles of indigenous peoples and local communities in the NBSAP implementation.
- v. Monitoring framework.

1.1 How the work has been accomplished?

A team of a technical working group (TWG) was formulated with membership including representatives and experts from different stakeholders coming from different sectors, institutes and groups. A national consultant was contracted with by HCENR to supervise and facilitate the whole process. The work was accomplished through an interactive participatory approach with and between all members of the TWG and in close follow up with the project manager. A number of physical – in person – meetings for the TWG were held in Port Sudan city, while on-line communications were continually made between all to exchange messages, views and documents. Physical meetings were held in order to present results of work, discuss progress, and agree on the way forward. The whole process was framed within a plan of work agreed upon right from the beginning.

1.2 Plan of work

A plan of work was agreed upon by the TWG to guide the whole process in the first meeting of the group. It included the following as milestones to be achieved within specified timeframes:

- i. Revising and updating the proposed actions, which were developed earlier in 2024 during the early action project (EAP) for aligning the current NBSAP with the KMGBF, including adding necessary new actions based on the Biodiversity Stocktaking Report accomplished during the EAP as well, or other documents resulted from EAP.
- ii. Determining and adding/incorporating necessary information in terms of priorities, opportunities, risks and challenges for either of the proposed actions, as means to ensure the effective implementation of the action plan.

- iii. Identifying capacity building and development needs as proposed within the actions of the plan, and at the same time providing information on implementation plan for such proposed actions.
- iv. Identifying the exact financial resources needs and estimated budgets to implement the different categories of actions proposed.
- v. Identifying from within the proposed actions those for which the gender dimension should be taken into account during the implementation, and proposing at the same time measures to be taken to ensure the gender mainstreaming across such actions.
- vi. Identifying from within the proposed actions those for which roles by indigenous peoples and local communities are to be taken into account during the implementation, and proposing at the same time measures to be taken to ensure the effectiveness of such roles where it will be appropriate.
- vii. Designing a monitoring framework/system to measure progress during implementation.

1.3 Approaches and mode of work

The TWG was subdivided into fourteen technical subgroups that were formulated based on different biodiversity components or related aspects. These subgroups covered the following:

- i. Cultivated Plant Agrobiodiversity.
- ii. Range Plant and Animal Agrobiodiversity.
- iii. Forest Biodiversity.
- iv. Wildlife Biodiversity.
- v. Marine Biodiversity.
- vi. Inland Waters and Wetlands Biodiversity.
- vii. Insect and Microorganism Biodiversity.
- viii. Access and Benefit Sharing Aspects related to Biodiversity.
- ix. Pollution Aspects related to Biodiversity.
- x. Climate Change Impacts on Biodiversity.
- xi. Biosafety and Biotechnology Aspects related to Biodiversity.
- xii. Health Aspects of relevance to Biodiversity.
- xiii. Gender Mainstreaming in Biodiversity Aspects.
- xiv. Roles of Indigenous Peoples and Local Communities in the Implementation of the NBSAP.

To realize the designated milestones specific templates were prepared by the consultant on different issues to be completed through consultation within either of the sub-groups. Proposed drafts of the different templates were reviewed and commented on in a continuous process that preceded the different physical meetings or come after till reaching agreeable drafts.

1.4 Technical working group meetings

The TWG met four times in Port-Sudan city as following:

1.4.1 First Meeting

The first meeting was held on 25 June 2025, and dealt with the following agenda:

- Introducing to each other.
- Understanding the mission.
- Agreeing on approaches and methodology of work.
- Developing plan of work.

- Proposing capacity building activities.

The meeting was concluded by agreeing on the work plan and the way forward, which formed the basis and schedule of the work accomplished.

1.4.2 Second Meeting

The second meeting was held across two days on 28 and 29 July 2025. The meeting focused on presentations by different subgroups on their proposed inputs as with regard to the following:

- New proposed actions.
- Ensuring the implementation effectiveness for the updated NPSAP in terms of the following for each of the proposed actions:
 - Priority levels.
 - Opportunities.
 - Risks.
 - Challenges.

All presented results were thoroughly discussed by the TWG meeting, which was concluded by adopting these results with required necessary changes.

1.4.3 Third Meeting

The third meeting was held during two successive days on 8 and 9 September 2025. It mainly dealt with presentations from different subgroups, including newly established subgroups on gender mainstreaming, and roles of indigenous peoples and local communities on the implementation of the NPSAP. These presentations focused on the following:

- Identified capacity building and development actions as per each subgroup.
- Implementation plans for the identified capacity building and development actions.
- Financial needs for the implementation of the different actions proposed by each subgroup.
- Proposals to ensure gender mainstreaming across different actions identified as gender-related.
- Identified actions, where indigenous peoples and local communities are perceived to have direct roles in their implementations.

A matrix of a monitoring framework for the NBSAP was presented by the national consultant on the issue during the EAP in 2024.

Thorough discussions were made over these different presentations, where the TWP concluded by adopting them with necessary further changes required to be made.

1.4.4 Fourth Meeting

A fourth meeting for the TWG was held during 18-19 October 2025, when a full draft of a proposed implementable nation action plan for 2025-2030 was presented by the consultant for discussion and adoption by the group. The drafted implementable action plan presented covered the following:

- The detailed proposed action plan.
- Detailed proposal on how to ensure effective implementation in terms of priorities, opportunities, risks and challenges.
- Detailed information on financial resources needed to implement the action plan.

- Detailed information on capacity building and development needs and the implementation plan as proposed within the action plan.
- Proposal on how to ensure gender mainstreaming during the implementation of the action plan.
- Detailed information on roles of the indigenous peoples and local communities during the implementation of the action plan.
- A proposed monitoring system for the proposed action plan.

The meeting was concluded by agreeing on the proposed drafts with some necessary inputs to be incorporated.

1.5 Validation Workshop

A validation workshop was convened at the end for further consultation with the stakeholders. It was attended by a high policy level representation from different stakeholders, including governmental and community-based organizations, with the membership of the TWG and the national consultant. The outcome of the updating was presented, including the proposed strategy and implementable action plan, which were thoroughly discussed by the participants, who finally agreed upon it, and provided necessary remarks to be considered, especially during the implementation phase.

1.6 End Note

The work documented herewith has been a result of effective and active contributions by different subgroups, and the TWG as a whole through more than 120 days. This wasn't to be realized without the effective facilitation by the secretariat of HCENR and their staff in general, and the HCENR secretary general and the manager of the project in specific. All of them are deeply best acknowledged.

Chapter 2

Sudan: Geography and Environment

Sudan is an African vast country with a geographical area of approximately 1,886,065 square kilometers (728,215 square miles). It lies between latitudes 10° and 22° N, and longitudes 22° and 38° E. Its landscape consists primarily of gently sloping plain, with the exception of Jebel Marra Massif, Red Sea Hills, and Nuba Mountains. Sudan lies in at the northernmost extent of the band of rainfall created by the Inter-Tropical Convergence Zone (ITCZ), a belt of low pressure that circles the earth near the equator (UNEP and HCENR, 2020). Mean annual temperatures vary between 26°C and 32°C across the country. However, Temperatures across the country do not vary greatly with the seasons. The far south has uniformly high temperatures throughout the year. It can be as high as 42° C, although temperatures can reach 48° C in some places, while the average minimum temperature is 11° C in the far north, but lows of 6° C have been recorded. The northern part is almost desert and semi desert with average annual temperatures are around 30° C and average annual rainfall of about 150 mm/year. The central area is semi-desert to savannah with average annual temperatures that are around 27° C, and rainfall averaging to about 200 mm/year. Rainfall, which supports the great majority of agricultural activity, is erratic and varies significantly from the northern to southern ranges of the country.

According to UNEP and HCENR, 2020, Sudan is divided into five ecological zones defined by the amount and pattern of rainfall and by the dominant vegetation type. Average annual rainfall varies considerably across the country, from almost nil in the desert of the north to more than 800 mm in the south. Those five zones are as following:

- i. Desert: (0-75 millimetres of precipitation), where there are sandy soils and vegetation that germinates only after rare rain showers.
- ii. Semi-desert: (75-300 mm), which are in areas that have sandy soils with grass and shrubs interspersed with trees. The vegetation varies according to rainfall and soil type.
- iii. Low rainfall savannah (300-800 mm) grasslands, which are characterized by mixed herbaceous non-woody vegetation including scattered trees and shrubs. This zone occurs at transition zones between semi-desert and forests where rainfall is too marginal for some tree species. It is classified into
 - a. Low rainfall savannah on clay, which covers most of eastern and central Sudan and the central plains of Sennar, Blue Nile and Gedaref states.
 - b. Low rainfall savannah on sand, which is found in west Sudan in areas such as the stabilized sand dune (Goz) areas of North Kordofan, North Darfur and the northern parts of South Darfur, as well as in the west of White Nile state.
- iv. High rainfall savannah, which is defined as receiving 800 mm or more annual rainfall, and their areas are dominated by perennial broad-leaved trees. They are mostly found in western and southern parts of Sudan.
- v. Montane Vegetation: (500-2000 mm), which is found in the Nuba Mountains, in Kordofan region, the Jebel Marra in Darfur region and the Red Sea hills. These regions are characterized by a rich diversity of trees and plants.

Therefore, Sudan is endowed with a wide range of ecosystems and species diversity, with ecological zonation extending over a wide range from the desert in the extreme north to the high rainfall woodland savannah in the south (Figure 2.1). A latest land cover map for Sudan was

developed through collaboration between the Forests National Corporation (FNC) and the Food and Agriculture Organization (FAO) with national remote sensing and land cover experts under Reducing Emissions from Deforestation and Forest Degradation (REDD+) in developing countries programme (FNC, 2021). Accordingly, bare soils/rock are the single dominant land cover occupying 995,481 Km² (about 53% of the country), Agriculture and Forests are other prominent land covers extending in about 328,658 Km² and 228,838 Km² (18% and 12% of the country, respectively), and shrubs (109,534 Km²) and herbs (182,743 Km²), together occupy about 15.5% of the total country area (Figure 2.2). Such extensive areas within diverse environmental systems in Sudan make it endowed with diverse flora and fauna, which are being subjected to a number of threats as a result of natural factors and human activities, hence genuine regular efforts should be exerted to combat such factors and conserve the country's biodiversity, while using them sustainably, in a concerted manner with the whole world.

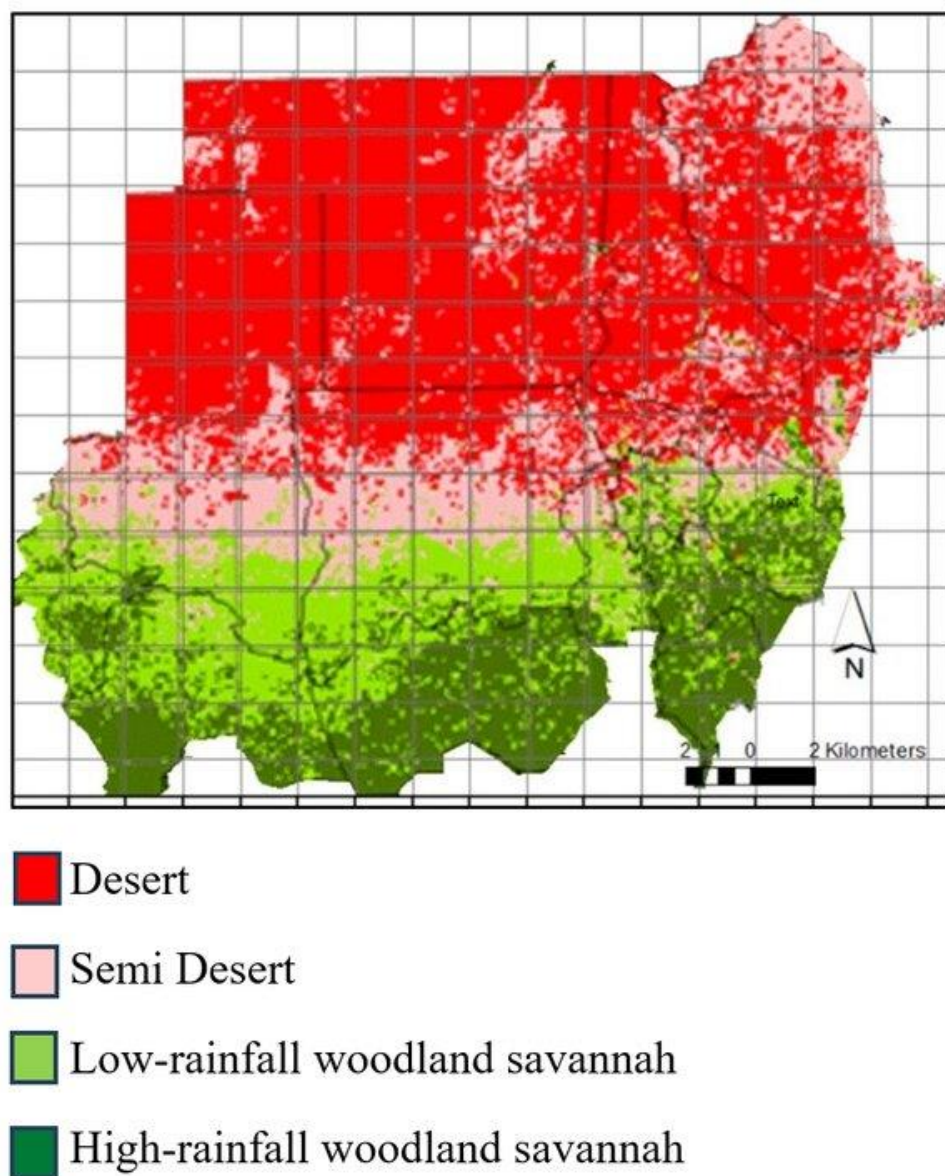


Figure 2.1. Map of Sudan vegetation zones (Eltoum *et al*, 2023)

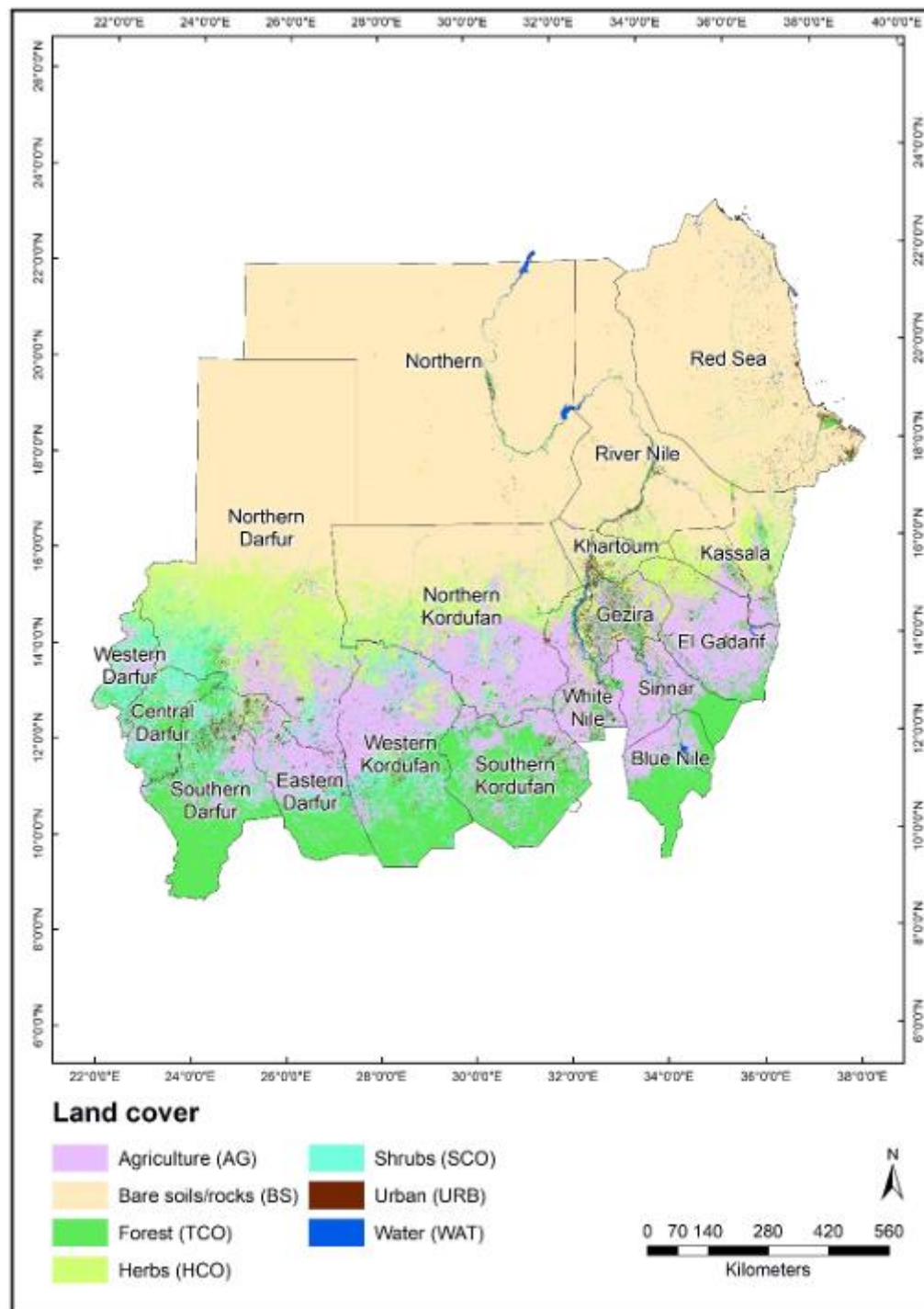


Figure 2.2. The 2020 Sudan National Land Cover Map

Chapter 3

State of Biodiversity

Although Sudan is rich in diverse ecosystems, habitats, species and genetic resources, yet no coordinated or comprehensive surveys and assessments were carried out. Most surveys or studies were fragmented and tailored for academic, research and scientific purposes. The collected data or information were mostly site-specific, local and at institutional levels.

Different ecosystems and habitats are available in Sudan across the zones, including terrestrial, inland waters and wetlands and marine and coastal habitats. These ecosystems are home to a great diversity of fauna and flora, including terrestrial and aquatic flowering plants, seaweeds, mammals, birds, freshwater and marine fish, coral reefs and a wide array of amphibians, reptiles, insects, phytoplankton, algae, zooplankton, mollusks and fungi (UNEP and HCENR, 2020). Within such different habitats variable biotic components are known including plant and animal agrobiodiversity, forests and wildlife. This chapter includes information to highlight the states of diversity among the different biodiversity components in Sudan based on different information sources available, including a latest biodiversity stocktaking report prepared in 2024.

3.1 Cultivated Plant Agrobiodiversity

The major crop production systems in Sudan are the irrigated crops system, which includes gravity irrigated schemes from the Nile and its tributaries, flush irrigation, and irrigation from boreholes; the mechanized rain-fed subsector, and the traditional rainfed subsector of the rain-fed crop system. Different types of crops are cultivated in these systems including cereals, oil crops, food grain legumes, vegetables, fruit crops, fibre producing crops, medicinal and aromatic plants. Cereal crops cultivated in Sudan include mainly sorghum (*Sorghum Bicolor*), pearl millet (*Pennisetum glaucum*), wheat (*Triticum aestivum*), maize (*Zea mays*), rice (*Oryza sativa*), and barley (*Hordeum vulgare*). The most important oil crops grown in Sudan are sesame (*Sesamum indicum*), groundnut (*Arachis hypogea*) and sunflower (*Helianthus annuus*). A number of food grain legumes are also grown in Sudan such as faba bean (*Vicia faba*), chickpea (*Cicer arietinum*), kidney bean (*Phaseolus vulgaris*) and cowpea (*Vigna unguiculata*). Vegetable crops that are widely grown are onion (*Allium cepa*), tomato (*Lycopersicon lycopersicum*), okra (*Abelmoschus esculentus*), peppers (*Capsicum* spp.), melons (*Cucumis melo*), watermelon (*Citrullus lanatus*), pumpkins and squashes (*Cucurbita* spp.), root crops such as potato (*Solanum tuberosum*), sweet potato (*Ipomea batata*) and carrot (*Daucus carota*), and leafy vegetables such as jews mallow (*Corchorus olitorius*), purslane (*Portulaca oleracea*) and rocket (*Eruca vesicaria*). The most well-known fruit-producing species in Sudan include date palm (*Phoenix dactylifera*), banana (*Musa* sp.), guava (*Pisum sativum*), citrus fruits (*Citrus* spp.), and mango (*Mangifera indica*). The most important fibre producing crop cultivated in Sudan is cotton (*Gossypium* spp.), and to a much lesser extent kenaf (*Hibiscus* sp.) and sisal (*Agave* sp.) are worthy of mention.

Sudan is in fact part of the Sahel zone that extends in sub-Saharan Africa from the extreme west to the extreme east and continues to conserve a wealth of diversity of African tropical crops. Sorghum, pearl millet, okra, melons, watermelon, sesame and dry dates most likely originated in Sudan, where wild and weedy relatives and old farmers' cultivars still exist. Sudan is part of the East African Primary Region of crop genetic diversity, which is a region with high diversity for coffee, cotton, cowpeas, melons, millets, olives, peas, sesame and sorghum (Khouri *et al*, 2016) (Figure 3.1). Sudan is also considered as part of a secondary centre of diversity for crops such as

hot pepper and Roselle (*Hibiscus sabdariffa*). Local cultivars originating from past migrations and introduction for crops such as maize, faba bean, cowpea, chickpea, and tomato are still existing and being utilized by some farmers.



Figure 3.1 Regions of Diversity of Agricultural Crops
(https://www.reddit.com/r/MapPorn/comments/e2b4qf/origins_and_primary_regions_of_diversity_of/)

The top cultivated cereal crops in Sudan are sorghum, pearl millet and wheat. The Sudan's flora includes the three wild sorghums believed to be the progenitors of cultivated sorghum viz *S. aethiopicum*, *S. verticilliflorum*, and *S. arundinaceum*. At present variability among traditional farmers' varieties is still observable in different regions of the country (Figure 3.2).



Figure 3.2. Variations among sorghum heads in Sudan. Source of pictures is the APGRC

Western Sudan is believed to be a part of a centre of origin for pearl millet. About 18 wild species of *Pennisetum* are found in the country. Genetic resources of this crop in Sudan include a variety of landraces grown by farmers mainly in Darfur and Kordofan regions (Figure 3.3).



Figure 3.3. Variations among pearl millet heads collected from Sudan.

Photo owner: APGRC – Sudan

Old landraces of wheat (*Triticum aestivum*) in Sudan seem to be highly eroded apart from some farms in the Northern and Darfur regions.

Cowpea comes among the most important summer adapted food grain legumes in Sudan. It is believed to have been introduced from West Africa to the western parts of Sudan. This has resulted in a considerable diversity of cowpea types especially in Kordofan region of western Sudan (Figure 3.4).



Figure 3.4. Variation among cowpea seeds collected from Sudan. Photo owner is APGRC

Other summer-adapted legumes grown in Sudan include pigeon pea (*Cajanus cajan*) and hyacinth bean (*Lablab purpureus*), both of which are cultivated depending mostly on old cultivars.

Bambara groundnut (*Vigna subterranea*) is a minor leguminous crop in western Sudan, of which cultivars grown are mixtures of several different lines originated from the original early introductions, which are clearly variable in seed size and colour.

Faba bean (*Vicia faba*) is a major winter-adapted cultivated legume grown in Sudan. It is grown in the Northern and Darfur regions. The varieties grown by farmers of faba bean are primarily landraces named after locality of production such as Aliab, Zeidab and Agabat (Figure 3.5).



Figure 3.5. Variations among seeds of faba bean collected from Sudan
(Photo owner is APGRC)

Other winter-adapted legumes include chickpea (*Cicer arietinum*), haricot bean (*Phaseolus vulgaris*), and lupin (*Lupinus ulbus*). Old introduced cultivars from these crops are still grown by farmers in Sudan although a number of improved cultivars were released to farmers.

Sesame is the top important oil crop in Sudan, where it might have originated. Germplasm collecting efforts exerted by APGRC during 2004 - 2021 have resulted in collection of sesame germplasm from areas in eastern, western and central Sudan. The sesame germplasm collected included both cultivated and wild material with different characters especially for seed colour (Figure 3.6).



Figure 3.6. Variations among sesame seeds collected from Sudan (Photo owner is APGRC)

Groundnut (*Arachis hypogea*) is another important oil crop grown in central, eastern and western regions of Sudan. It is mainly produced for its seed oil, which is among the top edible oils in Sudan. Farmers' varieties previously grown were of the runner type locally known as "Abu Hibailat", which is a type believed to be available at present only in some remote and isolated areas, with a high risk of disappearance.

A number of vegetables and cucurbits are grown in Sudan. Okra is the most traditional popular vegetable in Sudan, where both cultivated and wild genotypes are known. Some of the wild types belong to the cultivated species *A. esculentus*,

while others belong to other species such as *A. ficulneus*. Farmers depend almost completely on the use and production of landraces, which in many cases are designated names relevant to the localities, where they are usually produced. Collection efforts and characterization studies resulted in collection of indigenous okra genetic resources with remarkable variable plant and fruit characters (Figure 3.7) (El Tahir, 2023).



Figure 3.7. Variations among fruits of okra samples collected from Sudan (Photo owner is APGRC)

Tomato (*Lycopersicon lycopersicum*) is among the most important vegetables in Sudan, where it is used for salad and cooking. It is an introduced vegetable, and old introduced cultivars have been observed to still exist in some parts of the country especially in the Northern, Kordofan and Darfur states

Peppers (*Capsicum* spp.) that are either hot or sweet are popular in Sudan. They are mainly used as spice or green vegetable in salad. Hot pepper was introduced to Sudan since a long time. Variable local cultivars are well known in the country, and in western Sudan some unique and distinct local cultivars are very famous. A study conducted under APGRC has revealed that both species of hot pepper; *C. frutescens* and *C. chinense*, are believed to be grown in Sudan (El Tahir, 2001).

Among the most important cucurbits grown in Sudan are melon (*Cucumis melo*) and watermelon (*Citrullus lanatus*). Some types of cultivated melons, specifically tibish melon, are believed to have originated in Sudan. Four cultivated types of melons are grown in Sudan; sweet melon (*C. melo cantalupensis*), snake melon (*C. melo flexuosus*), a salad melon known locally as (Tibish), and a melon type used for its edible seeds known locally as (Seinat). True wild melons known locally as (Humaid) and belongs to the group *C. melo agrestis* grows in central, northern and western parts of Sudan (Figure 3.8).



Figure 3.8. Variations among fruits of cultivated and wild melons collected from Sudan (Photo owner is APGRC)

Watermelon used for production of seeds is a major crop in western Sudan, where variable landraces of watermelon are grown. One of the reasons for the importance of the genetic resources of watermelon in Sudan is the recently reported information by Renner *et al.* (2021), indicating that the closest relative to the domesticated watermelons was the Kordofan melon (*Citrullus lanatus* subsp. *cordophanus*) from Sudan (El-Tahir *et al.*, 2025). Wild relatives of watermelon could also be found in Sudan. One of them is the wild species *C. colocynthis* (bitter apple), which grows extensively in the Northern region. Remarkable variation has been observed in the local genetic resources of watermelon especially in fruit shape and size, pulp colour and taste, and seed size and colour (Figure 3.9).



Figure 3.9. Variations among fruits of wild and cultivated watermelon in Sudan (Photo owner is APGRC)

Among other cultivated cucurbits are pumpkins (*Cucurbita spp.*), and bottle gourd (*Lagenaria siceraria*), of which old farmers' cultivars are mainly grown for local consumption and other uses.

Several fruit producing species are grown in Sudan. Some of them are ancient in the country, while others were introduced not long time ago.

Date palm is believed to be cultivated in the northern Sudan and upper Nubia since 3200 BC. Dry date cultivars might have originated in Southern Egypt and Northern Sudan. Different local and old cultivars and seedling races are known in the country. More than 50 varieties of dates in Sudan, most of them are indigenous, have been recently described (Daoud and Fatima, FAO, 2022).

Mango is believed to be introduced into Sudan from India via Egypt. About 57 cultivars of mango are reported existing in Sudan. Main areas of mango production extend along the main Nile banks in northern Sudan, and Blue Nile banks in central Sudan.

The most important citrus fruit trees grown in Sudan are sweet orange (*Citrus sinensis*), grapefruit (*Citrus paradise*) and lime (*Citrus aurantifolia*). Such different types of citrus trees are grown in different parts of the country. Cultivars of citrus grown are introduced old or new varieties.

An old type of cultivars, which is Dwarf Cavendish, is the type of banana used to be produced in Sudan for long time since early twentieth century. However, some new cultivars have been evaluated and released to farmers after 2000.

In Sudan there are some plants species that exist in wild form and used traditionally for their food, fodder, fiber, oil or medicinal properties, but not yet have been adopted in large-scale agriculture. They may have the potential to contribute to food security, nutrition, health, income generation and environmental services. These species have been neglected or underutilized due to a variety of reasons. Some are economical and some are cultural. These plants include species such as *Brachiaria obtusiflora*, known locally as "Um chirr", *Cassia obtusiflora* known locally as "kawal", *Echinochloa colona*, locally known as "difra", *Oryza punctata* known as "roz el wadi", and *Sonchus* spp. known locally as "moleita".

Roselle (*Hibiscus sabadariffa*) is among most important beverage and medicinal cultivated plants. It is widely grown in the country, especially in North Kordofan state using a multitude of variable farmers' varieties characterised by different plant and calyx characters, with the latter include different shapes, colours and sizes of enlarged mature calyces (Figure 3.10). However, a number of aromatic and medicinal plant species are known grown in the country using local old cultivars such as fenugreek, coriander, dill and fennel. Others of wild nature are also used for medicinal purposes including many plant species.



**Figure 3.10. Variations among calyces of roselle collected from Sudan
(Owner of the photo is APGRC)**

3.2 Range Plant Agrobiodiversity

Rangelands make up almost 25% of Sudan's total land area (FAO, 2012). Major portion of rangelands in Sudan encompasses different ecological zones extending from desert and semi-desert in the north to low and high rainfall savannah to the south border. However nearly 80% of all rangelands are located in semi-desert and low rainfall ecological zones that characterized by variable and unpredictable rainfall, and occupy approximately 24% of the total country area (FNC, 2021). The forestry and rangelands of Sudan support about 109 million heads of cattle, sheep,

goats, and camels mostly under pastoral and small agro-pastoral systems in the traditional rain-lands.

The rangelands in Sudan are distributed across five ecological zones, according to rainfall patterns and soil type variations from North to South. These are desert, semi-desert (on clay, and sand), low rainfall on clay and sand, high rainfall and mountains vegetation (Table 3.1).

Loss of diversity among range plants in Sudan is being experienced at an alarming rate, but with no specific data available on estimates of the proportions and numbers of range plants endangered per specific ecological zone. However, there are thirteen (13) valuable herbaceous plant species were reported as decreasing in semi desert and low rainfall savannah ecological zones including: *Blepharis linariifolia*, *B. edulis* (Siha), *Aristida palmosa*, *A. paposa* (Byad), *Chrosophora brochidiana* (Argassy), *A. mutablis*, *Panicum turgidum*, *Cenchrus* species, *Eragrostis temula*, *Andropogon gyanus* (Abu rakhees), *Schenfoldia gracilis*, *Ischaemumis haemoidis* and *Dismodium dichotomum*.

Range and Pastures General Directorate (RPGD) reported in 2013 that in the semi desert grassland on clay, six range plant species were not encountered in many areas in Butana during 13 years period (2000-2013). Four forage range plant species were threatened, as they were very localized around inland valleys (*wadis*). The area has been invaded by four unpalatable plant species. Also, RPGD reported that in the low rainfall woodland savannah on sand in West Kordofan state during 20 years period (1992-2013) there was a change in the plant species composition, where five grass species were not encountered and one decreased, sixteen of the herbs were not encountered, while one increased and another decreased, six of the fodder trees and shrubs decreased and two increased.

Table 3.1. Ecological classification of the rangeland biodiversity in the Sudan

Rangeland ecological zone	Annual rainfall	Soil type	Common vegetation type
Desert	0-75 mm	Sandy	Gizzu plants
Semi desert	75-300 mm	Sandy, mixed	Sparse vegetation with grasses
Low rainfall savannah	300-500 mm	Clay and sandy	Short grass, forbs and shrubs
High rainfall savannah	500-900 mm	Clay	Tall grass, herbs and trees
Mountain's vegetation	500-900 mm	Rock and mixed	Mixed vegetation

3.2.1 Desert and Semi- Desert Rangelands

The gizzu vegetation is an example of unique range plants group, which grows in desert areas after the scarce rainfall rarely falls in the desert. The nomads seek the gizzu as highly desirable nutritious for winter grazing. The gizzu disappeared from the desert areas during the drought periods for more than 20 years. However, during the last few years, the gizzu appeared in vast areas of the desert in Darfur region.

According to FAO (2012) most of rangeland areas located at semi-arid areas (13.8% from total area of Sudan) are occupied by herbaceous closed-to-sparse in terrestrial and aquatic/ regularly flooded land. The dominant grasses are of *Eragrostis spp.* (Bano), *Cenchrus spp.* (Haskaneet) and

Aristida spp. (Gaw). The vegetation is characterized by these drought resistant short stature species scattered over the area. However, due to prevalence of drought conditions, wind-blown sands desertification, overgrazing, carrying capacity and clearance for farming and charcoal production, vegetation cover in the area is very sparse (Figure 3.11 and Table 3.2).



Figure 3.11. Sparse vegetation in the semi-arid zone dominated by *Panicum turgidum*

3.2.2 The Savannah Rangeland Biodiversity

Within the savannah-zone there are still wide variations in climate. According to the amount of rainfall and the length of the dry season, three main types of savannah can be distinguished: a. Low rainfall savannah (300-500 mm of rain/year, 8 -11 dry months), with short annual grasses under 1 m and scattered trees up to 10 m. b. Intermediate rainfall savannah (400-600 mm of rain/year, 5-8 dry months), with short annual grasses up to 2 m, trees up to 15 m. c. High rainfall savannah (600-900 mm of rain / year, 3-5 dry months), with denser woodland, taller trees and less grass. Climbing plants appear in the crowns of the trees. The dominant species are *Boscia senegalensis* (Makhaet) and *Calotropis procera* (Ushar) as well, while the dominant desirable plants for livestock grazing are species such as *Merremia emarginata* (Angreet elwarl), *Desmodium dichotomum* (Abuarida), *Clitaria stipoides* (laflaf), *Commelinia kotschy* (Bayeid), and *Echinocloa colonum* (Difra) (Table 3.2 and Figure 3.12).

3.2.3 Mountains Vegetation Biodiversity

The country has a unimodal rainfall which varies from below 75 mm in the north to over 800 mm in the south. Landscape consists primarily of a gently sloping plain, with the exception of Jebel Marra Masssif, Red Sea Hills, and Nuba Mountains with unique vegetations (Table 3.2, Figure 3.13).

Table 3.2. Key species of rangeland biodiversity in the key areas of Sudan

Desert and semi desert rangeland key species			
Species name	Family	Habit	Value, uses
<i>Cenchrus biflorus</i>	Poaceae	Annual grass	Grazing, feed
<i>Ipomea sinensis</i>	Convolvulaceae	Forbs	Grazing
<i>Panicum turgidum</i>	Poaceae	Perennial grass	Sand stabilizer, grazing
<i>Echinocloa colonum</i>	Poaceae	Annual grass	Grazing
<i>Eragristis spp</i>	Poaceae	Annual grass	Grazing
Savannah rangeland biodiversity			
<i>Cymbopogon proximus</i>	Poaceae	Perennial Grass	Aromatic, grazing
<i>Hibiscus spp</i>	Malvaceae	Forbs	Feed, food

<i>Andropogon gayanus</i>	Poaceae	Perennial grass	Aromatic, grazing
<i>Crotalaria senegalensis</i>	Fabaceae	Annual legume	Grazing and other
<i>Blepharis edulis</i>	Acanthaceae	Annual herb	Grazing and other
Mountains Vegetation			
<i>Datura innoxia</i>	Solanaceae	Forbs	Grazing and medicine
<i>Ocimum americanum</i>	Lamiaceae	Herb	Aromatic
<i>Dactyloctenium aegyptium</i>	Poaceae	Grass	Feed and food
<i>Suaeda monica</i>	Chenopodiaceae	Herb	Forage and Aromatic
<i>Avicennia marina</i>	Acanthaceae	Herb	Aromatic



Figure 3.12. The perennial grass (*Andropogon gyanus*) in Savannah areas



Figure 3.13. *Dactyloctenium aegyptium* in mountains areas

3.2.4 Unique rangeland areas and rare species

Rangeland in the Sudan is also fortunate to have special areas with rare plant species along the Red Sea coast, and other special areas (Table 3.3). Examples of such areas are The Butana area in Gedarif, Kassala and Khartoum states, AL-Baja area (grassland on sand), the Bahr Al Arab

areas in Southern Kordofan and Southern Darfur states, and the areas with gizzu plants in the dessert areas.

Table 3.3. Unique rangeland areas and species in the ecological zones of the Sudan

Unique areas and species	Ecological zone	Benefits
Gizzu plants	Dessert	Grazing by camel
Buttana area	Semi desert at clay soil	Seasonal grazing
Al-Baja area	Semi desert at sandy soil	Seasonal grazing

3.3 Farm Animal Agrobiodiversity

Sudan possesses a large and diversified wealth of domesticated livestock species, comprised of cattle, sheep, goats and camels. These four species amounted to 109.9 million head in 2020 according to the Department of Statistics, Ministry of Animal Resources. The majority of livestock are raised under pastoral and agro-pastoral systems. Other farm animal species raised include equine, poultry and small numbers of pigs.

3.3.1 Livestock species and breeds/types

The various animal species and types found in Sudan are shown in Table 3.4.

Table 3.4. Livestock breeds in Sudan

Animal Group	Breeds/Types
Cattle	Zebu: Western Sudan (Baggara), Kenana, Butana, Ayrashai, White Nile, Fuga, Nuba Dwarf (Kawalib). Exotic: <i>Bos taurus</i> (Friesian, Jersey, Friesian X Kenana or Butana crosses)
Sheep	Desert sheep: Hamari, Kabbashi, Dubasi, Watish, Zaghawa, Meidob, Beja, Shugur. Garag: resulting from long-term mixing between Desert and Nilotic sheep
Goats	Black Nubian goat Desert goat Nilotic goat Mountain goat (Tagar) Exotic: Saanin, Shami, Togenburg, Alpine
Camels	Riding camels: Anafi (Shukri), Bishari Pack camels: Rashaidi, Arabi, Kabbashi, Gharbawi
Equines	Horses: Local: Arabian type, Dongolawi Cross-bred horses Donkeys: Mackady, Dongolawi, Darawy
Pigs	Raised in small numbers in Nuba Mountain and Blue Nile state
Poultry	Local Baladi bird

	Exotic: High Sussex, White leghorn, Rhode Island red

3.3.1.1 Cattle

Cattle of the Sudan are of the *Bos indicus* (Zebu) type and are well adapted to the tropical environment because of their heat tolerance, partial resistance to diseases especially tick-borne diseases.

Western Sudan type of cattle forms the largest part of cattle population in Sudan approaching 59%. They are meat animals providing self-sufficiency in meat and contribute to exports. The Kenana cattle are found in the west bank of the Blue Nile and in the area between the Blue Nile and White Nile. The Butana types are found in the Butana plain lying between the main Nile, the Blue Nile and River Atbara. Both Kenana and Butana cattle are milk animals and represent about 15.3% and 8.7% of the cattle population respectively. Foga and Ayrashai cattle are also milk animals, the former are found in North Kordofan, while the latter in eastern Sudan.

3.3.1.2 Sheep

Sudan sheep belongs to the Sudan Desert Sheep, which is a large animal with excellent meat and carcass characteristics. Ecotypes and tribal types are listed in Table 3.4.

3.3.1.3 Goats

Goat breeds are listed in Table 3.4. The Black Nubian Goat is the predominant type existing in the country. It represents 50% of the goat population in the country. It is a large milk animal. The Desert goat constitutes about 17% of the goat population. It has long legs, dark brown in colour, is raised by the nomadic tribes of Baggara and Kababish, in the semi-desert regions. The Nilotic goat, has black or white or both colours and is found predominantly south of latitude 12° and represents 30% of the goat population of the country. The mountain goats or Tagar have short legs, are grey or brown in colour, and represent 3% of the goat population. It is reputed for its high twinning rate.

A number of exotic breeds of goats have been imported into the country. Toggenburg, Anglo-Nubian, Saaneen (temperate breeds), and Damascus or Shami (Middle East) are to be mentioned.

3.3.1.4 Camels

Camel types are shown in Table 3.4. Two major types of the one-humped camel (*Camelus dromedarius*) exist in the Sudan; the slender riding camels, and the heavy-built pack or baggage camel. The riding camels include the Anafi (Shukri), which is found in Kassala state, and the Bishari that is owned by the Bija, and Hadandawa. It is also found in Gedarif and Red Sea states. The pack or baggage type, is a heavier animal and constitutes 90% of the total camel population, and is widely, distributed in the desert and semi-desert regions. This type includes the Rashaidi, which is a strong, short-legged animal raised by the Rashaida in the Red Sea and Kassala states; Arabi camel makes up the majority of camels raised by Hadandawa, Beni Amir and Amarar, and the large sized is raised by Shukria and Bataheen. Another type is the Kababish distributed west of the Nile and raised by the Kababish, Hawawir and Kawahla in Kordofan region. There is also the Gharbawi (western), which is mainly found in Darfur states.

3.3.2 Equines

Equines in Sudan comprises horses and donkeys.

3.3.2.1 Horses

Two groups of horses are recognized in the Sudan (Table 3.4). The Arabian and the Dongolawi. The Arabian type is raised specifically in North and South Darfur states and in Kordofan states. It has a light brown colour, some are white in colour. The Dongolawi type is found in north and central Sudan and North Darfur states. The colour varies from brown to dark brown.

3.3.2.2 Donkeys

Typical pack donkeys, carrying local names such as Mackady, Dongolawi and Darawy, are found almost everywhere in the country. The Dongolawi type is a high, fast animal used for riding (Table 3.4).

3.3.3 Pigs

A small number of indigenous breeds of pigs are raised by the Nuba tribes in South Kordofan State.

3.3.4 Poultry

Poultry breeds are listed in Table 3.4. The local Beladi fowl (*Gallus gallus*) is well adapted in the backyard system everywhere in the country. They can thrive as scavengers on whatever is left over from home meals. There are also some exotic breeds such as Light Sussex and white leghorn as laying birds as well as broiler chickens.

3.4 Forest Biodiversity

The Sudan diverse forests and woodlands spread over a number of ecological zones according to rainfall, soil and topography. The forestry sector contributes some 12% of the Sudanese GDP, besides the indirect benefits it renders in the way of environmental protection, biodiversity conservation, soil amelioration, work opportunities for rural population and others. Perhaps the most tangible benefit derived by the people of the Sudan from their forests is fuel wood in the form of firewood and charcoal as well as gum arabic of which its annual export ranges between 20-40 thousand tons.

The forest tree cover in Sudan is mostly naturally regenerated with limited areas of plantations. The other woodland are mostly wooded grassland and woodland. The wooded wetland is very limited and lies entirely along the River Nile and its tributaries. Sudan's forests grow in a range of habitats, from high-rainfall savannah to the tropical southern mountains.

It is estimated that there are about 533 tree species in the Sudan, 25 of which are exotics. Also, there are about 184 shrub species in the Sudan of which 33 are exotics. Some of the species have a wide range of distribution and considerable variation within the species. However, the vegetation of Sudan forests is not adequately explored or adequately documented. Some forest formations are unique in the Sudan such as the Mangrove Forests along the Red Sea Coast and other unique forests on mountains and hills.

The only tree species that has adapted successfully to the flood basins of the Nile River is *Acacia nilotica* (*Vachellia nilotica*), which thrives in conditions of regular flooding (Figure 3.14). The

natural forests of *A. nilotica* along the Nile and its tributaries were declared protected reserves early in the 20th century. The conversion of the natural forests of *A. nilotica* into plantations started in 1935, when sawmills were operated for the production of railway sleepers.

Mountain forests are found in Jebel Marra, the Nuba Mountains, Jebel Al Dair and the Arkwait Mountains. The gallery of Jebel Marra plateau in Darfur region contains 932 species of flowering plants. Some of the most endangered tree species are found in the Arkwait Mountains in Red Sea state. For example, the species *Dracaena ombet* is found only in Arkwait. The Red Sea Hills contain mostly *Acacia* species. Al Angasana hills in Blue Nile state are dominated by broad-leaved trees. These regions are characterized by a rich diversity of trees and other plants.

3.4.1 Forests in the Semi-Desert Zone

In the semi desert areas, there are sandy soils with grass and shrubs interspersed with trees. The vegetation varies according to rainfall and soil type. *Acacia tortilis* and *Maerua crassifolia* grow in the eastern clay plains, and *Acacia mellifera* and *Commiphora africana* in the sandy soil of the west.



Figure 3.14. A riverine forest of Sunt trees (*Acacia nilotica*) in Khartoum state is seasonally inundated during the river flood (Photo credit © Awad Siddeg). Photo source: First state of environment & outlook report in Sudan (2020)

3.4.2 Forests in the Savannah Zones

The savannah grassland zone is characterized by mixed herbaceous non-woody vegetation including scattered trees and shrubs. Savannah grasslands occur at transition zones between semi-desert and forests, where rainfall is too marginal for some tree species. Typical vegetation consists of trees, shrubs, herbs and grasses

High-rainfall savannas, defined as receiving 800 mm or more annual rainfall, are dominated by perennial broad-leaved trees. They are mostly found in western and southern parts of the country.

3.4.3 Mangrove Forests

Sudan's mangrove forests, especially *Avicennia marina*, are distributed along the Red Sea coast from Mohammed Qol, north of Port-Sudan to Shabarango-Gafud, south of Suakin (Persga/ Gef, 2004). Mangroves (*Crimea spp.*) are located in three main areas: at the southern tip of the Dungenab peninsula, at the southern tip of the island of Mukkawar, and on the mainland coast of Anchoval Anchorage.

3.4.4 Level of Threats to Forest Biodiversity

A survey conducted at the request by the Forests National Corporation (FNC) indicated that a number of trees and shrubs, both indigenous and exotic are either on the verge of being extinct or are seriously threatened. Those deemed nearly extinct are of indigenous trees or shrubs, whose existence is confined to limited locations. Those considered seriously threatened are 241 tree or shrub species, which showed marked retreat in their distribution and/or regeneration due to climatic conditions and also due to the intensity of their removal for wood, fodder or clearance for cultivation. Also endangered are 43 exotic shrubs or tree species.

Table 3.5. shows tree species under threat for different causes. Figure 3.15 shows examples of trees endangered due to different reason.

Table 3.5. Sudan's tree species under threat

Species	Degree of Threat	Source of threat
<i>Balanites aegyptiaca</i>	Medium	Lack of natural regeneration
<i>Adansonia digitata</i>	High	Lack of natural regeneration
<i>Hyphaene thebiaca</i>	High	Lack of natural regeneration
<i>Borassus athiopum</i>	High	Expansion of agriculture
<i>Diospyrus mespiliformis</i>	High	Expansion of agriculture
<i>Tamarindus indica</i>	Medium	Expansion of agriculture
<i>Pterocarpus lucens</i>	High	Expansion of agriculture
<i>Cordia africana</i>	High	Expansion of agriculture
<i>Pseudosedrel akotshyi</i>	High	Expansion of agriculture
<i>Oxytenanthera abyssinca</i>	High	Over-felling
<i>Albizia aylmeri</i>	High	Over-felling
<i>Grewia tenax</i>	Medium	Over-exploitation
<i>Khaya senegalensis</i>	High	Over-exploitation
<i>Acacia seyal</i>	Medium	Expansion of agriculture
<i>Acacia mellifera</i>	Medium	Expansion of agriculture
<i>Acacia polycantha</i>	Medium	Expansion of agriculture
<i>Acacia seyal</i> var. <i>fistula</i>	Medium	Expansion of agriculture
<i>Acacia sieberiana</i>	Medium	Expansion of agriculture
<i>Faidherbia albida</i>	Medium	Expansion of agriculture

Species	Degree of Threat	Source of threat
<i>Terminalia laxiflora</i>	High	Over-felling
<i>Terminalia brownie</i>	High	Over-felling
<i>Medemia argun</i>	High	Gold mining
<i>Avicennia marina</i>	Affected at various levels	Camel grazing



The Baobab tree (*Adansonia digitata*) is an endangered tree in Sudan due to lack of natural regeneration.



The Argun palm (*Medemia argun*): An endemic critically endangered tree in the eastern desert of Sudan due to isolated population.

Figure 3.15. Examples of endangered tree species in Sudan due to different reasons (Source of photos: *First State of environment and outlook report (2020) – Sudan*)

3.5 Wildlife Biodiversity

The wildlife in Sudan is considered as an important natural renewable resource. Wild animals are found in protected areas and in some fragmented areas; in desert, semi-desert, low rainfall savannah woodland and high rainfall savannah woodland.

The number of many species has either declined or disappeared from many of their former habitats. The populations of the red fronted gazelle, dama gazelle, barbary sheep, nubian ibex and lion have declined to critical levels, and the number of endangered species is increasing such as black-backed jackal, wild dog, greater kudu, great bustard and leopard.

3.5.1 Wildlife in Protected Areas

Sudan has nine national parks, seven of them are terrestrials, and two are marine parks. There are game reserves, one game sanctuary, and two birds' sanctuaries (Table 3.6).

Table 3.6. Protected areas in the different ecological zones in Sudan

Ecological zone	Name of protected area and year of establishment	Location	Type of protected area
Arid	Wadi Hawer (2002)	North Darfur state	National Park
	Al Gazalla (2015)	Northern state	National Park
	Jebel Hasania (2003)	River Nile state	National Park
Semi-arid- terrestrial	Toker (1939)	Red Sea state	Game reserve
	Al Sabaloga (1946)	Khartoum state	Game reserve
	Arkwawit – Sinkat (1939)	Red Sea state	Game sanctuary
	Arkwawit (1939)	Red Sea State	Game sanctuary
Semi-desert- marine	Sanganeb (1990)	Red Sea	National Park
	Dongunab (2002)	Red Sea	National Park
Riverine ecosystem wetland	Sunt Forest reserve (1939)	Khartoum state	Bird sanctuary
Savannah	Dinder (1935) – Low-rainfall savannah	Sennar state	National Park
	Radom (1982) – High-rainfall savannah	South Darfur State	National Park
	Basounda-Taia-Glabat (1994)	Gedarif State	National Park

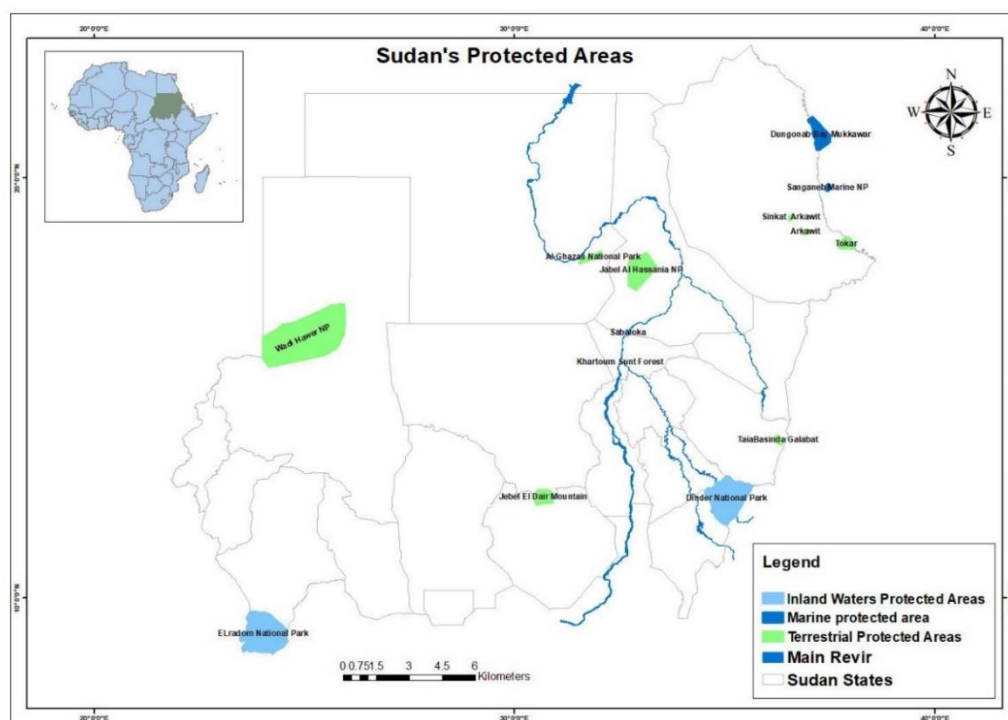


Figure 3.16. Sudan map showing locations of different categories of protected areas
(Source: Dr. Ahmed Elfaig, the Consultant for the 7th National Report on Biodiversity)

3.5.2. Status of Wild Animals

Animal wildlife is largely confined to protected areas and some pockets of habitats scattered throughout the country. The wildlife census conducted in Dinder National Park in 2010 by the Wildlife Research Centre (WRC) noted that the population of large wildlife species is declining rapidly, with some species becoming rare (Table 3.7).

Table 3.7. The status of wild animals in Sudan

Extinct	Endangered and/or vulnerable	Rare and not frequently seen
Addax (<i>Addax maculates</i>)	Tiang (<i>Damaliscus korrigum</i>)	Nubian ibex (<i>Capra ibex Nuniana</i>)
Dama gazelle (<i>Gazelle dama</i>)	Giraffe (<i>Giraffa camelopardalis</i>)	Mangalla gazelle (<i>Gazella albenetata</i>)
Rhim gazelle (<i>Gazella leptoceros</i>)	Barbary sheep (<i>Ammotragus lervia</i>)	Grant's gazelle (<i>Gazella granti</i>)
Beisa Oryx (<i>Oryx beisa</i>)	Somemmerring's gazelle (<i>Gazalla soemmerringi</i>)	Roan antelope (<i>Hippotragus equines</i>)
Cheetah (<i>Acinonyx jubatus</i>)	Black-backed jackal (<i>Canis adustus</i>)	Giant Forest hog (<i>Hylochoerus meinethageni</i>)
Scimitar-horned Oryx (<i>Oryx dammah</i>)	Wild dog (<i>Lycaon pictus</i>)	Crest porcupine (<i>Hystrix spp</i>)
Tora hartebeest (<i>Alcelaphus buselaphus</i>)	Greater kudu (<i>Tragelaphus strepsiceros</i>)	White-earned kob (<i>Kobus leucotis</i>)
Bongo (<i>Boocerus euryceros</i>)	Nubian ibex (<i>Capra nubiana</i>)	Elephant (<i>Loxodonta africana</i>)
Yellow-backed duiker (<i>Cephalophus sylvicultor</i>)	Great bustard (<i>Ardeotis kori</i>)	Pangolin (<i>Manis spp.</i>)
Cape eland (<i>Tauratragus oryx</i>)	Leopard (<i>Panthera pardus</i>)	Klipspringer (<i>Oreotragus oreotragus</i>)
Colobus monkey (<i>Colobus abyssinicus</i>)	African lion (<i>Panthera leo</i>)	Civet (<i>Viverra civetta</i>)
African Ass (<i>Equus africanus</i>)	Africa Elephant (<i>Loxodonta africana</i>)	
	Red-fronted gazelle (<i>Gazella rufifrons</i>)	
	Hippopotamus (<i>Hippopotamus amphibius</i>)	
	Tora hartebeest (<i>Alcelaphus buselaphus tora</i>)	
	Cape buffalo (<i>Syncerus caffer</i>)	

Extinct	Endangered and/or vulnerable	Rare and not frequently seen
	Lesser kestrel (<i>Falco naumanni</i>)	
	Green turtle (<i>Cheko niamydas</i>)	
	Dugong (<i>Dugong dugon</i>)	
	Arabian bustard (<i>Ardeotis arabs</i>)	

3.5.2.1 Mammals

Before the separation of South Sudan, there used to be twelve mammalian orders in Sudan in 2011. Therefore, new assessments are needed after the separation of South Sudan. Big mammals like buffalo, lion, roan antelope and elands are hosted in Dinder and Radom National Parks. The population of some species has declined to critical levels. Three hippos could only be seen south of Alrosseries dam in Blue Nile state. Elephants became rainy seasons' migrants. A herd of 4 to 8 individuals visit Dinder National Parks and a big herd visit Radom National Park. Most species belong to carnivore (cats, canes and foxes). Dorcas gazelle, red fronted gazelle are found in many localities, while damma gazelle is believed to be found in Wadi Hawar Park. Dorcas, which was considered the most abundant species, is threatened by habitat fragmentation and poaching. Recent surveys indicated that density of Dorcas ranged between 0.007 and 0.1 per km² in areas used to have the largest populations.

The Red Sea hills host the Nubian ibex (*Capra nubiance*) and klipspringer (*Oreo tragus*). Mountains (jebels) of Northern Darfur such as Medob, and Jebel Hassania of the River Nile state and Jebel Elba of the Red Sea state are hosting the Barbary sheep (*Ammotragus lervia*). The greater kudu is still in Jebel Marra in Darfur region, and Jebel El Dair and some Nuba mountains in Kordofan region. A number of endangered and extinct mammals and reptiles are reported *found*. There is also wildlife *ex situ*, mainly dorcas gazelle, in 22 farms.

3.5.2.2 Birds

About 927 bird species are known to be found in Sudan before separation of South Sudan in 2011. A new comprehensive assessment is, therefore, needed for Sudan to update such information. Fresh wetlands, coastal habitats, lakes created by dams such as Sennar, Roseries, Khashm el Girba and Marowe, are sites of resident and migratory birds.

The work on birds covered most species in Sudan and there is a new record of one species (Capped wheatear) in central Darfur. About 204 forest birds and 118 water birds were reported. Among these, the Sao' Tome (Newton's) Fiscal of the forest birds and the Sociable Lapwing of the water birds are critically endangered. About 36 raptors are recorded in ecosystems of Sudan. They were intensively and extensively surveyed in Sennar state and the Eastern states, particularly the Red Sea state. Many raptors are endangered including the Egyptian vulture, white-backed vulture and the hooded vulture.

3.5.2.3 Reptiles and Amphibians

Various species of reptiles are found in Sudan, including lizards, snakes and turtles (Table 3.8). Among the most notable are:

- The savannah monitor (*Varanus exanthematicus*), a ground dwelling species found in bushes and burrows in sub-Saharan Africa. It is threatened by hunting for the leather, meat and pet trades;
- The black-necked agama (*Acanthocercus atricollis*), a common reptile that lives on trees and feeds on ants and beetles.
- The side-striped chameleon (*Trioceros bitaeniatus*), also common but threatened by capture for use as a pet.
- The leopard tortoise (*Stigmochelys pardalis*), found in Sudan's grassland and thorny bushes.
- Common snakes include the rhombic forest adder (*Causus maculatus*), the rufous beaked snake (*Rhamphiophis oxyrhynchus*), the common egg eater (*Dasypeltis scabra*), the fan-footed gecko (*Ptyodactylus hasselquistii*) and the northeast African carpet viper (*Echis pyramidum*).
- Reptilian species found in inland waters include *Trionyx triunguis*, *Trionyx niloticus*, *Pelusios subniger*, *Varanus niloticus* and *Crocodylus niloticus* (Figure 3.17) (El Moghraby, 2013).



Figure 3.17. Nile crocodile (*Crocodylus niloticus*), Sai Island, North Sudan (Photo credit © Anaconda, 2014)

Table 3.8. Native Reptiles of Sudan

Common name	Scientific name
Savannah Monitor	<i>Varanus exanthematicus</i>
Black-Necked Agama Chameleon	<i>Acanthocercus atricollis</i>
Side-Striped	<i>Trioceros bitaeniatus</i>
Gaboon Viper	<i>Bitis gabonica</i>
Leopard Tortoise	<i>Stigmochelys pardalis</i>
Rhombic Forest Adder	<i>Causus maculatus</i>
Rufous Beaked Snake	<i>Rhamphiophis oxyrhynchus</i>
Common Egg Eater	<i>Dasypeltis scabra</i>

Common name	Scientific name
Fan-Footed Gecko	<i>Ptyodactylus hasselquistii</i>
Northeast African Carpet Viper	<i>Echis pyramidum</i>
African spurred tortoise	<i>Centrochelys sulcata</i>

Source: Ministry of Environment and Physical Development, 2014

3.6 Marine Biodiversity

The Sudanese Red Sea, which is located in the central part of the Red Sea, with a coastline extending up to 750 km or more, is worldwide renowned for its notably unique and varied habitats with rich biological communities particularly coral reefs. It has some of the world's best and attractive coral reefs that fringe the mainland coast; beside numerous coral islands, atolls and submerged reefs further offshore. Its productive and sensitive coastal and marine habitats, which are composed of mangroves, seagrasses, algal beds, well developed coral reefs and pelagic waters, host potential marine resources containing enormous counts and varieties of commercially and ecologically important marine organisms. These include shellfisheries, bony and cartilaginous (sharks, whales and rays) fishes. This is in addition to rare mammals of global importance such as dugongs and dolphins, turtles and sea birds.

However, it has been well illustrated that levels of biodiversity and endemic species, especially among some groups of reef fishes and reef associated benthic fauna, not encountered anywhere else in the world, are extremely high, approaching their maxima in the Sudanese Red Sea (Vine and Vine, 1980 and Krupp *et al.*, 1994).

Below are descriptions for different biological components in such ecosystem habitats.

3.6.1 Coastal Vegetation (Flora)

This typically includes mainly mangroves (salt marshes) and halophytes (salt-tolerant plants).

3.6.1.1 Mangroves

Mangroves and other shallow marine habitats support a diversity of marine fauna and flora. Mangroves are the main conspicuous coastal vegetation that constitute a characteristic feature of the Sudanese Red Sea coast (Figure 3.18). They are highly productive habitats favourable for fishery activities, as nurseries for many commercially important fishes such as mollusca, crustaceans and finfishes, and breeding sites for various seabirds. These trees are generally found, as stands or patches, at the coastline, at edges or around bays (mersas) and some offshore islands.

In Sudan, mangrove vegetation is currently represented by two species, which are *Avicennia marina* and *Rhizophora mucronata*. The dominant form observed is *Avicennia marina*, which exists in both tree form with a single stem, and bush form with multiple stems. Studies have shown that while mangrove stands are declining globally, mangroves in countries bordering the Red Sea have expanded by 13% over the last 50 years. The mangroves in the Sudanese Red Sea are also recovering and spreading to new protected estuaries along the coast (IMR, 2015). About 13 mangroves stands with varying sizes and density cover had been reported along the Sudanese coast, mainly from Mohammed Qol north of Port-Sudan to Shabarango-Gafud south of Suakin (Wilkei, 1995 and IMR, 2012). It is relevant to mention that when the present status is compared with previous status in the area, noticeable degradation in several mangrove stands (or patches), distributed along the coast could be observed mainly in the north.

3.6.1.2 Halophytes

Halophytes form a notable feature of coastal vegetation, along the Sudanese coast, characteristic of arid zones (Figure 3.19). Various types of halophytes (ephemerals, annuals and perennials) of different sizes ($\leq 2.0 - 60$ cm high) occur just above the coastline (supralittoral zone), fringing much of the coast with varying densities.

The dominant halophytes along the coast are low succulent (fleshy) shrubs including several species mainly of *Suaeda* spp., *Zygophyllum* spp., *Arthrochemum* spp., *Halopeplis* spp., *Limonium* spp., as well as small herbs, grasses and creeping forms. However, such coastal vegetation, primarily *Suaeda* spp., are also reported to predominate several offshore islands, located north and south of the coast (IMR, 2006; IMR, 2008; IMR, 2012; and IMR, 2015).



Figure 3.18. Mangroves at the Sudanese Red Sea Coasts (Source: IMR reports and collection)



Figure 3.19. Halophytes at the Sudanese Red Sea Coasts (Source: IMR reports and collection)

3.6.2 Terrestrial vegetation (inland vegetation)

Results of recent inland surveys indicate that terrestrial vegetation in the area is typified by a mixture of grasses, herbs, shrubs and trees up to 2 – 3 m or more in height, including mainly, *Acacia* spp. and *Prosopis* spp. "Mesquite", interspersed with bare areas (Figure 3.20).

Both density and diversity of the inland flora increase westward towards the Red Sea Hills (≤ 40 km distance), mainly located in Khors and Wadies where more freshwater is drained during the rainy season. It is also noted that the plant cover and biodiversity increase southward and decrease northward, along the coast depending on availability of freshwater.



Figure 3.20. Some coastal inland vegetation (Source: IMR reports and collection)

3.6.3 Marine vegetation

Seagrasses (marine angiosperms or plants) and seaweeds (macro algae) comprise one of the most productive habitats in marine shallow coastal waters. In addition to their biological importance in maintaining potential resources such as mollusca, crustaceans, shrimps and finfishes, they are considered as important nursery grounds for various herbivorous fishes as well as food.

3.6.3.1 Seagrasses

Seagrasses are categorized as soft-bottom communities. Seagrass meadows are abundant and diverse in the lagoons and sandy banks of the Red Sea. There is a general increase in extent and species diversity from north to south with the most abundant seagrass species include *Halophila stipulacea*, *Thalassia hemprichii*, *Halodule uninervis*, and *Halophila minoi*. Other reported species include *Halophila ovalis*, *Thalassodendron ciliatum*, *Cymodocea serrulata*, *Cymodocea rotundata*, and *Enhalus acoroides*.

3.6.3.2 Seaweeds

Research and information regarding seaweeds in the Sudanese Red Sea are scarce. Seaweeds are considered as hard-bottom (rocky) inhabitants of shallow coastal and sub-tidal fringing and outer reefs as well as offshore (submersed / raised) coral islands.

3.6.4 Marine Invertebrates (Fauna)

3.6.4.1 Corals (micro-benthos)

Coral reefs are considered a major characteristic feature of the Sudanese Red Sea which has some of the richest, diverse more attractive and unique coral reefs in the world (Krupp *et al.*, 1994). Such high productive, unique and more sensitive habitats contain vast numbers of valuable associated marine fauna (animal organisms), with high degree of biological diversity.

Three types of reefs exist in the Sudanese Red Sea Coast, particularly at Port-Sudan as follows:

- Fringing reefs: They are parallel and almost continuous along the coast (1 – 3 km wide).
- Barrier reefs (patch reefs): These are about 1-14 km wide such as Towartit barrier reefs, just south, and Wingate barrier reefs; just east, and in vicinity to Port-Sudan harbour.
- Atoll reefs: Such reefs which are located about 25 nautical miles offshore (north – east Port-Sudan harbour) formed what is now known as Sanganeb Atoll or Island (Figure 3.21), which had been declared as an a marine protected area (MPA) since 1990, and inserted in World Heritage List with Dugonab Bay and Mukawwar Island MPA in 2016.



Figure 3.21. Sanganeb Atoll Reef Island (Source: IMR reports and collection)

Common species dominating the coast include *Styllophora pistillata*, *Acropora* sp., *Porites* sp., and two species of *Favia* spp. The quantity and diversity of species increase at the sheltered edges of the fringing reefs, where *Acropora* and *Porites* species are abundant. On the exposed sides of the reef, branching corals such as *Pocillopora* sp., *Millipora dichotomata*, *Echinopora* sp. and *Goniostrea* dominate. At greater depths and with reduced wave action, several species of *Acropora* sp., *Favia* sp., *Fungia*, *Cyphastrea*, *Hydrophora*, *Gardinoseris* and *Labophyllia* could be found (IMR, 2006; IMR, 2008; IMR, 2012; and IMR, 2015). In deeper reefs with reduced illumination, the dominant species are of *Podobacia* and *Mycedium*.

On the barrier reefs, the shallow-water coral assemblages are dominated by species of *Styllophora*, *Favia*, and *Porites*. On the exposed and shallow edges of hermatypic corals, *Pocillopora* and *Porites* are dominant. Slightly deeper edges feature species of *Galaxea*, while at the edge, *Millipora*, *Echinopora*, *Porites*, and *Fungia* are found. In deep waters, *Acropora* and *Xenia* species, and various sponges predominate.



Figure 3.22. Some typical types of Corals in the Sudanese Red Sea (Source: IMR reports and collection)

3.6.4.2 Invertebrates (Macro-benthos)

The main macro benthic (motile) organisms assessed in previous records, mainly at the fringing reef in Port-Sudan, included in terms of abundance: *Tridacna* sp. (Giant Clam – Mollusca) (Figure 3.23), Sea urchins (Echinoderms) (Figure 3.24), Sea cucumber (Echinoderms – "Aliseri"), *Trochus* sp. (Mollusca – "kokian"), *Strompus* sp. (Gastropods – "Abzrumback), Triton (Gastropods Starfishes, (*Acanthaster planci* – COT).

It was noted that both density and diversity of the above benthic fauna were generally low to moderate in the harbour area particularly *Trochus* sp., *Sea cucumbers*, *Strompus* and *Trion*. Earlier studies conducted in Port Sudan showed relative abundance and high diversity of marine

invertebrates in the area, especially *Trochus* and Sea cucumber, in addition to *Strompus* (IMR, 2006; IMR, 2008; IMR, 2012; and IMR, 2015).



Figure 3.23. Some typical types of *Molluscus* in the Sudanese Red Sea (Source: IMR reports and collection)



Figure 3.24. Echinoderms (Source: IMR reports and collection)

3.6.5 Marine Vertebrate fauna

3.6.5.1 Fishes

Table 2.11 shows a list of common fish species in the Sudanese Red Sea areas.

A. Reef fishes

Numerous studies and reports have documented fish biodiversity in the Sudanese Red Sea coasts. Relative abundance and variations of the main coral reefs groups, including fancy (exotic fishes) indicate that the population densities of the different coral reef fish communities reported in Port-Sudan harbour area are low to moderate. On the other hand, their biodiversity is relatively high (particularly fancy fishes) as more than 50 species and genera, belonging to more than 20 families have been identified in the Port-Sudan harbour (IMR, 2006; IMR, 2008; and IMR, 2015). The various associated coral fish species registered, which include relatively larger groupers i.e. *Plectropomus* (Najil), *Snappers* (Bohar), and relatively small to medium fish forms (mainly fancy fishes),

including Butterfly fishes, Angel fishes, damsel fishes, sweetlips small grouper and snappers are important economic fisheries potential in the area (Figure 3.25).

B. Demersal and pelagic fishes

The main common coastal (demersal) and pelagic (open waters) commercial fishes reported (or sighted) in many previous studies as well as from records provided by the Marine Fisheries Department and from local fishermen are shown on Table 3.9).



Figure 3.25. Some coloured reef fishes. (Source: IMR reports and collection)

3.6.5.2 Sharks and rays

A number of only few sharks, mainly small size black tip, were sighted during the limited present survey at Sudanese coasts (mainly coastal fringing reefs). However, previous and recent records revealed that the northern Sudanese coast in addition to Sanganeb is typically famous of its various and numerous types of sharks; small, medium, large and largest (whale sharks). They have been reported to occur mainly at offshore reefs with deep, reef drop – off and various barrier reefs.

It is important to add that manta rays (*Manta bristoris*) or commonly called "Devil's rays", were reported in massive aggregations (for late winter breeding) in Dunganab and Mukawwar area and Meyatib Shambaya and Mesharifa islands, located north and north east of Mukawwar (Magarsum) island.

3.6.5.3 Turtles

Four out of five pantropical marine turtles reported in the Red Sea are common in the Sudanese Red Sea, including Hawksbill, Green, Loggerhead, and Leatherback turtles. However, Hawksbills (*Eretonochelys imbricate*) and the Green (*Chelonia sp*) turtles were observed to be the most common ones in the Sudanese coast (Gasparetti *et al.*, 1993). Both types are categorized as endangered amphibians in the IUCN Red Sea List of Threatened Species.

3.6.5.4 Mammals

Two classes of marine mammals occur in the Sudanese Red Sea; *Sirenia* (Dugongs) in few numbers (≤ 400), and *Cetacea* (Dolphins) present in several species. These mammals are considered globally endangered macrofauna, according to the IUCN Red List of Threatened Species (IUCN, 1996).

Several species of dolphins including mainly bottlenose (*Tursiops truncata*) and the common dolphins (*Delphinus dolphins*) have been sighted regularly at coastal and offshore areas located north and south along the coast.

Table 3.9. List of important common fish species available in the Sudanese Red Sea
(Sources: IMR, 2006; 2008; and 2015; Elhag et. al, 2007/ 2008)

Local name	English name	Scientific name
Bounouk	Tarpon or Bone fish	<i>Albula vulpes</i>
Shagool	Giant Herring	<i>Elops machnata</i>
Salamani or Bunji	Salmon herring or Milk fish	<i>Chanos chanos</i>
Abusive	Wolf Herring	<i>Chirocentrus dorab</i>
Kombir	Gar fish or needle fish	<i>Tylosurus crocodiles</i>
Jajaloom	Soldier fish	<i>Holocentrum spp</i>
Betel	Google-eye	<i>Pricanthus hamrur</i>
Najil	Coral Trout	<i>Plectropomus maculates</i>
Kutrouban	Rock code	<i>Cephalophollis roga</i>
Goholab	Round- tailed Rock code	<i>Cephalophollis spp</i>
Rishal	Moon –tail code	<i>Variola louti</i>
Ghoushar shooni	Spotted Rock code	<i>Epinephelus aerolatus</i>
Tauwina	Grooper or merous	<i>Epinephelus tauvina</i>
Bayad or girim	Giant trevally	<i>Caranx spp</i>
Seleikh	Banded trevally	<i>Caranx emburi</i>
Bayad Goutar	Yellow spotted trevally	<i>Caranx fulvoguttatus</i>
Habot	Finletted trevally	<i>Caranx mate</i>
Kortom	Torpedo fish	<i>Melalaspis cordyla</i>
Shawish	Plumed trevally	<i>Alectis indica</i>
Teeman	Swallow tail	<i>Trachinotus bailoni</i>
Teeman	Pompano	<i>Trachinotus bailoni</i>
Shirwi	Leather skin	<i>Horinemus lysan</i>
Kanaf	Bat fish	<i>Blatax orbicularis</i>
Kaham	Ring –tailed surgeon fish	<i>Acanthurus gahm</i>
Abu- garin	Unicorn fish	<i>Nasaso uni cornis</i>
Farsi	Red snapper	<i>Aprion spp</i>
Hamroon	Red snapper	<i>Etelis carbunculus</i>
Koreib	Red snapper	<i>Pristi pomoides</i>
Fofal	Spiny snapper	<i>Argyrops spinifer</i>
Bohar	Red Bass	<i>Lutjanus bohar</i>
Safin	Mangroove Jack	<i>Lutjanus argentimaculatus</i>

Table 3.9. Contd.

Asmoot	Scarlet Perch or Paddle- tailed	<i>Lutjanus gibbus</i>
Ablein asfar	Blue Banded Perch	<i>Lutjanus kasmira</i>
Hababir	Finger Mark Perch	<i>Lutjanus fulviflamma</i>
Kut	Black Perch	<i>Macolor niger</i>
Telham	Rubber lip	<i>Gaterin schotaf</i>
Gadrenb or gatrín	Yellow –finned Rubber	
Fateletta or shikfa	Sweet lip	<i>Plectorhynchus pictus</i>
Ko koi	Grunter Bream	<i>Pomadasys opercularis</i>
oor-Sha	Emperor or red mouth bream	<i>Lutjanus spp</i>
Agous	School Barracuda	<i>Sphyraena jello</i>
Faras elbhar	Sail fish	<i>Istiophorus gladius</i>
Umm falloos	Dolphin fish	<i>Coryphaena hippurus</i>
Arabi	Mullet	<i>Mugil spp</i>
Zerigan	Striped pike	<i>Sphyraena obtusaa</i>
Abu shenab	Goat fish or red mullet	<i>Mugil spp</i>
Sijan	Spine foot	<i>Siganus spp</i>
Silinty	Half beaks	<i>Hemiramphus spp</i>

3.6.5.5 Sea birds

Sea birds, which form a notable feature along the Sudanese Red Sea, particularly at its northern part, are generally of tropical Indian Ocean origin (Table 3.10). The various seabirds identified along the coastal and many offshore islands of the Sudanese Red Sea are more than 30 species. The whole area of Dungonab Bay and Mukawwar Island MPA is internationally recognized as an Important Bird Area (IBA). Breeding seabird species include: *Sterna bengalensis*, *Sterna repressa*, *Sterna anaethetus*, *Larush emprichii* and *Larush eucophthalmus* (PERSGA, 2006).

Suakin Archipelago, which is an unprotected area, is also an important bird area including the following breeding seabird species: *Sterna bergii*, *Sterna bengalensis*, *Sterna repressa*, *Sterna anaethetus*, *Anousstolidus*, *Sula leucoaster* and *Larush emprichii* (PERSGA, 2006).

Table 3.10. Sea bird species common in Sudanese Red Sea

Common Name	Latin Name
Brown Booby	<i>Sula Leucogaster</i>
Western Reef Heron	<i>Egretta gularis</i>
Osprey	<i>Pandion haelietus</i>
Saker Falcon	<i>Falco cherrug</i>
Demoiselle Crane	<i>Anthropoides vergo</i>
Terek sandpliper	<i>Xenus cinerus</i>
Sooty Gull	<i>Larus hemprichii</i>
White – eyed Gull	<i>L. leucaphthalmus</i>
Black– Ground Sparrow	<i>Eremopterisc nigriceps</i>
Caspian Tern	<i>Sterna caspia</i>
White – checked Tern	<i>Sterna repressa</i>
Sooty tern	<i>Sterna fuscata</i>
Bridled Tern	<i>Sterna anaethetus</i>
Pink – backed Pelican	<i>Pelecanus rufescens</i>
Little Green Heron	<i>Butorides striatus</i>
Goliath Heron	<i>Ardea goliath</i>
Spoonbill	<i>Platalea Leucorodia</i>
Crab Plover	<i>Dromas ardeola</i>
Sooty Falcon (terrestrial)	<i>Falco concolor</i>
Clamorous Reed Warbler (terrestrial)	<i>Acrocephalus stentoreus</i>
Graceful Prinia (terrestrial)	<i>Prinia haesitata</i>

3.7 Inland Waters and Wetlands Biodiversity

The inland waters and wetlands in Sudan are characterized by different systems, feature and biota.

3.7.1 Systems and features

The inland waters could be classified into two categories: running waters “Lotic” or non-running water “Lentic”, with other features.

3.7.1.1 Lotic water systems

The Nile River System is the main lotic system in the Sudan. The system is made of the Blue Nile, the White Nile and the seasonal rivers such as Atbara, Dinder and Rahad. The Nile System in the Sudan is a mosaic of contrasting combinations: long and short; fast and slow; permanent and seasonal; blue and white; silty and clear; infested and weed-free and dammed and free-flowing. Other non-Nilotic lotic waters also exist and are represented by seasonal water courses

(Wadis/Khors) such as Khor Baraka, Khor El Gash, Khor Abu Habil, Wadi El Mugaddam, Wado Kaja, Wadi Nyla and others.

3.7.1.2 Lentic inland waters

Lentic systems in the Sudan are encountered in four types:

i. Natural freshwater lakes, which are found in the western region of Sudan. Lake Kundi lies in the southern part of Darfur region about 10 km of the seasonal Bahr el Arab river. Lake Keilak lies in South Kordofan region about 200 km north of the junction of Bahar el Arab and Bahr el Ghazal rivers. They have drainage systems, with specific bathymetric features, tphysico-chemical properties and biota, Special inland waters are found in South Kordofan in the form of Boutas, which are inland delta of Wadi El Galla, a seasonal water course which originates in the Nuba Mountains of Kordofan region and terminates in a chain of small ponds each known locally as a Bouta (pl Bowati) (Ali and Elhagaz, 2021).

ii. Saline lakes, which are represented by two crater lakes. The Dariba crater lakes lie in the massif volcanic caldera of Jebel Marra in Darfur, while the Malha (salty) lake lies in the Medoub series in Northern Darfur (Figures 3.26 and 3.27). Saline non-crater lakes also exist in the form of oases such as Nukheila, Natroun and Saleema in the north, in the northern region (Figure 3.28).



Figure 3.26. The two Dariba lakes in the volcanic caldera of J. Marra



Figure 3.27. Nomads' camels watering their livestock in Malha crater in the Maidob hills



Figure 3.28. Nukheila saline oasis

iii. Man-made lakes, which resulted from the construction of dams in the River Nile stretches that create large water impoundments. These are Lake Sennar and Lake Roseiris in the Blue Nile, Lake Jebel Aulia in the White Nile, Lake Khasham el Girba in River Atbra, Lake Merowe and Lake Nubia in the River Nile. Further/New lakes are formed by the construction of more dams in Seteit and Upper Atbara and on the Nile Rivers.

iv. Other impoundments, which include many seasonal water bodies that are formed resulting from the standing of rainwater in natural depressions, hafirs, and road burrows. The latter have changed into new aquatic ecosystems inhabited by new vegetation and became bird sanctuaries.

The Ga'ab Depression wetland has been formed when several test boreholes were sunk in the Ga'ab depression. The result was an enormous wetland with typical swampland vegetation, exclusively *Phragmites*, *Typha* and *Echinocloa* spp. (El Moghraby, 2013).

3.7.1.3 Other water features

As well as wetlands and lakes, the country has several other important water features, including terrestrial aquatic ecosystems such as;

- Riverine floodplains, riverine forests, such as Al Sunut Forest in Khartoum state, and Al-Saleem Basin and Kadroka Forest in the Northern state. The Sunut Forest, also known as the White Nile Birds Sanctuary, was established in 1939. It is an important IBA for migratory species that visit Sudan every year.
- The May'as of the Dinder River. These are wetland meadows found along the flood plains of the river. They have been formed due the meandering character of the channel and nature of flow of its waters. They occupy low-lying basins, meander and oxbows. They are generally crescent with light and / or no clear banks.
- Seasonal frequency (Umm Bader Turda) in West Kordofan state. It is flooded with water for specific periods every year.

3.7.2 Biotic diversity of inland waters and wetlands

The biodiversity of Sudanese inland waters and wetlands reflects its diversity in types, locations and water characteristics. They are home to a wide spectrum of aquatic flora and fauna, with some species that are rare and or endemic.

3.7.2.1 Aquatic flora

The diversity of aquatic flora in Sudan is characterised by including the following:

i. Algal communities

In aquatic ecosystems there are two types of algal communities: planktonic algae (phytoplankton), which live suspended in water, and benthic algae (Epipellic), which attach themselves to the bottom of the water body.

a. Phytoplankton

All the lotic and lentic water systems in the Sudan are inhabited by phytoplankton communities forming the main primary aquatic producers. According to different sources, the phytoplankton community in the lotic waters of the Sudan are embraced within six families, namely: *Chlorophyceae*, *Euglenophyceae*, *Dinophyceae*, *Chrysophyceae*, *Bacillariophyceae* and *Cyanophyceae* (Sinada and Abdelrahman, 2016). The volcanic Dariba saline lake of Jebel Marra hosts a dense bloom of the Cyanobacteria *Spirulina geitleri* found in association with *Anabaenopsis arnoldii* (Green *et al.*, 1979).

b. Epipellic algae

Epipellic algae, which live on the interface between water and sediment, are found along the White Nile River, with diatoms (*Bacillariophyceae*) making up over 90 per cent (Abdel Karim and Ali O.M. 1985).

ii. Aquatic macrophytes

The inland waters of the Sudan are inhabited by various communities of macro aquatic plants. They exhibit a remarkable diversity.

a. Aquatic Ferns (Pteridophytes)

There are two families of aquatic ferns in the Sudan; *Salvinaceae* and *Marsileaceae*. *Salvinaceae* is represented by three species: *Azolla nilotica*, *A. filiculoides* and *Salvinia molesta*. *Marsileaceae* of which there are three species in the Sudan: *Marsilea gibba*, *M. nilotica* and *M. minuta*.

b. Aquatic vascular plants

Around sixty species belonging to 24 families are reported. These plants are found in both lotic and lentic waters, and in fresh and saline waters.

They are grouped into six growth forms categories:

- i. The free-floating species represented by *Lemna purpusilla*, *Eichhornia crassipes*, *Pistia stratiotes* and the smallest flowering plant *Wolffia arrhiza*.
- ii. Submerged species represented by *Ottelia alismoides* and *Ceratophyllum demersum*
- iii. Suspended species such as *Utricularia stellaris* L. F.
- iv. Floating-leaved plants such as *Nymphaea lotus* L., *N. micrantha* Guill. & Perrott and *Nymphoides nilotica* (Kotschy & Peyr.) Léonard (Figure 3.29).
- v. Emergent species represented by *Limnophyton obtusifolium* (L.) Miq., *Phragmites australis* and *Typha domengensis* (Figure 3.30).
- vi. Trailing from the edge of the water body, such as *Neptunia oleracea*, a member of the

Fabaceae family and *Ipomoea aquatica* (Figure 3.31).

In addition to that, some woody plants are found in permanent water bodies, while others tolerate waterlogging where the water stands for a long period. The former is represented by *Mitragyna inermis* Kuntze (Ali and Elhagaz, 2021), while the latter includes *Vachellia nilotica*, *Acacia albida* (*Faidherbia albida*), *Tamarix nilotica* and *T. senegalensis*.



Figure 3.29. *Nymphaea micrantha* Guill. & Perr (Photo credit © O. Ali)

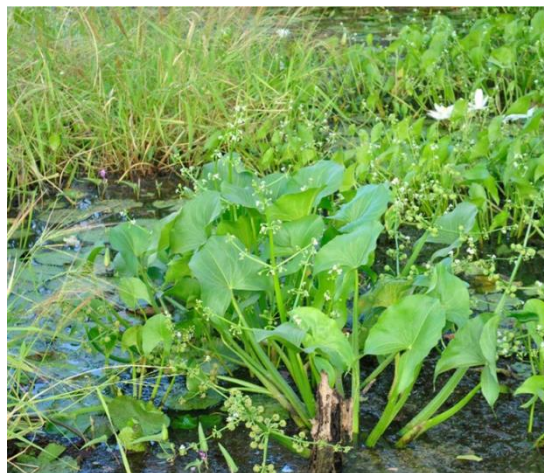


Figure 3.30. *Limnophyton obtusifolium* (L.) Miq. Photo credit © O. Ali



Figure 3.31. A mat of *Neptunia oleracea* trailing from the water edge (Photo credit © O. Ali)

3.7.2.2 Aquatic fauna

Fauna in aquatic habitats in Sudan are diverse, including the following:

i. Zooplankton

There are 18 different zooplankton genera. They are represented by six Rotifera, two genera for the families of *Crustacea*, *Rhizopoda*, *Lobosea* and *Eurotatoria*, one genus for the families of *Adenophorea*, *Phylactolemata*, *Secernetea* and *Ciliata* (Idam *et al.*, 20123).

The Dariba volcanic lake has a very sparse zooplankton community composed exclusively of rotifer species that are characteristic of saline lakes: *Brachionus plicatilis* O. F. Muller, *Brachionus dimidiatus* (Bryce), and *Hexarthra jenkiniae* (de Beauchamp) (Green *et al.*, 1979).

Saline inland waters in the desert away from the Nile valley (e.g. Nukheila oasis) contain the brine shrimp *Artemia artemia*, claimed to be a new species of aquatic crustacean (El Moghraby, 2013).

ii. Molluscs

Many species of molluscs, including 17 species in the White Nile, six in the Blue Nile, twelve in the River Nile and eight in West Sudan.

The freshwater gastropods in the Sudan include the below families and species.

- Ampullariidae: (*Lanistes carinatus*, *Marisa cornuarietis*).
- Paludomidae: *Cleopatra bulimoides*.
- Thiaridae: *Melanoides tuberculata*.
- Planorbidae: *Biomphalaria pfeifferi* (Krauss), *Bulinus truncatus* and *B. forskalii*.
- Lymnaeidae: *Radix natalensis*.

iii. Inland waters fish

The inland waters of the Sudan are rich with a diverse community of fish inhabiting both lotic and lentic waters. A recent study showed the occurrence of 133 inland waters fish species belonging to 27 families dominated by *Cyprinidae* (22 spp.), *Mochokidae* (17 spp.), *Mormyridae* (15 spp.) and *Distichodontidae* (10 spp.). Eight freshwater fish species are endemic, seven are new species and four are first record (Mahmoud *et al.*, 2024).

In Sudan, there are two subspecies of the African lungfish: *Protopterus annectens annectens* and *P. aethiopicus aethiopicus* (Omer *et al.*, 2013).

iv. Aquatic reptiles and amphibians

Reptilian species found in inland waters of Sudan include *Trionyx triunguis*, *Trionyx niloticus*, *Pelusios subniger*, *Varanus niloticus* and *Crocodylus niloticus* (Figure 3.32) (El Moghraby, 2013).



Figure 3.32. The Nile Lizard (*Varanus niloticus*) in Dinder National Park

v. Aquatic mammals

In the Dinder National Park the water bucks (*Kobus ellipsiprymnus*) are common (Figure 3.33). There is no clear reference if *Hippopotamus amphibius*, a semiaquatic, vulnerable mammal, is still sighted within the Sudanese inland waters.



Figure 3.33. Water bucks in Dinder National Park (Photo credit © Awad Siddeg)

vi. Aquatic avifauna

The inland wetlands of Sudan are enormously important for huge numbers of many species of waterbird resident, wintering and on passage. A joint survey by Sudan and France identified 3,132 wetland spots with over 500 wintering waterbirds in 2014 (Jean-Yve M. and Pierre, 2018). In a survey carried out by foot and boat in 2014 a total of 54,482 waterbirds were found (Jean-Yve, M. and Pierre, 2018).

It is interesting that all the Important Bird Areas in the Sudan are inland waters or contain important wetland element as shown below:

- Wadi Halfa.
- Khor Arba'at.
- Gezira.
- Umm Badir.
- Jebel Marra.
- Dinder National Park.
- Lake Keilak.
- Lake Abyad.
- Radom National Park.

The Mayas of the Dinder National Park is renowned for their water birds communities which include: Pink-backed Pelican (*Pelecanuse rufescens*) (Figure 3.34), Open-billed Stork (*Anastomus lameligerus*), Woolly-necked Stork (*Ciconia episcopus*), Abdims Stork (*Ciconia abdimii*), Yellow-billed stork (*Mycteria ibis*), ducks and geese such as Fulvous Whistling Duck (*Dendrocygna bicolor*), White-faced Whistling Duck (*Dendrocygna viduata*), Egyptian goose (*Alpochen*

aegyptiacus), Spur-winged Goose (*Plectropterus gambensis*) and Knob-billed Duck (*Sarkidoris melanotis*); Herons, bitterns and egret (*Egretta garzetta*) .



Figure 3.34. The pink-backed pelican *Pelecanus rufescens* in one of Dinder National Parks Mayas. (Photo credit © Awad Siddeg)

Also, amongst the wetlands sheltering important numbers of water birds is Khor Abu Habil alluvial fan (Figure 3.35).



Figure 3.35. Birds in Khor Abu Habil

In the Dariba Lake of J. Marra, only four species of aquatic birds were seen in the caldera: *Podiceps ruficollis* (Little grebe), *Threskiornis aethiopicus* (Sacred ibis), (Also reported in Lake Kundi), *Himantopus Himantopus* (Stilt) and *Tringa nebularius* (Greenshank) (Green *et al.*, 1979). A total of 24 bird species were found at Alga'ab Depression wetland in west of Dongola, Northern State.

3.8 Insect Biodiversity

At the level of insect diversity, more than 5,000 species of insects belonging to 246 families and 15 orders were collected in Sudan and identified by the insect collection unit at the Agricultural Research Corporation.

The orders Coleoptera (beetles) and Lepidoptera (moths and butterflies) represent the most dominant insect species in Sudan, while insect species belonging to the orders Siphonoptera, Isoptera, Ephemeroptera, Dermaptera, Trichoptera and Thysanoptera are the least prevalent.

Based on their economic importance, insects can be grouped as follows:

- i. Insect pests. This is the most studied group of insects due to their economic importance as pests of field and horticultural crops.
- ii. Insects as natural enemies of insect crop pests. Several insect predators and parasites of

crop insect pests have been reported in Sudan. These predators and parasites help in checking the outbreaks of some crops' insect pests provided that the environment is favourable for their population build-up. The orders Hymenoptera, Diptera, Coleoptera, Dermaptera, Hemiptera and Neuroptera are the orders that include insects as natural enemies.

- iii. Insects as pollinators of flowering plants. These are insects that play a role in the pollination of either field crops, vegetable crops or fruit trees. Among these insects, the honeybee (*Apis mellifera*) of the order Hymenoptera, butterflies (Lepidoptera) and some beetles (Coleoptera) are the most important ones in Sudan.
- iv. Insects as food. Several insects such as desert locust and tree locust (*Anacridium melanorhodon melanorhodon*), Dura andat (*Agonoscelis pubescens*) and the queens of termites are eaten by the native people in some parts of the country. Insects also serve as food for birds and fishes.

The extensive irrational use of non-selective broad-spectrum pesticides for the control of insect pests of field and horticultural crops have resulted in partial elimination of the beneficial insects such as predators, parasites and plant pollinators including the honeybees.

3.8.1 Insect Pests

There are three groups; store pests, agricultural crop pests and insects causing diseases.

3.8.1.1 Store pests

Insect pests are the direct cause of most of the loss that occurs in stored grain in the Sudan. They are divided into

A. Primary Store Pests

The main known primary pests in the Sudan comprise six species of insects; three beetles and three moths. These are as follows:

- i. The Rice Weevil, *Calandra oryzae* L. (Curculionidae).
- ii. The Lesser Grain Borer Beetle, *Rhizopertha dominica* F. (Bostrichidae)
- iii. The Khapra Beetle, *Trogoderma granaria* Everts (Dermestidae).
- iv. The Angoumis Grain Moth, *Sitotroga cerealella* O. (Gelechiidae).
- v. The Rice Moth, *Corcyra cephalonica* H. (Pyralidae).
- vi. Unidentified grain moth species, *Ephestia* sp. (Phycitidae).

B. Secondary Store Pests

Known secondary pests include the following beetles:

- i. Flour Beetles, *Tribolium* spp. and *Latheticus* spp. (Tenebrionidac).
- ii. Saw-Toothed Grain Beetles, *Oryzaephilus* spp. (Cucujida).

3.8.1.2 Agricultural Insect Pests

Crop losses in African countries due to insect pests are estimated at 49% of the expected total crop yield each year, according to the Centre for Agriculture and Biosciences International. But some crop losses can be even worse, and the effects of the changing climate are expected to increase the damage done by insects. In Sudan, they include insects such as the following:

B. Desert locust

The desert locust is a migratory pest whose population development in remote areas must be monitored to prevent outbreaks, upsurges and plagues. The spatial distribution of solitary desert locusts on the Red Sea coastal plain of Sudan was determined over 3 years from November to March.



Figure 3.36. Desert locust

C. White Flies

Whiteflies are hemipterans that usually feed on the undersides of plant leaves. They belong to the subfamily *Aleyrodidae*. More than 1,550 species have been described under this sub-family. In Sudan, the cotton whitefly is found in all cotton growing areas and is always abundant on cotton in Gezira and New Halfa.

D. Onion Thrips

Onion thrips (*Thrips tabaci*) is the major pest of onions in the Sudan. In the Gezira scheme onions are normally transplanted between October and January, when the thrips population is very low. Later, thrips commence to breed. Early transplanted onions are well established before infestations become severe. Onions transplanted later, when thrips begin to multiply, produce lower yields.

E. Aphid

The aphid is considered one of the piercing-sucking insects that attack crops in the winter in central and northern Sudan. It is present in the period from the 11th month to the 3rd month of the following year, and the farmer may not notice its presence due to its presence in separate parts of the field.

F. The Arabian Palmate

A very harmful insect that infects many plants, especially sesame. It has a piercing, sucking mouth. It sucks the plant's sap, causing the leaves to curl, the plant to become stunted, and the seeds of the large plant to be destroyed and the small.

3.8.1.3 Insect-borne Diseases

In Sudan there are a number of insects causing a number of diseases to humans as carriers for the causal organisms (Figure 3.37). They include mosquitoes causing malaria and dengue fevers, ticks causing two main types of tick bite fever, Colorado tick fever and African tick bite fever, house fly causing diseases of which cholera is one of most dangerous that can be spread by flies contaminating food and water sources, sand fly causing Leishmaniasis, which spread by bites from female sand flies, and lice causing the Epidemic Typhus, which tends to occur in conditions of overcrowding and poor hygiene due to lice being the main carriers.



Mosquito



House fly



Sand fly



Lice

Figure 3.37. Some insects causing diseases

3.8.2 Beneficial Insects

Among the beneficial insects is the honey bee. There are currently African honey bee species in Sudan. These species are widespread in most states of Sudan. Central, southern and western areas have natural apiaries in trees and caves. Studies to know the types of Sudanese bees and develop this industry using modern methods have begun in the late last century with the aim of producing honey and other products for bees, in addition to benefiting from them in increasing the productivity of various agricultural crops, as bees are considered the most important agricultural insects that pollinate crops.

Chapter 4

Threats and Causes of Loss of Biodiversity

Biodiversity in Sudan is threatened by a number of factors, including environmental and human-made factors. The country is ranked eighth in terms of vulnerability to climate change out of 185 countries in the world, and ranked 175th in terms of preparedness according to Global Adaptation Initiative Matrix of the University of Notre Dame (GAIN- ND) ([Matrix // Notre Dame Global Adaptation Initiative // University of Notre Dame](#)). Therefore, Sudan scored high on the vulnerability scale and low on the preparedness scale.

Currently, the ongoing war in Sudan is causing untold human suffering and destroying the country's ecosystems. It threatens biodiversity and environmental stability on a large scale, and has long-term repercussions for Sudanese society, including increased vulnerability to climate change, deforestation, and soil degradation.

A number of factors cause direct threats to each of the biodiversity components, as could be highlighted in the following:

4.1 Cultivated Plant Agrobiodiversity

Factors threatening the genetic diversity of agricultural crops in the Sudan are many including natural and human factors. These threats include environmental changes such as the climatic factors, including drought spells and rain fluctuations, floods, temperatures fluctuations; expansion in modern agriculture and use of advanced improved cultivars in a mono-cropping system of agriculture, and expansion in new developmental constructions and activities within the country, in addition to un-rest conditions due to armed conflicts. Following are the major factors causing losses in the local plant genetic resources for food and agriculture (PGRFA) in Sudan:

- i. **Environmental changes:** causing loss of farmers' varieties and complete failure of crops, as well as crop wild relatives due to drought spells and fluctuations in rains and temperatures, including heavy rains and floods, and high heat waves.
- ii. **Modern agriculture:** the modern agriculture is characterized by the use of advanced improved cultivars in a mono-cropping system of agriculture at the expense of traditional crop varieties produced at small scales in mixed farming patterns.
- iii. **Socio-economic factors:** The civil war, which continued for more than twenty years in parts of western and central Sudan has negatively affected the diversity of plant crops in that area. The current war, which erupted since April 2023, and spreading in wide areas of the country, has been resulting in disturbing the normal cultivation seasons, and forcing thousands of local farmers to flee from their original habitats, where they used to practice farming using their own seeds, which might have been lost from them by skipping production seasons, or due to the displacement to different habitats.

As a result of the intensification of the fighting operations that began in mid- April 2023 in Khartoum state, the only national gene bank of the Agricultural Plant Genetic Resources Conservation and Research Centre (APGRC) in Wad Medan, Sudan has reached a critical stage due to looting almost all of its facilities, including the deep freezers of the genebank, and the data servers and computers. At the beginning the situation was accompanied by frequent and prolonged power outages, in-availability of sufficient fuel supply to run standby generator, severely threatening the Genebank's

ability to maintain cold storage conditions crucial for preserving seed viability in seed bank. The situation has severely exacerbated since mid- December 2023 when the war extended to Wad Medan city in the Gezira State in Central Sudan, where the headquarters of the APGRC and the central national seed genebank are located within the premises of the Agricultural Research Corporation (ARC), and the gene bank facilities have been very negatively affected due to that, as almost all the deep freezers used for storage of the seed samples of different accessions in the gene bank have been stolen. Other laboratory equipment has either been stolen or might be damaged.

- iv. **New developmental constructions:** for example, oil exploration and production activities in some parts of western and southern Sudan are remarkable real examples that disturb the life patterns of the local people and hence will definitely result in negative impacts on the existing plant agrobiodiversity.
- v. **Biotic factors:** pests and diseases that attack crops usually have negative impacts on the genetic variability within the crops. A number of examples could be cited for damages being caused by destructive pest and disease causal agents leaked into the country due to the weak quarantine measures applied. Among those is the loss of considerable numbers of local date palm trees in the 1990s due to the infestations by the pit green scale insect introduced illegally to some areas in the Northern state sometime in 1980s.
- vi. **Farmers' practices:** farmers used to select the outstanding strains of crops within their fields for future cultivation. They tend to do that on the basis of their knowledge on the environments and crops. Such selection practice results in the dominance of some genotypes at the expense of others.
- vii. **Administrative and financial factors:** lack of sufficient sustainable funding for genebank operations, together with possible administrative ineffectiveness, inefficiency and / or indifference can lead to catastrophic losses of important genetic resources as probably recently resulted in complete loss of 357 banana accessions in the field gene bank of banana in Kassala state; a collection that represented the most banana production sites of Sudan.

4.2 Range Plant Agrobiodiversity

Rangeland biodiversity presently faces both area reduction and degradation. The extreme change in biodiversity can be observed among seasons within a year and between years and decades. There are different factors that are affecting the rangeland biodiversity, such as overgrazing, unplanned fire, invasive plants, weather and climate fluctuations. There are some threats with impact on rangeland biodiversity that can be of direct or indirect effects, including the followings:

- i. **Climate change and drought:** Sudan's vulnerability to drought poses a significant threat to its biodiversity. Prolonged dry spells severely impact plants, animals, and their habitats, leading to a decline in species diversity and ecosystem instability. The repeated drought conditions that hit the country in the 1970s, 1980s and 1990s had their negative impacts on range plants diversity resulting in the disappearance of several range plant species.
- ii. **Over-grazing and grazing selectivity:** Overgrazing has occurred in many parts of the

semi-desert and other zones as a result of over stocking of livestock, poor distribution of water sources, and amount of available vegetation and blockage of livestock routes during the wet season. The practice of overgrazing by livestock, driven by population growth and socio-economic factors, results in the degradation of grazing lands, leading to habitat loss for many wildlife species.

- iii. **Armed conflicts and civil wars:** Armed conflicts in Sudan, including the civil war erupted since 2023, disrupt conservation efforts, hamper wildlife management, and lead to habitat destruction as well as negative effects on soil seed bank ecology of most very important rangeland areas at fragile zones such as Butana area in central Sudan, and sandy soil areas in western Sudan.
- iv. **Seasonal wildfire out-breaks:** Increased wildfire hazard is associated with low humidity, high fuel loads and the presence of moving grazers. Repeated fires pose a serious threat to rangelands resulting in the consumption of 10 - 30% of the standing dry forage in different ecological zones.
- v. **Bush encroachment:** Bush encroachment is defined as the increase in the density of woody vegetation in grassland and savannah ecosystems. It happens at the expense of such natural rangelands.
- vi. **Seed collection:** Methods of the traditional range seeds collection from natural rangelands lead to soil erosion, land degradation and seed loss, as most collectors harvest the whole plants.
- vii. **The migration of the population from rural areas to cities and big towns:** The migration of population due to insecurity or economic reasons has negatively affected the agrobiodiversity, including of range plants, that used and conserved by the local people. Pressures on habitats are increasing with more areas opened to development and investors.
- viii. **Overexploitation of natural resources:** Sudan's rich natural resources, including timber, minerals, and water, are often exploited without proper regulation, causing irreversible damage to ecosystems and threatening the survival of plant and animal species.
- ix. **Expansion of mono-crop agriculture:** The expansion of mono-crop agriculture, particularly for commercial crops like cotton and sugarcane, leads to loss of natural habitats, deforestation, and the use of chemical inputs that harm natural plant biodiversity, including in the rangelands.
- x. **Human encroachment and population growth:** The growing human population in Sudan puts increased pressure on natural resources and leads to habitat fragmentation, encroachment on protected areas, and the destruction of critical wildlife habitats and natural rangelands.

4.3 Animal Agrobiodiversity

Livestock diversity is threatened by a host of factors some of which are briefly discussed below:

- i. **Animal movement:** The vast majority of Sudan livestock are raised under nomadic, transhumant or sedentary village-based management systems. All these systems of management allow mixing of animals and thereby mixing of gene pools and erosion

livestock diversity.

- ii. **Extreme climate events and drought conditions:** under extreme climate events and drought conditions, loss of animal lives occurs, especially those that are less tolerant. Cattle and cattle breeds, which are more productive are affected most. Camels are the least affected.
- iii. **Feed availability:** Amount and quality of feed are affected by factors such amount of precipitation, grazing pressure, distribution of water points, fire incidence and season where feed quality drops sharply after forage maturity in the dry season.
- iv. **Diseases:** Diseases that can cause catastrophic animal losses were reasonably under control due to veterinary care especially vaccination. However, the security situation in the country hindered movement and access to many good grazing areas.
- v. **Investments in agriculture:** The expansion in semi-mechanized agricultural schemes has increasingly appropriated pastoral land resulting in feed insecurity. More recently a trend emerged that scheme owners began to deny free access to crop residues, which was a common practice in the past.
- vi. **Civil war:** The war that broke out in April 2023 resulted in destruction of feed factories, veterinary laboratories, veterinary drugs storage facilities, mobile clinics, fattening pens, poultry and dairy facilities, loss of millions of poultry and an undetermined number of improved dairy animals. The traditional sector is also badly hit by loss of grazing land due to inaccessibility due to insecurity, robbery, loss of markets and damage to water facilities.

4.4 Forest Biodiversity

Sudan's forests declined to 10.3 % by 2015, according to the FAO Global Forest Resources Inventory (1990–2015). The annual loss in 2015 was estimated at 855,000 feddans (35.91 square kilometres). There are several gaps of knowledge in the field of resource assessment at the national level and much work needs to be done. Abide by the present status of environmental degradation, loss in forest biological diversity is being experienced at an alarming rate due to a number of reasons included in a recent study on “Analysis of Key drivers of deforestation and forest degradation in the Sudan”. The results of the study revealed that the direct causes of deforestation and forests biodiversity loss encompass unsustainable extraction of wood including legal, illegal and selective logging for energy and other uses, overgrazing, insecurity, biotic (man, animal and insect) or abiotic (drought spells, fire, wind and floods destructive agents). The study indicated that the main underlying causes include rapid human and animal population increase and the associated growing demand for land and energy, subsistence agriculture, legal and institutional gaps including lack of stable and equitable forest tenure, lack of stakeholders' participation in forest management and benefit-sharing schemes and weak law enforcement.

An epidemic of *Acacia nilotica* dieback is affecting many riverine forests along the Nile and its tributaries. Termites are a serious problem in *Eucalyptus* plantations, while seed borer affects the natural regeneration of species like Acacias, *Balanites aegyptiaca* and several species of *Combretum*.

Fire is a serious problem in several forest areas in Sudan. Grass fire in plantations of *Acacia senegal* causes a reduction in yields of gum arabic, an important export commodity (Table 4.1).

The riverine forest system is at risk of extinction because of the Renaissance dam in Ethiopia due to the expected change in the natural flow system of the Blue Nile and the retention of its flood waters, especially since the Blue Nile is primarily a seasonal river and the pulse of its flood is considered the main responsible for the ecological systems present in the wetlands on its banks and the banks of the White and the River Nile. This will include the loss of forests such as that of *Acacia nilotica*.

The recent conflicts and war have an important impact on the process of planting, protection, and technical management of forests, especially in areas located in the war zone. Also, there has been a major encroachment on forests due to the lack of energy and the increase in gas prices. Regular and irregular forces encroached on tree cover by cutting for fuel. Overgrazing also increased in various areas due to the lack of pastoral resources.

The impact on the gum arabic sector will be reflected on the supply chain that will be affected (producing farms, the local market, local companies, and most importantly, the global market). The strategic stock of gum will be affected for major manufacturing companies, and pharmaceutical companies. This makes importing countries shift to other countries such as Kenya, Nigeria, and Mauritania and Chad. These countries cannot compete with Sudan, especially with regard hashab gum, but they will have new markets that Sudan has lost.

Table 4.1. Annual burned area of forest, woodland and range ecosystems in Sudan, 2010–2015

Fire season	Burned area / ha
2010–2011	1,075,974.8
2011–2012	1,049,790.7
2012–2013	1,076,363.9
2013–2014	1,087,602.0
2014–2015	1,090,119.7

4.5 Wildlife Biodiversity

Sudan's unique wildlife biodiversity faces a range of threats and challenges. Drought, overgrazing, overexploitation of natural resources, expansion of mono-crop agriculture, poaching, and smuggling are just a few of the factors endangering the country's wild flora and fauna. Mangrove stands, forests, and riverine areas are particularly affected, as well as sensitive marine habitats along the coast. Human encroachment, population growth, and climate change exacerbate the pressures on Sudan's biodiversity. Following is more detailed description of factors threatening the wildlife biodiversity in Sudan:

- i. **Drought:** Prolonged dry spells severely impact plants, animals, and their habitats, leading to a decline in species diversity and ecosystem instability.
- ii. **Overgrazing:** The practice of overgrazing by livestock results in the degradation of grazing lands, leading to habitat loss for many wildlife species.
- iii. **Overexploitation of natural resources:** Sudan's rich natural resources, are often exploited without proper regulation, causing irreversible damage to ecosystems and threatening the survival of wild fauna and flora species.

- iv. **Expansion of mono-crop agriculture:** The expansion of mono-crop agriculture leads to the loss of natural habitats, deforestation, and the use of chemical inputs that harm biodiversity.
- v. **Poaching and smuggling:** Poaching for bush meat, illegal wildlife trade, and smuggling of endangered species impact wildlife populations, disrupt ecosystems, and undermine conservation efforts.
- vi. **Human encroachment and population growth:** The growing human population in Sudan leads to habitat fragmentation, encroachment on protected areas, and the destruction of critical wildlife habitats.
- vii. **Gold mining:** Gold mining, whose use of poisonous cyanide and mercury is highly destructive to humans and wildlife.
- viii. **The oil industry:** The oil industry causes damage to wildlife habitats through exploration and extraction, as well as pollution of marine protected areas.
- ix. **Pesticides and chemicals:** Use of chemicals to control insects such as locusts and grasshoppers could affect migratory birds, apart from the use of some avicides hazardously affecting the birds' biodiversity.
- x. **The intentional lighting of fires:** For example, in bamboo tree harvesting in Jebel Al Dair, and in honey collection in Dinder National Park.
- xi. **Tribal conflicts:** Tribal conflicts affect wildlife in many ways due to wide spread of using weapons, especially in Darfur region.
- xii. **Refugees and internally displaced persons:** Refugees and internally displaced persons often settle in or around protected areas. The spread of small weapons during civil wars and conflicts also leads to an increase in poaching and illegal trade in wildlife;
- xiii. **Climate Change:** The effects of climate change, including rising temperatures, erratic rainfall patterns, and increased frequency of extreme weather events, pose a significant threat to Sudan's biodiversity, resulting in population declines and local extinctions. Climate change will have a negative impact on habitats for wild animals and birds.

4.6 Coastal and Marine Biodiversity

The Sudanese marine environment is still considered in largely pristine conditions compared to other parts of the Red Sea region, and pollution is mainly confined to Port Sudan harbour area. Nevertheless, both coastal and marine environments and their resources are becoming vulnerable to various environmental threats due to increasing urban, industrial and recreational development and other marine practices in coastal and marine environments especially around Port Sudan harbour area. The main environmental impacts in the area, which usually originate from land-based and marine-based sources can be summarized as following:

- i. **Land-filling and dredging:** Such destructive practices are considered one of the main environmental problems related to the present coastal land uses and human activities. They are usually carried out in nearshore and shallow coastal waters for marine constructions and, therefore, result in destruction and loss of a number of biologically

productive habitats, including coastal vegetation, mangroves, seagrasses, coral reefs and associated fisheries.

- ii. **Oil pollution:** Oil is becoming the main source of pollution in the Red Sea, which occurs as a result of improper handling at oil terminals, or accidental spills and discharges due to navigation risks. Oil pollution has serious direct or indirect effects to marine habitats and their associated marine living resources and other marine activities. It is at present becoming a serious problem to marine environment and its resources due to construction and operation of two oil exporting ports (Bashair 1 and 2), which have been in operation since 2006 /2007, and located just south of the main harbour.
- iii. **Waste disposal:** It is another source of pollution, which, at present, poses a real problem facing the coastal zone area environment. Both solid (plastics, tins, pesticides, fertilizers, chemicals and other garbage or litter), and liquid (industrial and municipals effluents) wastes exist. Waste management in or around Port Sudan is largely uncontrolled though there is a regular system of garbage collection.
- iv. **Other sources of threats:** There are certain existing and expected other indirect sources of environmental threats to land / sea resources. These can be summarized in the following:
 - a. **Over-grazing and exploitation of natural resources** due to increased human activities along several parts of the coast, coupled with poor planning and management.
 - b. **Road construction:** Construction of permanent roads such as that made between Port Sudan and Suakin, Port Sudan and Egypt, and Suakin and Tokar (~150 km) along the southern coast, have their direct influence on the coastal and marine habitats.
 - c. **Agricultural and mining activities:** Extensive use of pesticides, insecticides and herbicides for agricultural purposes mainly at Delta Tokar in the southern coast, as well as mining for gold and gypsum production in areas north and south-east Port Sudan, will impact land and coastal environments and habitats, especially the terrestrial and coastal vegetation and fauna.

4.7 In-land Waters and Wetlands Biodiversity

The inland waters and wetlands and their natural biota of Sudan are facing a number of threats that could be listed as below:

- i. **Development:** Human activities in the form of developmental projects are usually accompanied by negative impacts if not well managed. These impacts are more manifested in the case where the project is in or near to an inland water or wetland system. Examples are such as the change from lotic to lentic waters usually occurs when a dam is built, and a reservoir is formed. Also, urban development in wetland areas is another example.
- ii. **Lack of legislation and regulatory frameworks:** For example, there is no national legislation governing the sustainable use of wetlands. A gap in legislation is also behind the failure to control invasive species and to understand their impact on local

biodiversity.

- iii. **Low or lack of understanding and appreciation of the various values of wetlands:** These have resulted in inadequate planning, poor land use policies, conflicting land use practices, ineffective management and ineffective law enforcement.
- iv. **Little scientific attention**, which is reflected in the fact that taxonomy of many aquatic species is either old or absent.
- v. **Lack of participation and coordination with important stakeholders** such as with local communities, who have the indigenous knowledge, which is valuable source of information to understand the ecological services and economic values of the inland waters and wetlands.
- vi. **Pollution:** Pollution from industrial, agricultural and urban sources is a threat to the inland waters and wetlands and the organisms living within, near or associated with such as from sewage effluents and discharges of different chemical wastes.
- vii. **Overexploitation:** This threat is particularly befalling the fish communities through excessive uncontrolled fishing and via using illegal fishing methods.
- viii. **Exotic species:** A well-documented case of invading species is that of the alien water hyacinth (*Eichhornia crassipes*) in the former southern Sudan, which has outnumbered and almost excluded the native Nile cabbage (*Pistia stratiotes*) in the upper stretches of the White Nile.
- ix. **Climate Change:** A changed climate will alter hydrology, and functionality may be impaired by increased temperatures, drought or flooding events, CO₂ increases, and/or salinity intrusion (Junk *et al.*, 2013). Drought will result in drying up of water bodies, while increased flooding could lead to wiping of biota.
- x. **The Grand Ethiopian Renaissance Dam:** GERD could affect the Blue Nile in many ways. For example, water downstream of GERD will have decreased turbidity increasing the euphotic zone. Increased photosynthesis will lead to phytoplankton bloom or change in community.

4.8 Threats and Causes of Loss of Diversity due to IAS

The occurrence of IAS can damage the ecosystems and biodiversity in all sectors as they may become dominant and result in losses of other species. Also, in some cases IAS could be toxic or harmful to animals and humans. Below are examples of threats to biodiversity due to IAS:

- i. Many of IAS in agriculture, rangeland and forestry can be unpalatable species, harmful and toxic to the animal or to the human beings.
- ii. Losses of biodiversity in insects can damage the balance of insects that are important for pollination.
- iii. Some of invasive micro-organisms can pollute the fresh water.
- iv. Inadequacy of check points and quarantines to prevent introduction of IAS, with lack of laws, policies and legislation for control of IAS.

. Chapter 5

Policies, Plans and Legal Frameworks

Comprehensive national policies and legislations targeting biodiversity in general, or the specific biodiversity components are generally lacking with the exception of the NBSAPs being regularly developed and updated in the last twenty-five years in Sudan. However, there have been a number of sectoral acts dealing with matters related to different biodiversity terrestrial, freshwater and marine components, such as:

- The Wildlife Protection Act (1935).
- The Nile Pumps Control Act of 1939.
- National Parks, Sanctuaries and Reserves Regulation (1939).
- The Environmental Health Act (1975).
- The Wildlife Act 1935 amended (1986).
- The Fresh Water Fisheries Act of 1954.
- The Water-Hyacinth Act of 1960.
- The Terrestrial Waters and Continental Shelf Act (1970).
- The Irrigation and Drainage Act of 1990.
- The Pesticides Act (1994).
- The Water Resources Act (1995).
- The Petroleum Wealth Act (1998).
- The Environmental Protection Act of 2001. Amended 2020.
- Disaster Management and Public Safety Act (2001).
- The Forests and Renewable Natural Resources Act (2002).

Sudan has ratified the Convention on Biological Diversity, the Convention on the International Trade in Endangered Species of Wild Fauna and Flora, the United Nations Convention to Combat Desertification, the United Nations Framework Convention on Climate Change, the World Heritage Convention and the African Eurasian Waterbird Agreement. It also participates in the UNESCO Man and Biosphere Programme under which two sites, Dinder and Radom National Parks, have been designated Biosphere Reserves.

However, some of policies, plans and legislations linked with different biodiversity components are there as indicated below.

5.1 Cultivated Plant Agrobiodiversity

Following are some highlights on policies, plans and legislations related to cultivated plant agrobiodiversity in Sudan:

5.1.1 Policies and Plans

Actions in this field of cultivated plant agrobiodiversity are usually proposed and undertaken under

the guidance provided by the National Biodiversity Strategy and Action Plan (NBSAP), together with other institutional frameworks of programmes set by relevant institutes such as the Agricultural Research Corporation (ARC). External linkages are established within global and/or regional arrangements such as the membership of the country in global and regional plant genetic resources (PGR) bodies and related instruments such as the FAO Commission on Genetic Resources for Food and Agriculture, and some regional networks, and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) since 2002. However, Sudan has not yet put in place a separate national policy and strategic plan for the domestication of such treaties and other global plan of actions as far as plant agrobiodiversity is concerned. Sudan is also a party to the Nagoya Protocol on Access to Genetic Resources and Sharing of Benefits arising from their Utilization.

5.1.2 Legal Frameworks

Sudan is a party to the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), and the Ministry of Agriculture is the national focal point for this Treaty. National legislation that deals with different relevant aspects such as conservation, sustainable use, access and benefit sharing, and information management of plant genetic resources in Sudan has been developed as a part of the domestication process of such agreement and others such as the CBD and Nagoya Protocol, but not yet approved by the legislative authority.

This proposed legislation has been developed in order to attain the following objectives:

- i. Conservation of PGR.
- ii. Sustainable use of PGR for food security and other public benefits.
- iii. Facilitated access to PGR for conservation and sustainable use.
- iv. Equitable and fair sharing of benefits arising from the use of the PGR.
- v. Protection of farmers' and community rights related to PGR.
- vi. Capacity building and transfer of technology related to PGR.
- vii. Protection of traditional knowledge, techniques and practices related to PGR.

This legislation is divided into a number of chapters dealing with:

- i. Institutional arrangements.
- ii. Conservation of PGR.
- iii. Sustainable use of PGR.
- iv. Access to PGR.
- v. Protection of farmers' and community rights and traditional knowledge.
- vi. Registration and information of PGR.

A local internal system is adopted by the APGRC / ARC for regulating the process of accessing the germplasm other than those included in the Multi-Lateral System (MLS) of the ITPGRFA. It consists of a germplasm request form to be filled out by the germplasm applicant and a material transfer letter that is submitted to the applicant upon receipt of the germplasm requested, stating the conditions for providing the requested germplasm materials, which are only provided upon the acceptance of such conditions by the applicant.

5.2 Range Plant Agrobiodiversity

A major policy document of relevance to the range plant agrobiodiversity is the NBSAP, containing various suggested plans and actions to conserve diversity in rangeland sector, including the following issues, for examples:

- Establishing ecological enclosures and fencing of rangeland areas for monitoring and evaluation of biodiversity in different vegetation zones.
- National monitoring of biodiversity with integration with other sectors to exchange information related to rangeland biodiversity and its conservation.
- Reseeding programmes using original species based on ecological site characteristics.
- Collect seeds of local genetic resource to document and save range plant genetic resources.
- Use of modern technologies (RS, GIS and GPS) to study habitats and their changes over time as well as detection of vegetation changes.

5.3 Animal Agrobiodiversity

There are major gaps and weaknesses in the institutional frameworks for animal genetic resources (AnGR) management as there are also several positive developments in recent years, including the development of national strategies and action plans for AnGR.

The establishment of regional and subregional focal points for AnGR over recent years has strengthened cooperation and capacity to undertake AnGR management actions at supranational level. However, the following should be given due consideration as important policy issues:

- a. Incorporating livestock in policies and development projects.
- b. Agricultural policies (e.g. in rainfed sector) should take on board the concerns of livestock owners, who are increasingly losing traditional grazing lands and traditional grazing rights such as access to crop residues in mechanized schemes.
- c. Pricing policies and fees can be used as leverage to enhance keeping more adapted but less commercial animal species.

5.4 Forest Biodiversity

Following are some highlights on policies, plans and legislations related to forest biodiversity in Sudan:

5.4.1 Policies and Plans

The first forest policy for the Sudan was enacted in 1932. Its main objective was to protect and reserve country forests resource. The policy included directives on afforestation and logging activities in and outside of reserved areas, and also the prohibited actions in forests. It also outlined privileges and rights of the population in and surrounding the forests.

A second forest policy was issued in 1986, and it was the basis for forestry sector strategy, and it recognized and encouraged establishment of private, community and institutional forests, including irrigated forest plantations in agricultural schemes. It provided clear directions to raise the total areas of natural forests, wildlife reserves, and range lands to reserve 20 percent of the total area of the country, manage the forest resources on sustainable basis, institutional strengthening and capacity building.

In 2006, Sudan defined its National Forest Policy Statement, developed with FAO technical

support, as an update of Sudan's Forestry Policy of 1986. The 2006 statement, which, unfortunately, has not been ratified, incorporates poverty reduction strategy, improvement of people living standards, amelioration of physical environment and combat of desertification.

National goals and policy priorities of the proposed National Forest Policy (2006) include the following concerns:

- i. Governance of the forestry sector.
- ii. Population welfare.
- iii. A greener Sudan.
- iv. Maintaining competitiveness.
- v. Peoples' participation.
- vi. Land use and tenure conflict resolution.
- vii. Development of jobs and income generation programmes.
- viii. Conservation of biodiversity.

The specific objectives of the statement include:

- Objective 1: To build institutional capacity of stakeholders to maximize the contribution of forestry to the national and states socio-economies.
- Objective 2: To promote greening of marginal areas through protection and reforestation programmes.
- Objective 3: To protect, and sustain the management of the existing forest reserves and to establish new reserves.
- Objective 4: To support other sectors in Sudan involved in National Biodiversity Strategy and Action Plan.
- Objective 5: To support the establishment of land tenure system.
- Objective 6: To enhance benefits of non-wood forestry products (NWFP).
- Objective 7: To conduct an inventory programme to assess the status of forests products and the existing industrial capacity to produce commercially oriented, highly technical, modern and competitive private forest milling industry.

The draft forest policy, 2006, was reviewed in 2015 in a broad gathering with stakeholders emphasizing that, the National Policy for Sudan's Forests is statement of the intentions of the Government of the Sudan, reflects the government's firm commitment to guide or direct the management of forest resources in the Sudan to maintain the supply of forest products and services to meet the needs of the current generation without compromising the needs of future generations of these products and services. New items were introduced like, conservation of forest genetic resources, biodiversity, the trans-boundary movements of forest products and benefit sharing. Still the policy not yet sanctioned.

5.4.2 Legal Frameworks

The first recognized forest law was issued in 1901, and the second was in 1932. The Forest Act of 1932 divided the responsibilities of forest administration between the central and provincial authorities. In 1939, a royalty order was enacted for collecting royalties from forest products produced outside the forest reserves to discourage people from cutting trees outside the forest reserves. A new forest law was issued in 1989. This law enacted the Forests National Corporation (FNC), and legalized people's participation in forest management and made provision for private,

community and departmental forests.

The establishment of the Forests National Corporation was a drastic change in the forestry administration. The outcome of the act with the assistance of the international contributions led to the establishment of the Forests National Corporation, which is a parastatal service-oriented and independent body corporate. It has much more functional freedom and flexible procedure in retaining revenue to meet its recurring expenses, namely wages, salaries, operation and maintenance.

The Forests and Renewable Natural Resources Act, 2002 (FRNR), provides the framework for the management and protection of forests and renewable natural resources encompassing pasture and range, as well as the framework governing the managerial system of the forestry sector. The FRNR Act for 2002 is still binding but not administered yet. In 2015, the FRNR of 2002 was revised. The revised Act of 2015 provides for joint forest management, benefit sharing, community forestry, and recognize indigenous culture and peoples, and protection of genetic resources. The multi-sectoral approach of the 2002 Act has also been repealed and all measures related to range and pastures in the 2002 Act have been disregarded. Still this revised act of 2015 is not sanctioned.

5.5 Wildlife Biodiversity

The policy and legal frameworks in Sudan regarding wildlife are primarily governed by the Wildlife Protection and National Parks Law (1986). This act provides the legal basis for the conservation and protection of Sudan's wildlife, including regulations related to hunting, trade, and possession of wildlife species. It covers the conservation, protection, development and management of game animals and national parks. The act does not cover the conservation of plants and trees or the protection of marine species. It also ignores community participation in management plans (Ministry of Environment, Natural Resources and Physical Development, 2015). This law has been under revision and updating, and a revised draft is waiting for further steps towards official endorsement

5.6 Inland Waters and Wetlands Biodiversity

Generally, the inland waters and wetlands do not have a tailored legal legislation. Their legal framework is interwoven within those targeting other natural resources such as forests, wildlife, fisheries and water resources. None of the aquatic flora and fauna has a national protection status. However, the inland waters are included, though not clearly explicitly, within the country's constitution and the environmental and sectoral acts. In addition, the Sudan has signed/ratified many regional and international agreements within the realm of environmental natural habitats and their biota.

The Environment Protection Act (2001) is policy-oriented framework legislation for the protection of the environment and natural resources in Sudan. Several sections are relevant for the preservation and management of inland waters and wetlands. These are:

- Section 17: Calls for the conductance of an Environmental Impact Assessment for projects that might adversely affect the environment.
- Section 18: Stipulates certain directives to guide the activities of various concerned authorities. These directives include, *inter alia*:
 - Laying down quality control standards for the protection of the environment;
 - Preservation of air, food, soil, the vegetation cover from pollution and

- degradation;
 - Preservation of water sources from pollution.
- Section 20: enumerates the following relative violations:
 - Polluting water sources, such as rivers, seas, lakes, water courses and other natural and artificial reservoirs.
 - Deforestation and illegal removal of the vegetation cover;
 - Illegal hunting and endangering the wildlife habitat.

Sudan is party to several global and regional multilateral agreements of relevance to conservation and sustainable use of wildlife, freshwater and marine biodiversity. They include the following:

- The Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES) (signed in 1973 and ratified in 1983);
- The Ramsar Convention on Wetlands (signed in 1971 and ratified in 2005). This Convention is implemented through three pillars: the wise use of all wetlands; the designation and management of Wetlands of International Importance (Ramsar sites), including reporting on adverse change; and international cooperation, including for shared wetlands.
- The African-Eurasian Migratory Waterbirds Agreement (AEWA) (signed in 1995 and ratified in 1999);
- The Convention on Biological Diversity (signed in 1992 and ratified in 1995);
- The African Convention on the Conservation of Nature and Natural Resources (signed in 1968 and ratified in 1973).

5.7 Insect Biodiversity

No specific policies or legislations dealing with insect and microorganism biodiversity. There are only a number of legislations that are still valid on plant protection against pests and diseases, including the insect and microorganism pests, include the following:

- Locust Control Act (1907).
- The Plant Diseases Act (1913).
- Agricultural Pests Control Act (1919).
- Cotton Ordinance (1926) and (1929).
- Water Hyacinth Control Act (1960).
- The Pesticides and Pest's Control Products Act (1974), amended (1994).
- Plant Protection Bill of Sudan (2001, 2012).

Chapter 6

Institutional Frameworks and Related Practices for Conservation and Sustainable Use

The Higher Council for Environment and National Resources (HCENR) is an umbrella and coordinator for policies and strategic planning for all natural and biodiversity components in Sudan, and it supervises some projects funded by global organizations on biodiversity conservation and development and implemented in the Sudan.

Sudan is a party to the Convention on Biological Diversity (CBD), shouldering the responsibility of developing and updating the country's national biodiversity strategies and action plans for conservation and sustainable use of biological diversity since early 2000s. These NBSAPs provided the framework for taking actions by the different stakeholders in biodiversity, including the people themselves, for achieving the three objectives of the CBD, namely conservation of biodiversity, sustainable use of its components, and fair and equitable sharing of benefits arising out of their use. However, Sudan has a number of various institutions and official bodies involved in implementing actions for the conservation and sustainable use of different biodiversity components across the different sectors and ecosystems, as described below.

6.1 Cultivated Plant Agrobiodiversity

The Plant Genetic Resources (PGR) Programme in the Agricultural Research Corporation (ARC) of Sudan plays a significant role for the conservation of the PGRFA in the country. The programme is being run by the Agricultural Plant Genetic Resources Conservation and Research Centre (APGRC), which has been equipped with central genebank facilities in Wad Medani for long term conservation of local genetic resources of cultivated crop species. Human technical cadre of researchers and technicians supervise, guide and execute different tasks related to collection, conservation, enhancement of use and documentation of the targeted genetic resources. Historically, the APGRC has been assigned the responsibility of conserving and enhancing the utilization of the genetic resources for different crops since 1995. Since then, a total of more than 16000 accessions have been acquired for conservation of more than 30 crop species, on top of them are crops such as sorghum, pearl millet, okra, sesame and different cucurbits. A number of these crops are among those covered by the MLS established by the ITPGRFA.

A set-back for the efforts to conserve the PGRFA in Sudan by the APGRC has happened in December 2023 due to the spread of the current civil war in the country to Wad Medani city, where the APGRC and the central seed genebank is located. Unfortunately, all facilities of the APGRC were exposed to looting and damage since then. All deep freezers used for seed storage were looted. The facilities for data documentation and management were also looted or damaged, including servers and computers, blocking access to the genebank documentation system. As a result, a considerable number of the seed samples of the accessions held by the genebank might have been lost or deteriorated.

A latest assessment of the APGRC was conducted by a technical review team visited the APGRC from the Global Crop Diversity Trust in November 2022 in preparation for involvement of the APGRC in the current Biodiversity for Opportunities, Livelihoods and Development Project funded by the Norwegian government. Findings of such review could be

summarised in the following as a latest data baseline on the APGRC prior to war erupted in Sudan since April 2023.

The germplasm collection of PGRFA held by the APGRC has been growing since mid-1990s to become more than 16000 accessions of different crops conserved in seed banks for seed propagated crops, as well as field genebanks for banana and date palm. About three-quarters of the accessions conserved are of crops included in *Annex I* of the ITPGRFA covering those under the MLS. The two main cereal crops in Sudan, sorghum and pearl millet account for 83% of *Annex I* crops. The *non-Annex I* crops are mainly vegetables and oil crops, and five of these crops have more than 500 accessions conserved per each. Overall, 57% of the *non-Annex I* accessions are from okra, pumpkin, snake melon, sweet melon, watermelon, sesame, and groundnuts. In general, the composition of the collections would be described as 75% of accessions from seven crops, six of these have origins in Sudan. The other 25% of the collections consist of accessions from 62 crops of importance to Sudan agricultural systems but many of these have only a small representation of diversity.

The accessions conserved at APGRC are unique with 89% landraces overall but for most of the crops the collections are 100% local landraces. A number of crops have a small proportion of breeding material except wheat, where 93% of the accessions are breeding material, cotton has 88% breeding material, and tomato has 26% breeding material. Overall, there are few cultivars or released varieties currently being conserved at APGRC.

Crop wild relatives account for 5.5% of the accessions conserved by the APGRC, and there are only limited numbers of wild accessions for sorghum, pearl millet, cowpeas, eggplant, okra, sesame, watermelon, melon and jewsmallow. There are also several accessions of range plants that are a complex of native wild species. Generally, the crop wild relatives are underrepresented as is the long-term conservation of cultivars or released varieties for the major crops.

There is some level of conservation of crop diversity originating from Sudan within the global system when assessed based on a comparison of the number of accessions conserved at APGRC with those conserved at other genebanks globally. This comparison was based on the country of origin reported to FAO-WIEWS, according to which sorghum and pearl millet had the highest number of accessions conserved by others globally. This result is not unexpected given the history of collaborative collection missions on these two crops by ARC with ICRISAT and USDA. The other crops with a significant number of accessions originating from Sudan are rice with IRRI (18 accessions) and faba bean with ICARDA. For barley that has originated from Sudan, there are more accessions conserved globally than at APGRC. Generally, for *Annex I* crops, there are 4 to 6 institutes in the global system that also conserve accessions originating from Sudan. The exceptions are for *Cajanus*, and *Beta* where the only accessions conserved globally are found at APGRC.

Seed samples of some of the accessions held by the APGRC are duplicated inside or outside the country for safety purposes. The safe duplication inside the country is made in the sub-national genebank unit in Elobeid in North Kordofan state, where accessions collected from Kordofan and Darfur regions in western Sudan are duplicated as active collections (more than 5000 accessions so far), while some of the accessions collected from other regions are duplicated for safety only in a black box system (more than 2000 accessions so far). On the other hand, more than 4500 accessions are duplicated outside the country in the Svalbard Global Seed Vault (SGSV) in

Norway (latest information as of February 2025). A number of accessions are also duplicated in other genebanks outside the country such as the Millenium Seed Bank in U. K., ICRISAT in India, IITA in Nigeria and USDA in USA. Around 65% of the accessions held by the APGRC have at least been preliminary characterized so far using standard descriptor lists.

There is no national openly accessible documentation system for the plant genetic resources for food and agriculture (PGRFA) in Sudan. Information on PGRFA holdings is only available with institutes and individuals holding such materials. However, the APGRC programme in the ARC is engaged in systematic documentation of the PGRFA under conservation using accession-level systems. The APGRC has records on the material conserved for different information categories including passport, management and characterization and evaluation data. The data available are sometimes incomplete for some accessions due to gaps created by factors such as incomplete documentation while collecting, or incomplete data handed when germplasm material is provided by collectors from outside the PGR programme. As up to December 2025 APGRC has been using a genebank documentation system operated through a genebank data management tool called SESTO for documenting and accessing the passport, management and characterization data. SESTO is a genebank data management tool, developed by the former Nordic Gene Bank (now the Nordic Genetic Resource Centre) with the purpose to document the genetic variation in Nordic material from plant species used in agriculture and horticulture. It is worth mentioning here that the SESTO has been adopted as a tool for PGR documentation and data management by the Eastern Africa Plant Genetic Resources Network (EAPGREN) of which Sudan was a member among eight countries. To facilitate access to data on Sudanese PGRFA accessions held, the APGRC joined the Genesys platform and become among providers of data on this global PGR data platform since 2017.

6.2 Range Plant Agrobiodiversity

There are a number of institutional governmental, educational and research bodies concerning with range plants in the country, including the following:

- Range and Pasture General Directorate (RPGD), which is one of the administrations of the Ministry of Animal Resources, with 17 state head offices and more than 36 branch offices.
- Department of Rangeland Science, College of Forestry and Range Science, Sudan University of Science and Technology.
- National range and pasture research units in research institutions, contributing to rangeland biodiversity conservation and use in terms of conducting research on rangeland plants, habitats and other natural vegetation aspects.

6.3 Animal Agrobiodiversity

Conservation activities have become more widespread recently. There are major gaps and weaknesses in the institutional frameworks for animal genetic resources (AnGR) management as there are also several positive developments in recent years, including the establishment of specifically AnGR-focused institutional structures and policy instruments – in particular the appointment of National Coordinators for the Management of AnGR and the development of national strategies and action plans for AnGR. The establishment of regional and subregional focal

points for AnGR over recent years has strengthened cooperation and capacity to undertake AnGR management actions at supranational level. However, major gaps remain, both in *in situ* and in *ex situ* conservation programmes in Sudan. Many breeds remain untargeted or inadequately covered by conservation programmes. The risk status of the majority of breeds is unknown. Detailed assessments of threats to specific breeds are rare, which constrains the development of effective conservation programmes and the prioritization of breeds for inclusion in such programmes. There is a need for national early-warning and response systems that can rapidly identify threatened breeds and allow quick and well-defined action to be taken.

Setting up AnGR gene banks is a requirement. However, inadequate funding, infrastructure and technical skills are obstacles to the establishment or further development of such facilities. Establishing gene banks at subregional or regional level is a potential option. However, this would require agreements on rules for the transfer of genetic material and the identification of locations considered “safe” by all parties.

6.4 Forest Biodiversity

One of the missions of the Forests National Corporation (FNC) is to develop public policies, rules and methods for safeguarding and protection of the forest resources. The FNC also has the role of technical supervision of the forests and raising awareness about forest issues, as well as undertaking studies and planning of forests. In addition, it is responsible for afforestation and reforestation projects including developing gum arabic and other small forest products, and for implementing the policy objective of increasing the area of reserved forests to at least 20% of the country’s area.

The forest service of the Sudan, in accordance with the forest policies of 1932 and 1986, was required to provide forest products needed by the population. This was carried out by reservation, plantation and management of the forests in all parts of the country with due consideration to participation of local communities as far as possible. Whereas the people traditionally obtained their requirements of wood and other products from the natural forests, the rate of tree planting inside forest reserves was far below the satisfaction of people's needs.

Conservation of forest resources is enshrined in national and state laws, including the conservation of genetic diversity at the ecosystem and species levels. Most forest genetic resources are conserved in national parks, forest reserves, natural stands and plantations. The felling of endangered tree species inside protected areas is prohibited. *In-situ* conservation means conservation of forest species in their own home by providing protection, including through:

- Forest reserves,
- Selected delineated seed sources, and
- Game reserves.

The followings have been achieved in this regard:

- i. An area of 12.3 million ha by the end of 2016 was conserved as forest reserves, which represent 4.54% of the total forests, consisting of public, institutional, community, private and wildlife protected areas and national parks.
- ii. About 85 seed sources of the most important and endangered species were selected and marked for annual collection of forest seeds.

- iii. There are 3 game reserves in Sudan, which contain several forest species.

The National Tree Seed Centres in Sudan (NTSC) have the major role in establishment and monitoring of forest germplasm storage at its main buildings in Soba through the followings:

- i. Room temperature seed store for one to two years as short-term seed storage.
- ii. Cold store at 1-5 degrees centigrade for 5 to 10 years as mid-term seed storage.
- iii. Deep freezing or gene bank at -18 degrees centigrade for long term seed conservation.

Moreover, there has been one main Botanic garden in Khartoum, but it is drastically negatively affected by the current war erupted since April 2023.

The herbarium in the plant section of the Forestry Research Centre is the biggest and richest in Sudan. It contains over 8000 forest and plant species of the country. The second rich herbarium is the one of the Department of Botany in the Faculty of Science, University of Khartoum. There are some small incomplete herbaria here and there in some universities and research centres. Status of such seed stores and herbaria is not well known after 2023 due to the war erupted in Khartoum since 2023.

In addition to *in situ conservation*, genetic material from Sudan's forests is stored off-site in conditions that will allow for future regeneration. Radom National Park is in the high-rainfall savannah ecological zone. No recent scientific survey has been conducted in this park. The last survey was carried out by the Wildlife Research Centre (WRC) and UNESCO's Man and the Biosphere Programme in 1995. It revealed the presence of many endangered tree species such as *Anogeissus leiocarpus*, *Khaya senegalensis* and *Isoberlinia doka*.

Acacia senegal is one of Sudan's most important tree species because of its use in the production of gum arabic. Its seeds have been a focus of a major genetic conservation effort with local knowledge being used to select consistently high-yielding and healthy trees in the wild and in plantations. Care is also needed towards other gum-producing trees such as *Acacia seyal*, *Sterculia setigera* and *Boswellia papyrifera*.

Most of Sudan's forest reserves are owned by the government and cover each of the country's five ecological zones (Table 6.1). They are surveyed, demarcated, mapped and registered in the Sudan Gazette (the official government periodical publication for legal news and notes). As well as conservation of forest resources, the objective of forest reserves is for sustainable management, based on the understanding that felling programme should take place inside reserves because their protective status allows regeneration and reforestation.

Table 6.1. Total Reserved Forests in Sudan till 2017

State	Total Number of Forests	Total Area (Feddans)	Ecosystem-Dominant Tree Association	Main Produce
Gezira	33	12423	Riverine-Nile. <i>A. nilotica</i>	Fuelwood Building poles
Sennar	142	75121	Riverine-Nile. <i>A. nilotica</i>	Sawn timber Fuelwood
Blue Nile	16	8340	Riverine-Nile. <i>A. nilotica</i>	Sawn timber Fuelwood

State	Total Number of Forests	Total Area (Feddans)	Ecosystem-Dominant Tree Association	Main Produce
Gedaref	75	83855	Riverine-Nile. <i>A. nilotica</i>	Sawn timber Fuelwood
White Nile	27	89202	Riverine-Nile. <i>A. nilotica</i>	Fuelwood- Building Poles
North Kordofan	2	44460	Watershed (El Ain Water Reservoir)- <i>A. nilotica</i> , <i>A. mellifera</i> , <i>A. seyal</i>	Protection
Gedaref	2	124290	<i>Acacia-Balanites</i> Association	Fuelwood- Range
Gezira	42	4025	Irrigated Plantation- <i>Eucalyptus</i>	Building Poles- Fuelwood
Kassala (New Halfa)	----	3443	Irrigated Plantation- <i>Eucalyptus</i>	Building Poles- Fuelwood
South Darfur (Jebel Marra)	2	1410	Watershed-Exotics: <i>Eucalyptus</i> - <i>Cupressus sp.</i>	Protection- Building Poles
Total Riverine and Watershed Forests			446 569	
Total Other Public Forest Reserves			10 915 635	
Total Public Forest Estate			11 362 204	
Total Institutional Forests			13 723	
Total Community Forests			26 056	
Total Private Forests			59 770	
Total Wildlife Parks			17 740 800	
Total Forest Estate and Wildlife Parks			29 202 555	
Total Surface Area			448 868 000	
% Forest Estate and Wildlife			6.51	
% Wildlife National Parks			3.95	
% Forest Public Forest Estate			2.53	
% Riverine and Watershed Estate			0.10	
% Community Forests			0.006	
% Private Forests			0.01	

Plantation's area constitutes small fraction compared to natural forest reserves and forests outside reserves. Plantations include both indigenous and exotic types. The Forests National Corporation (FNC) launched a number of afforestation programmes to plant fast-growing trees (Tables 6.2 and 6.3). The largest plantations (52227 ha.) are made of *Acacia senegal* raised to compensate for areas damaged by fire, illicit felling and salinity. These are followed by *Acacia nilotica* (18200 ha.) planted and managed on rotation to produce millable timber, building poles and fuel wood. Teak, *Tectona grandis*, (10130 ha.) is in third position, while *Eucalypts spp.* comes last among the most important planted stock. Various other species including *Khaya spp.*, *Cupressus spp.*,

Oxytenanthera abyssinica, *Acacia seyal*, *Prosopis spp.* and *Acacia mellifera* are planted on small scale.

Two projects have been implemented using the participatory approach, which are namely Nabag Forest-Southern Kordofan state, and Revitalizing the Sudan Gum Arabic Production and Marketing Project. These projects were developed and implemented in order to adopt a participatory approach involving the community, local governments and other stakeholders at state and federal levels in the natural resources rehabilitation programmes.

Socio-economic study of FNC indicated the willingness of most of the people of the area to participate in the Rehabilitation Programme of the Nabag Forest. The implemented programme, which commenced in 2004 was able to involve the local communities, using seeds and seedlings through agroforestry system, with a total rehabilitated area reaching 5900 feddans by 2011. The communities were composed of different age groups ranging between 20 and 50 years old. They were illiterate (26%) or had religious, primary and secondary education base.

Table 6.2. Afforestation inside forest reserves

Period/ Year	Area (ha.)
Up to 1990	270207
1990 / 2000	378000
2001-2005	63972
2005 - 2012	511183

Table 6.3. Planted area in community forests

Year	Total (ha)
1986 – 90	270276
1991 – 2000	519653
2000 – 2012	1622675

Other two projects of relevance have been under implementation:

- i. Landscape approach to riverine forests restoration, biodiversity conservation and livelihood improvement:
The project objective has been to restore and maintain critical ecosystem services of globally significant riverine forest landscapes along the River Nile in Sudan. 50,878 ha of riverine forest ecosystems managed to benefit biodiversity and maintain productive value (2022-2024FNC- FAO Sudan).
- ii. Boosting Restoration, Income Development Generating Ecosystem Services (BRIDGES)
Its objectives have been:
 - Catalyse action, support sustainable management and restoration of dry land forests and agro-silvo-pastoral systems in three Great Green Wall countries -

Eritrea, Mauritania and Sudan.

- Stimulating production, benefiting livelihoods and generating ecosystems goods and services

The planned restoration was of 5000 hectares during 2017-2020 (Sudan riverine forest land scape document).

Sudan boosted its forest conservation efforts in 2012 by initiating the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation, known as REDD+. In addition to reducing carbon emissions from forests, the programme aimed at improving conservation and the sustainable management of forests.

RSSA Land Use Atlas of Sudan (2000 and 2010) is available both in digital and analogue format (the raw images of 2010 are available with RSSA and FAO). Aster data (15 m) for 2006 and Landsat data (30 m) for years 2010, 2014 and 2018 are available only for three states; El Gadarif, Sinnar and Blue Nile. The data is available both in digital and analogue (hard copies) format. Satellite images with spatial resolution of 30 m and spectral resolution of Landsat 7 and Landsat 8 covering parts of Sudan are available. Land Use Atlas of Sudan for 2000 and 2010 is available both in digital and analogue format. Land cover maps of 2000 and 2010 are available for each state in Land Cover Atlas of Sudan, which was developed under the Africover Project. The Africover project was launched in 1997 and covered 10 Nile Basin and East African countries including the Sudan. The project used TM coverage and the produced maps were visually interpreted. Ground validation was limited to some areas in Western Kordofan, Southern Darfur and Red Sea.

Being a party to United Nations Framework Convention on Climate Change (UNFCCC), Sudan is implementing the REDD+ Readiness Project (R-PP) with financial support from the Forest Carbon Partnership Facility (FCPF) of the World Bank (WB) to address deforestation and forest degradation. An action Plan (AP) for Sudan's National Forest Monitoring System (SNFMS) is developed in consultation with relevant stakeholders. The goal of the SNFMS is to generate consistent and reliable data as well as periodic information to provide strategic planning. One of the main objectives of this action plan is to develop a national forest and land use web portal of information related to Sudan's land use. Land Use Change Forestry (LULUCF) sector under the SNFMS, a national database and separate web portal for the forests and land use sector was established to ensure quality, transparency and accessibility of information related to the forest and land use sector in Sudan. These web portals were linked to FNC's already established electronic Resource Management System.

A recent National Forests Inventory (NFI) in 2017 - 2018 was carried out covering almost all the states and forest types in the country. The NFI results in 2021 constitute a major step forward and add to the existing national experience on field sampling and measurements methodology. The capacity of FNC staff was strengthened on a variety of skills related to forest and land monitoring. All these elements result in a better placement of the Government of Sudan in its fight against the detrimental effects of climate change and its biodiversity protection, which still provides the source of livelihood for a large portion of Sudan's population. Results of the NFI are now available and has been archived centrally through a robust data base management system.

Forests National Corporation geoportal is Web based Geoportal to enable the HCENR to upload, share and access forests environment related data in form of maps and documents. The geoportal is based on Geonode, which is an Open Source, Content Management System (CMS) for

geospatial data. It is a web-based application and platform for developing geospatial information systems (GIS) and for deploying spatial data infrastructures (SDI). Sudan forest monitoring system Geoportal designed to build on the existing system established at FNC and other government bodies.

6.5 Wildlife Biodiversity

Wildlife leading institution in Sudan is the Wildlife Conservation Forces (WCF) under the Ministry of Interior. It represents the official and implementing instrument for wildlife administration, conservation, sustainable use, law enforcement and reporting about treaties, conventions and MOUs concerning wildlife issues in Sudan.

Wildlife Research Centre (WRC) is concerned with the scientific consultation through conducting studies and researches relating to distribution, habitats and trends of wildlife in Sudan in coordination and cooperation with the related partners including Wildlife Conservation Forces, universities and the HCENR. The outcomes of these studies assist to evaluate the status of wildlife population and help in the implementation of CITES regulations and manage sustainable use and planning.

Protected Areas in Sudan are 15, including terrestrial, inland waters and marine protected areas. (Table 6.4). They include terrestrial national parks, marine national parks, game reserves, bird sanctuaries and wildlife sanctuaries (Table 6.5).

Table 6.4. Total Protected Areas in Sudan

Protected area category	Number of protected areas	Area in Km ²	Percent from the Total area of Sudan
Terrestrial Protected Area	8	133974.20	7.1%
Inland Waters Protected Area	5	34,900.09	1.85%
Marine and coastal Protected Area	2	2845	0.15%
Total	15	171719.29	9.10

Source: Baseline data gathered during the preparation process for the 7th National Report on Biodiversity (2025)

Table 6.5. National designations, number and names of different protected areas in Sudan

National designation	Number	Name of the Designated area
National Park	8	Dinder National Park
		Radom National Park
		Wadi Hower National Park
		Jebel Elhassania National Park
		Taya Basunda Elgalabat National Park
		Jebel Eldayir National Park
		Elgazali yg National Park
Game Reserve	2	Sabaloka Game Reserve
		Tokor Game Reserve

Marine National Park	2	Dungonab Bay and Mukkawar Island Marine National Park
		Sanganab Marine National Park
Bird Sanctuary	1	Khartoum Sunt Forest Bird Sanctuary
Wildlife Sanctuary	2	Erkawit Wildlife Sanctuary
		Erkawit - Sinkat Wildlife Sanctuary
Total	15	171719.29 Km²

Source: Baseline data gathered during the preparation process for the 7th National Report on Biodiversity (2025)

6.6 Coastal and Marine Biodiversity

The following institutions are involved in the use and management of coastal and marine resources:

- The Higher Council for the Environment and Natural Resources (HCENR) at federal level with the mandate of coordinating environmental protection and resources management. It is the technical branch body in charge of coordination, policy making and international cooperation.
- The State Council for the Environment and National Resources at Red Sea state government level.
- Marine Fisheries Administration (MFA) at Red Sea State government level, and Red Sea Fisheries Research Station (RSFRS), which manage fisheries resources and control fishing and observe enforcement of fisheries regulations, as well as consultation on shell fisheries culture areas and any fisheries related activities.
- Institute of Marine Research (IMR) and Faculty of Marine Sciences and Fisheries (FMSF) of the Red Sea University (RSU), which are responsible for regular monitoring of coastal and marine environments, coastal and marine research, training and provision of scientific advice on environmental and sustainable management matters.
- Sea Ports Corporation (SPC), which is responsible for managing the ports of Port Sudan, Suakin, Haydob and Oseif. It is also responsible for marine operations and Maritime Administration Directorate.
- NGOs, which are active in the Red Sea state working in various social activities including rehabilitation, health, nutrition and education. This is in addition to environmental conservation, management and governing regulations.
- Sudan as a country is a member in the Regional Organization for the Protection of Environment of the Red Sea and Gulf of Aden (PERSGA), and is a party to a number of principal international and regional conventions.

7.7 Inland Waters and Wetlands Biodiversity

Equally, and as stated in the previous chapter, the inland waters and wetlands of Sudan are not privileged by institutional frameworks solely dedicated to them. The following institutions are responsible for the protection and management of wildlife, marine and inland waters and wetlands ecosystems:

- Up to 2018 the Ministry of Environment, Natural Resources and Physical Development (MENRPD) was the federal authority custodial of the natural resources and environment in the Sudan. In September 2019, the MENRPD was dissolved and replaced by the

National Council for Environment. In April 2020 the Environment Protection Act of 2001 was amended and a new Higher Council of Environment and Natural Resources (HCENR) was established.

- The Ministry of Electricity and Water Resources.
- Ministry of Animal Resources, Fisheries and Rangelands, under which the Wildlife Research Centre and Fisheries Administration operate.

The country has delineated and declared several protected areas. Within the 15 protected areas distributed in six states, seven of them are with significant inland waters components as shown in Table 6.6.

Academic and research institutes in the Sudan have been playing a role within the realm of conserving and sustainably utilizing the country's natural resources. Few examples in the realm of or related to inland waters and wetlands are highlighted below:

- In 1979 the University of Khartoum established the Institute of Environmental Studies (IES) to offer an M.Sc. degree in Environmental Studies. The IES has defined four areas for research and training. One of them is the Freshwater Ecosystems Management. Within this unit, the IES has conducted research in important inland waters and wetlands such as the White Nile, Blue Nile and River Nile, the Dinder National Park, Jebel Marra Volcanic lakes, Dariba lake in Medoub mountains and in some saline oasis. The IES also coordinated efforts to include environmental dimension in Sudanese schools' curricula.
- The Faculty of Engineering, University of Khartoum (U. of K.), has established a higher degree in Integrated Water Resources Management (IWRM).
- Sudan University for Science and Technology via its UNESCO-ISESCO Chair for Women in Science and Technology, organized a scientific workshop in March 2022 titled "**Climate Change and Environmental Adaptation and its Impact on Empowering Women in Natural Reserves**". The workshop was within the framework of the project to strengthen the systems of protected areas and integrated management of ecosystems in Sudan.
- The Wildlife Research Centre of the Federal Ministry of Animal Resources and Fisheries, has been conducting research in the wildlife and their habitats in Sudan. Examples are the surveys conducted in the Nuba Mountains in Kordofan by the Wildlife Research Centre (WRC) and the Wildlife Conservation Forces during 2008–2010. Their research in Dinder National Park has been going on for decades.

Table 6.6. Protected areas with significant inland waters component

Protected area	State	Year	Ecosystem
Khartoum Bird Sanctuary	Khartoum	1930	Semi-desert
Sabaloga	River Nile	1939	Semi-desert
Dinder National Park	Sennar	1936	Low rainfall woodland savannah
Wadi Hawar National Park	Northern Darfur	2001	Desert

Radom National Park	Southern Darfur	1980	High rainfall woodland savannah
Jebel Al Dair National Park	Northern Kordofan	2010	Low rainfall woodland savannah

6.8 Insect Biodiversity

Main institutes dealing with matters related to insect biodiversity include the Plant Protection Directorate (PPD) of the Ministry of Agriculture, entomology sections in universities, and entomology research bodies in research institutions, including the insect taxonomy unit in the ARC.

Part II

Strategy and Action Plan

Chapter 7

National Biodiversity Strategy

This National Biodiversity Strategy and Action Plan (NBSAP) of Sudan for the years from 2025 to 2030 has been developed in compliance with the Sudan's obligation as a party to the Convention on Biological Diversity (CBD) since 1995. It is a result of wide consultation processes continued for months during the years 2024 and 2025, involving different stakeholders, and in alignment with the Kuming-Montreal Global Biodiversity Framework (KMGBF) adopted on December 2022 by the 15th Conference of Parties (COP) to the Convention on Biodiversity (CBD).

This proposed NBSAP is based on three strategic pillars, which are the national vision, national mission and national goals.

7.1 National Vision

Contributing to a world of living in harmony with nature, where “By 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people”

7.2 National Mission

To take urgent actions to halt and reverse biodiversity loss in Sudan contributing to put nature on a path to recovery for the benefit of the Sudanese people, the country and the planet, by conserving and sustainably using biodiversity and ensuring the fair and equitable sharing of benefits arising from the use of its genetic resources, while providing the necessary means of implementation.

7.3 National Goals

Four national goals are set as following:

Goal A:

The integrity, connectivity and resilience of all ecosystems in Sudan are maintained, enhanced, or restored; Human induced extinction rate and risk of known threatened species are reduced, and the abundance of native wild species is increased; The genetic diversity within populations of wild and domesticated species, is maintained, safeguarding their adaptive potential.

Goal B:

Biodiversity in Sudan is sustainably used and managed, and nature's contributions to people, including ecosystem functions and services, are valued, maintained and enhanced, with those currently in decline being restored.

Goal C:

The monetary and non-monetary benefits from the utilization of Sudanese genetic resources, and digital sequence information on genetic resources, and of traditional knowledge associated with such genetic resources, as applicable, are ensured to be shared fairly and equitably, while ensuring traditional knowledge associated with genetic resources is appropriately protected, thereby contributing to the conservation and sustainable use of biodiversity, in accordance with internationally agreed access and benefit sharing instruments and national legislation.

Goal D:

Adequate means of implementation, including financial resources, capacity-building, technical and scientific cooperation, and access to and transfer of technology to fully implement the NBSAP are secured from different domestic and foreign sources, and aligning financial flows with the vision and mission of the NBSAP.

Chapter 8

National Biodiversity Action Plan

The national biodiversity action plan is set for implementation in Sudan during 2025-2030. It is composed of the following:

- National targets aligning with the KMGBF global targets.
- Component targets dealing with targets specific with the following biodiversity components and related aspects:
 - i. Cultivated Plant Agrobiodiversity.
 - ii. Range Plant and Animal Agrobiodiversity.
 - iii. Forest Biodiversity.
 - iv. Wildlife Biodiversity.
 - v. Marine Biodiversity.
 - vi. Inland Waters and Wetlands Biodiversity.
 - vii. Insect and Microorganism Biodiversity.
 - viii. Access and Benefit Sharing Aspects related to Biodiversity.
 - ix. Pollution Aspects related to Biodiversity.
 - x. Climate Change Impacts on Biodiversity.
 - xi. Biotechnology and Biosafety Aspects related to Biodiversity.
 - xii. Health Aspects of relevance to Biodiversity.
- Proposed actions to achieve the different national and component targets.

8.1 National Targets

The following are the set national targets aligning with the corresponding KMGBF targets to be realized in Sudan during the period from 2025 up to 2030:

National Target 1

By 2030, the rate of loss of all natural habitats in Sudan is brought down by at least 25 percent, and degradation and fragmentation are significantly reduced through participatory, integrated and biodiversity inclusive spatial planning, and/or effective management processes, while respecting the rights of indigenous peoples and local communities.

National Target 2

Ensure that, by 2030, at least 10% of degraded terrestrial, inland waters and wetlands, coastal and marine ecosystems in Sudan that provide essential services, including services related to water, and contribute to health, livelihoods, wellbeing and climate, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

National Target 3

Ensure by 2030, that at least 15 per cent of terrestrial, inland waters and wetlands and coastal and marine areas in Sudan, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area based conservation measures, and integrated into the wider landscapes and seascapes, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, and recognizing

and respecting the rights of indigenous peoples and local communities, including over their traditional territories.

National Target 4

Ensure by 2030, that urgent management actions are taken to prevent the extinction of known threatened species, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species, including cultivated plants and domesticated animals, and to improve and sustain their conservation status, particularly of those most in decline, including through *in-situ* and *ex-situ* conservation practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence.

National Target 5

Ensure that the use, harvesting and trade of wild species in Sudan is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.

National Target 6

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services in Sudan by identifying and prioritizing their pathways, controlling or eradicating the priority species, and putting in place measures to manage pathways to prevent their introduction and establishment, and reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 20 per cent by 2030.

National Target 7

By 2030, pollution, including from excess nutrients, pesticides and plastic, has been brought to levels that are not harmful to biodiversity and ecosystem functions and services, by reducing to half excess nutrients lost to environment, and risks from pesticides and other chemicals, through more efficient nutrient cycling and use, and integrated pest management, and working towards eliminating plastic pollution.

National Target 8

Minimize the impact of climate change and ocean acidification on biodiversity in Sudan, including the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems, and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, so as to maintain their integrity and functioning, and enhance the contribution of biodiversity to carbon stocks, through conservation and restoration.

National Target 9

By 2030, at the latest, national and state governments in Sudan, business and stakeholders at all levels have taken steps to achieve or have implemented plans to ensure sustainable use of wild species, and have kept the impacts of use of natural resources well within safe ecological limits, while protecting and encouraging customary sustainable use by indigenous peoples and local communities.

National Target 10

Ensure, by 2030, that areas under agriculture, aquaculture, fisheries and forestry in Sudan are managed sustainably, through the sustainable use of biodiversity, and biodiversity-friendly practices, contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services.

National Target 11

Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.

National Target 12

Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas in Sudan sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services.

National Target 13

Take effective legal, policy, administrative and capacity building measures at all levels in Sudan, to fully implement the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, and other international instruments of relevance, in order to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources originating from Sudan, and from digital sequence information on such genetic resources, as well as traditional knowledge associated with these genetic resources, and facilitating appropriate access to such genetic resources, in accordance with applicable international access and benefit sharing instruments.

National Target 14

Ensure by 2030, that biodiversity and its values have been integrated into national, state and local development and poverty reduction strategies, planning and developmental processes, strategic environmental assessments, and environmental impact assessments, and are being incorporated into national accounting, as appropriate, and reporting systems.

National Target 15

Take legal, administrative or policy measures to encourage and enable business in Sudan, and in particular to ensure that large and transnational companies and financial institutions:

- a. Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains and portfolios;
- b. Provide information needed to consumers to promote sustainable consumption patterns;
- c. Report on compliance with access and benefit-sharing regulations and measures, as applicable;

in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production.

National Target 16

Ensure that by 2030, the national and state governments, business and stakeholders at all levels in Sudan have taken steps to achieve or have implemented plans for sustainable consumption, and people are encouraged in the meantime to make sustainable consumption choices, and to reduce waste, including by improving education and raising awareness on alternatives, in order to keep the impacts of use of natural resources well within safe ecological limits.

National Target 17

Establish, strengthen capacity for, and implement in Sudan biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity, and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention.

National Target 18

Ensure that, by 2030 at the latest, incentives, including subsidies, harmful to biodiversity are identified, eliminated, phased out or reformed, starting with the most harmful, in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socioeconomic conditions.

National Target 19

Substantially increase and mobilize financial resources for effectively implementing the National Biodiversity Strategy and Action Plan of Sudan from all sources, such as from domestic, international, public and private resources, including by significantly increasing domestic resource mobilization, facilitated by the preparation and implementation of a national biodiversity finance plan or similar instruments according to national needs, priorities and circumstances, while enhancing the effectiveness, efficiency and transparency of resource provision and use.

National Target 20

Improvement of the knowledge and science base on the biodiversity in Sudan, and information sharing mechanisms, through capacity building and development, access to and transfer of technology, access to innovations, technical and scientific cooperation, joint technology development and joint scientific research programmes for the conservation and sustainable use of biodiversity.

National Target 21

Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity in Sudan, and to strengthen communication, awareness raising, education, monitoring, research and knowledge management and, also in this context, the traditional knowledge, innovations and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, and should only be accessed with their free, prior and informed consent in accordance with national legislation.

National Target 22

Ensure the full and effective participation of indigenous peoples and local communities in Sudan, at all relevant levels, and their access to justice and information related to biodiversity, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as women and girls, children and youth, and persons with disabilities, and ensure the full protection of environmental human rights defenders.

National Target 23

Ensure gender equality in the implementation of the NBSAP in Sudan through a gender responsive approach, where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity.

8.2 Component Targets and Actions

A number of actions are set to realize different component targets, that are specific for each of the biodiversity components or related aspects, under each of the 22 national targets, from target 1 to target 22. Following are the component targets and the outlines of these actions in terms of the content, timeframe, spatial and geographical extent for implementation, estimated budget, and the main implementor responsible for implementation and reporting on progress, under each of the components and component targets. More details are given in *Appendix 1*, including the proposed actions for each component, categorized under each of the national targets, with information on the indicators to track the progress of the implementation, as well as information on the implementors, including the collaborators. However, the national target 23, which is dealing with the ensuring of gender equality in the implementation of the NBSAP, is treated as a general cross cutting target with one proposed action on developing of a national gender plan of action for biodiversity, as referred to in *Appendix 1*.

Following are the component targets set under each of the biodiversity components and related aspects, with outlines of the specific actions set to realise each of these targets:

8.2.1 Cultivated Plant Agrobiodiversity

The component targets and the actions set for the component of the cultivated plant agrobiodiversity are as following:

i. Component target aligning with national target 4:

Conservation of Sudanese Plant Genetic Resources for Food and Agriculture (PGRFA) through different measures, including building necessary capacities, and development and implementation of a national strategic action plan for the conservation of PGRFA in Sudan, by 2027 at the latest.

Action 1

Initiation of activities for *in-situ* and on-farm conservation of plant genetic resources for food and agriculture in close collaboration with local farmers and communities, through establishment of community gene banks.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Agricultural Plant Genetic Resources Conservation and Research Centre (APGRC) of the Agricultural Research Corporation.

Action 2

Strengthening, rehabilitation and provision of necessary physical, human and financial capacities, as well as building necessary policy, legal and institutional instruments for conservation and sustainable use of PGRFA.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: APGRC.

Action 3

Conduct and participate in training and human capacity building activities on areas of relevance to conservation and sustainable use of PGRFA, including plant identification, population biology, ethno-botany, use of geographical information systems (GIS), and molecular tools.

Time frame: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: APGRC.

Action 4

Collection and re-collection of PGRFA from all over the country to fill taxonomic and geographical gaps, as well as the gaps resulting in the germplasm holdings of the APGRC consequent to the current war.

Time frame: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: APGRC.

Action 5

Repatriation of Sudanese PGRFA conserved abroad in international research centres such as those belonging to the Consultative Group on International Agricultural Research (CGIAR).

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 30000.

Body responsible for implementation and reporting: APGRC.

Action 6

Take necessary measures for safe duplication of accessions held by the APGRC inside and outside the country.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: APGRC.

Action 7

Restoration of traditional varieties back into war and disaster-affected areas as in Darfur, Kordofan and Blue Nile states.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: APGRC.

Action 8

Conduct research on crop genetic diversity to determine the level of genetic diversity in order to develop plans for conservation and management and enhance sustainable use.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: APGRC.

Action 9

Carry out well-coordinated comprehensive surveys/exploration and assessments all over the country for all field and horticultural crops.

Timeframe: 2027 - 2030

Geographical coverage/level: country-wide.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: Ministry of Agriculture.

ii. Component target aligning with national target 6:

Eliminate, minimize, reduce, and / or mitigate the impact of invasive alien species (IAS) that affecting the fields of cultivated crops by identifying and managing pathways of their introduction, preventing the introduction and establishment of priority invasive alien species.

Action 1

Conduct awareness raising activities among different stakeholders on the issue of IAS and their impacts on cultivated plant agrobiodiversity.

Time frame: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Ministry of Agriculture (Department of Agricultural Extension).

Action 2

Conduct a study on IAS and their impacts on plant agrobiodiversity, and evaluate their economic, social and environmental impacts.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Agricultural Research Corporation.

Action 3

Empower the current plant quarantine authority by strengthening quarantine capacities and measures such as borders control facilities.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Ministry of Agriculture (Plant Protection Directorate).

Action 4

Produce an inventory of invasive alien species.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 10000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 5

Developing participatory projects/programmes targeting priority IAS species for elimination and eradication.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 50000

Body responsible for implementation and reporting: Ministry of Agriculture.

iii. Component target aligning with national target 7:

Reduce the overall risks from pesticides and highly hazardous chemicals on cultivated plant agrobiodiversity, including through integrated pest management, based on science, taking into account food security and livelihoods.

Action 1

Conduct awareness raising activities among farmers about the risks associated with excess use of pesticides on plant diversity through different means including farmers schools.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 30000.

Body responsible for implementation and reporting: Ministry of Agriculture (Department of Agricultural Extension).

Action 2

Conduct a study on the effect of excess use of pesticides on agrobiodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: Agricultural Research Corporation (ARC).

Action 3

Development of project proposals on using integrated pest management to reduce the negative impacts of chemical uses on plant agrobiodiversity with direct participation of farmers.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 10000.

Body responsible for implementation and reporting: ARC.

Action 4

Establishment of agro-chemicals committees for inspection and monitoring of the marketing processes of chemical pesticides and fertilizers, and inspecting their methods of spraying and storage.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 10000.

Body responsible for implementation and reporting: Ministry of Agriculture.

iv. Component target aligning with national target 8:

Minimize the impact of climate change on agrobiodiversity and increase its resilience through scientific research and breeding using PGRFA, and mitigation and adaptation measures for agricultural crops.

Action 1

Development of one national harmonized programme addressing the issues of climate change impacts on biodiversity conservation, management and use.

Time frame: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: HCENR.

Action 2

Conduct research and breeding programmes addressing adaptation to climate change using PGRFA, such as breeding for resistance to biotic and abiotic stresses.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Agricultural Research Corporation (ARC).

v. Component target aligning with national target 9:

Ensure sustainable use, management and conservation of crop wild relatives (CWR).

Action 1

Conduct germplasm collection missions targeting CWR from all over the country for *ex situ* conservation.

Time frame: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: APGRC.

Action 2

Explore the potential of CWR through research on identification of valuable traits to be used in breeding programmes in order to enhance their utilization.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: APGRC.

Action 3

Documentation of information on CWR and associated indigenous knowledge.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: APGRC.

vi. Component target aligning with national target 10:

Sustainable management and development of agricultural sector in a manner ensuring *in-situ* and on-farm conservation of plant agrobiodiversity as well as enhancing eco- and organic farming, and participation of local communities in related processes and activities, by 2030.

Action 1

Development of agricultural policy that is based on the sustainability of resources.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 2

Identification of appropriate farmers' varieties/landraces for multiplication and/or developing new breeding populations to incorporate specific traits into locally adapted materials with farmers participation.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: APGRC.

Action 3

Extending formal and sustainable agricultural extension programmes into the rain-fed sector.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 4

Conduct and strengthening research on the problems of shifting cultivation, crop rotation in the traditional farming systems in order to improve such systems for sustainable use of agricultural biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: ARC.

Action 5

Establish an early warning system to predict, identify and control potential sources of adverse impacts on agrobiodiversity

Timeframe: 2026 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: Ministry of Agriculture.

vii. Component target aligning with national target 13:

By 2030, issuance and implementation of a national legislation on plant genetic resources, with establishment of necessary institutional set-ups for regulating the access to plant agrobiodiversity and related indigenous traditional knowledge on the basis of fair and equitable sharing of benefits arising from the utilization of genetic resources and from digital sequence information on genetic resources, with the full consideration of farmers' and local community rights in consistence with

the international instruments of relevance such as the CBD, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the GBF.

Action 1

Building capacity, human and institutional, for regulating access to plant genetic resources and digital sequence information, and sharing of benefits arising from their utilization with necessary consideration to farmers' and local community rights in consistence with the international instruments of relevance such as the CBD and the ITPGRFA.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: APGRC.

Action 2

The official endorsement of the existing proposed national PGR legislation by the legislative authority.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 3

Approval of the already proposed national legislation for protection of plant varieties and breeder's rights with necessary harmonization with the national and international instruments on the PGRFA.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 4

Conduct awareness raising activities on access to plant genetic resources and sharing of benefits arising from utilization among concerned stakeholders.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: APGRC.

viii. Component target aligning with national target 14:

By 2030, at the latest, agrobiodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes, and are being incorporated into national accounting, as appropriate, and reporting systems.

Action 1

Development and adoption of a national policy and strategic action plan for the conservation and sustainable use of cultivated plant agrobiodiversity as part of the national policies and strategies for economic and social development.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: APGRC.

Action 2

Train civil servants on transforming plant agrobiodiversity components into items of monetary value.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 30000.

Body responsible for implementation and reporting: HCENR.

Action 3

Organization of non-class activities to encourage universities to incorporate agrobiodiversity and its economic valuation in their curricula.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: Ministry of Agriculture.

ix. Component target aligning with national target 19:

Mobilization of necessary financial resources for effectively implementing the actions related to conservation and sustainable use of plant agrobiodiversity, including international, local (domestic) and private sector contributions, with participation of the local community and indigenous people, under governance of a national resources mobilization strategy or similar instruments.

Action 1

Development of project proposals to tap possible financial contributions of regional and international organizations in the implementation of different actions related to cultivated plant agrobiodiversity.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: APGRC.

Action 2

Conduct activities to encourage farmers and indigenous people for contributing to provide and managing financial resources for community plant agrobiodiversity conservation activities, including through formation of community-based bodies.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 30000.

Body responsible for implementation and reporting: HCENR.

x. Component target aligning with national target 20:

Improvement of the knowledge and science base on the genetic diversity of PGRFA, and information sharing mechanisms in order to enhance their use.

Action 1

Rehabilitation of the documentation system of the APGRC by reestablishing local database on genetic resources holdings and make it accessible through local networking, and globally through the PGR data portal "Genesys".

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: APGRC.

Action 2

Conduct training activities to enhance technical capacities on knowledge and information sharing with regional and international agrobiodiversity related institutions.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

Action 3

Conduct research on plant agrobiodiversity related issues such as characterization and evaluation of PGRFA for different desirable traits, and promote joint cooperation activities with national, regional and international institutions working in the field.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: APGRC.

Action 4

Documentation of indigenous knowledge, practices and technologies that are associated with the PGRFA, and make this information accessible after obtaining owners' prior informed consent.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: APGRC.

xi. Component target aligning with national target 21:

Promotion and strengthening of public awareness on importance, conservation and use of PGRFA, and ensure that the best available data, information and knowledge are accessible for different users.

Action 1

Establishment and operationalization of a web site for APGRC on plant agrobiodiversity related data and information.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: APGRC.

Action 2

Organize and conduct regular awareness campaigns to disseminate information, innovations, practices and any relevant plant agrobiodiversity information to different stakeholders.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Ministry of Agriculture.

8.2.2 Range Plant and Animal Agrobiodiversity

The component targets and the actions for the range plant and animal agrobiodiversity are as following:

i. Component target aligning with national target 1:

By 2030, rate of loss of natural rangelands is brought down by at least 25%.

Action 1

Establish range enclosures in identified areas, to prevent over-grazing and early grazing.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Range and Pasture General Directorate (RPGD).

Action 2

Develop awareness materials and conduct awareness activities on importance of preventing losses in rangelands.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Range and Pasture General Directorate (RPGD)..

Action 3

Conduct activities to activate the Rangeland Act (2015) for conservation, protection, and sustainable use of rangelands.

Timeframe: 2026 – 2027,

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Range and Pasture General Directorate (RPGD).

Action 4

Conduct pilot activities for using water harvesting techniques to increase soil moisture content for restoration.

Timeframe: 2027.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Range and Pasture General Directorate (RPGD).

ii. Component target aligning with national target 2:

Ensure that by 2030, at least 10 per cent of areas of degraded rangelands in Sudan are under effective restoration, in order to enhance natural range plant biodiversity and ecosystem functions and services, ecological integrity and connectivity.

Action 1

Seed broadcasting in degraded rangelands, removal of harmful and unpalatable plants, and digging of water spots along pastoral paths.

Timeframe: 2025 – 2030.

Geographical coverage/level: All states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: RPGD.

Action 2

Establishment of a system for managing the water bodies, particularly “hafirs”, in order to share the water resource management and to avoid conflicts, and at the same time to ensure the ability to sustain and maintain the “hafirs”.

Timeframe: 2028.

Geographical coverage/level: All states.

Estimated budget: US\$ 75000.

Body responsible for implementation and reporting: RPGD.

iii. Component target aligning with national target 4:

Ensure that urgent management actions are taken to halt human induced extinction of known threatened range plant species, and for recovery and conservation of threatened species, reduce extinction risk, maintain and restore the genetic diversity within and between populations of native range plants, and maintain their adaptive potential, through *in situ* and *ex situ* conservation and sustainable management practices.

Action

Collect indigenous range plant genetic resources for *ex-situ* conservation in the national gene bank.

Timeframe: 2025 – 2030,

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: APGRC - ARC.

iv. Component target aligning with national target 8:

Minimize the impact of climate change on rangeland biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, minimizing negative and fostering positive impacts of climate actions on biodiversity.

Action

Establish meteorological stations for monitoring climate and weather conditions at different rangeland sites in order to get prepared with any necessary plans and actions.

Timeframe: 2025 – 2030,

Geographical coverage/level: All states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: RPGD.

v. Component target aligning with national target 10:

By 2030, at least 25% of rangeland areas are managed sustainably, ensuring conservation of biodiversity.

Action

Conduct programmes for transplanting evergreen range species from areas, where they are well established, to deserted areas.

Time frame: 2025 – 2030,

Geographical coverage/level: All states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: RPGD.

vi. Component target aligning with national target 14:

Full integration of rangeland and farmed animals' biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic

environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors in Sudan.

Action

Development of strategic action plan(s) for conservation and sustainable use of range and animal agro-biodiversity as a tool for integrating the issue in the national development strategies and plans.

Timeframe: 2025 – 2030,

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Ministry of Animal Resources.

vii. Component target aligning to national target 16:

Make sustainable consumption choices, including by establishing supportive policy, legislative or regulatory frameworks, improving education and accurate information on alternatives, and reduce the footprint of consumption of farmed animals in an equitable manner, halving food waste, reducing overconsumption and substantially reducing waste generation.

Action

Conduct studies on rangelands capacities.

Timeframe: 2025 – 2030,

Geographical coverage/level: All states.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: RPGD.

viii. Component target aligning with national target 18:

Identify and eliminate, phase out or reform incentives, including subsidies, harmful for range plants and farmed animals' biodiversity, in a proportionate, just, fair, effective and equitable way, starting with the most harmful incentives, and scale up positive incentives for the conservation and sustainable use of biodiversity.

Action

Conduct studies on the impact of negative and positive incentives for range and animal agrobiodiversity.

Timeframe: 2025 – 2030,

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Ministry of Animal Resources.

ix. Component target aligning with national target 19:

Increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources, to conserve and enhance sustainable use of rangeland and domesticated animals' biodiversity.

Action

Develop project proposals for implementation of actions on conservation and sustainable use of range plant and animal agrobiodiversity.

Timeframe: 2025 – 2030,

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Ministry of Animal Resources.

x. Component target aligning with national target 20:

Strengthen capacity-building and development, and transfer of technology, and promote development of, and access to innovation and technical and scientific cooperation, and joint scientific research programmes for the conservation and sustainable use of range plants and farm animal biodiversity in Sudan, and strengthening scientific research and monitoring capacities.

Action

Conduct programmes for building capacity for the staff and range and animal office units.

Time frame: 2025 – 2030,

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Ministry of Animal Resources.

xi. Component target aligning to national target 21:

Ensure that the best available data, information and knowledge on biodiversity of range plants and farm animals in Sudan are accessible for decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities on range plants and animal biodiversity should only be accessed with their free, prior and informed consent, in accordance with national legislation.

Action

Carry out data collection and establish database units and information platforms for range and animal agrobiodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Ministry of Animal Resources.

8.2.3 Forest Biodiversity

The component targets and the actions for the forest biodiversity are as following:

i. Component target aligning with national target 1:

Ensure that all areas in Sudan, including forest areas, are under participatory, integrated and biodiversity inclusive spatial planning and/or effective management processes.

Action 1

Develop and implement programmes for applying sustainable land management practices such as rotational grazing, agroforestry and contour ploughing in some targeted areas.

Timeframe: 2025 – 2030.

Geographical coverage/level: Red Sea, Kassala, Northern and River Nile states.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: Forests National Corporation (FNC).

Action 2

Conduct assessment studies to identify degraded forest areas and prioritize sites for restoration.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Forests National Corporation.

ii. Component target aligning with national target 4:

Ensure urgent management actions to halt human induced extinction of known threatened forest species, and for the recovery and conservation of species, in particular threatened species, to significantly reduce extinction risk, as well as to maintain and restore the genetic diversity of forest plants using *in situ* and *ex situ* conservation approaches.

Action 1

Carry out necessary actions for registration of 10% of proposed forests as reserved forests and be reforested using mainly indigenous species such as *Acacia senegal*, *Acacia nilotica* and *Khaya senegalensis*.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 14000000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Implement *ex situ* conservation measures for critical threatened forest species.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: Forest National Corporation.

Action 3

Provide training and capacity-building for community members involved in conservation activities.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: Forest National Corporation.

Action 4

Gazette registration of identified biodiversity species reserves of forest trees.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 35000.

Body responsible for implementation and reporting: Forest National Corporation.

iii. Component target aligning with national target 6:

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on forest biodiversity and ecosystem services by identifying and managing pathways of the introduction of invasive alien species, preventing the introduction and establishment of priority invasive alien species.

Action 1

Conduct activities to eradicate invasive alien species that are already been found having adverse effects on biodiversity.

Timeframe: 2025 – 2028.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 7000000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Develop effective systems and tools for monitoring and evaluation of invasive alien species.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 700000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 3

Provide training and capacity building to local communities in a process for combating invasive alien species.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 140000.

Body responsible for implementation and reporting: Forests National Corporation.

iv. Component target aligning with national target 8:

Minimize the impact of climate change on forest biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solutions and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity.

Action 1

Conduct activities to promote the use of climate-resilient tree species and drought-tolerant crops in regions affected by climate change in reforestation and agricultural initiatives.

Timeframe: 2025 – 2028.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 8000000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Develop and implement activities on climate-smart land management practices, such as agroforestry, soil conservation, and water management techniques in regions prone to soil erosion and water scarcity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 3500000.

Body responsible for implementation and reporting: Ministry of Agriculture and Forestry.

Action 3

Establish early warning systems and community-based adaptation measures to address climate-related disasters, such as droughts and wildfires in high-risk areas for climate-related disasters.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 120000.

Body responsible for implementation and reporting: Higher Council for Civil Defence.

Action 4

Conduct necessary activities to monitor and evaluate the effectiveness of adaptation measures in enhancing ecosystem resilience and forest biodiversity conservation.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: Forests National Corporation.

v. Component target aligning with national target 10:

Ensure that areas under forestry are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices.

Action 1

Rehabilitation and establishment of forest plantations in degraded traditional rain-fed areas.

Timeframe: 2025 – 2028.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 2000000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Initiate 400 community engagement programmes, and train a substantial percentage of community members on sustainable practices.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Relevant State Government(s).

Action 3

Implement agroforestry demonstration plots to showcase sustainable land use practices combining tree planting with agriculture.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 1200000.

Body responsible for implementation and reporting: Agricultural Extension Department.

vi. Component target aligning with national target 14:

Ensure the full integration of forest biodiversity and its multiple values into national and local policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors in Sudan.

Action 1

Develop awareness materials and conduct activities to raise the awareness and interest at high policy levels in order to integrate the forest biodiversity and its values into different national strategies, policies and plans at both national and local levels.

Timeframe: 2025 – 2028.

Geographical coverage/level: National, state and local levels.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Organize activities for integration of forest biodiversity conservation agenda into the Forests National Corporation (FNC) development plans, and the systematic monitoring of the forest biodiversity conservation using the appropriate standards across all FNC operational areas.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 40000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 3

Develop legal framework(s) for ecosystem service valuation and integrate them into national and sectoral accounts.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: Forests National Corporation.

vii. Component target aligning with national target 16:

Ensure that people are encouraged and enabled to make sustainable consumption choices for forest products, including by establishing supportive policy, legislative or regulatory frameworks, improving education and access to relevant and accurate information and alternatives.

Action

Implement a national certification and labelling scheme for sustainably sourced forest products, coupled with a public awareness campaign to educate consumers about the environmental impacts of their consumption choices, and promote certified products.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 900000.

Body responsible for implementation and reporting: Forests National Corporation.

viii. Component target aligning with national target 18:

Identify by 2030, and eliminate, phase out or reform incentives, including subsidies, harmful for forest biodiversity, in a proportionate, just, fair, effective and equitable way.

Action 1

Conduct comprehensive review and assessment of all current forest-related incentives and subsidies to identify those negatively impact forest biodiversity.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 700000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Develop and start implementing a comprehensive national scheme for providing incentives and benefits to communities involved in sustainable management of forest resources, such as granting financial incentives, provision of necessary resources and tools, and infrastructure improvements.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 8000000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 3

Develop and start implementing a national scheme for providing subsidies to encourage the development and use of alternative energy sources to firewood and charcoal such as solar energy, cooking gas, hydro-energy and electricity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 1600000.

Body responsible for implementation and reporting: Ministry of Energy.

Action 4

Production and distribution of free or subsidized seedlings to encourage rural communities to establish community forests, including using indigenous tree species.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: Forests National Corporation.

ix. Component target aligning with national target 19:

Substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources, in accordance with Article 20 of the Convention, to implement the actions related to conservation and sustainable use of forest biodiversity in Sudan.

Action 1

Develop project proposals and establish partnerships with international donors and agencies to secure funding for biodiversity projects.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Develop and implement project proposals using public-private partnerships to fund and implement specific conservation activities.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 3

Launch awareness campaigns to promote private and corporate donations for biodiversity conservation.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: Forests National Corporation.

x. Component target aligning with national target 20:

Strengthen capacity-building and development, access to and transfer of technology, and promote development of and access to innovation and technical and scientific cooperation, to meet the needs for effective implementation of actions related to conservation and sustainable use of forest biodiversity in Sudan.

Action 1

Organize activities to establish partnerships with academic institutions, research organizations, and government agencies to support collaborative research and data sharing.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Forests National Corporation.

Action 2

Physical and human capacity building for conservation and sustainable use of forest genetic resources.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: Ministry of Agriculture and Forestry.

xi. Component target aligning with national target 21:

Ensure that the best available data, information and knowledge on genetic resources are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of forest biodiversity in Sudan, and to strengthen

communication, awareness-raising, education, monitoring, research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities should only be accessed with their free, prior and informed consent, in accordance with national legislation.

Action 1

Digitize herbarium and forest genetic resources collections to support research and planning

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 450000.

Body responsible for implementation and reporting: Forests Research Centre.

Action 2

Document indigenous knowledge and practices relevant to conservation and sustainable use of forest biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 7500000.

Body responsible for implementation and reporting: Forests National Corporation.

8.2.4 Wildlife Biodiversity

Component targets and actions set to realize them for conservation and sustainable use of wildlife biodiversity are as following:

i. Component target aligning with national target 1:

Ensure that all areas are under effective management processes addressing land- and sea-use change, to bring down the rate of loss of areas of high biodiversity importance, including wildlife ecosystems of high ecological integrity, by at least 25% by 2030, while respecting the rights of indigenous peoples and local communities.

Action 1

Conduct a survey on wildlife biodiversity in some states to identify the most affected areas by land and sea uses, which lead to wildlife loss.

Timeframe: 2025 – 2027.

Geographical coverage/level: Northern states, eastern states and central states.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: Wildlife Conservation Forces (WCF).

Action 2

Develop effective action plans to address the detected types of loss causes identified.

Timeframe: 2026 – 2028,

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: WCF.

Action 3

Take actions to effectively enforce the law by improving the performance of wildlife-antipoaching unit through increasing means of field work such as vehicles and radio communications.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: WFC.

Action 4

Participate in training courses outside the country on effective wildlife management for wildlife officers and non-commissioned officers.

Timeframe: 2025 – 2029.

Geographical coverage/level: National.

Estimated budget: US\$ 2000000.

Body responsible for implementation and reporting: WCF.

ii. Component target aligning with national target 3:

Ensure and enable that by 2030, at least 15 per cent of terrestrial and inland waters and wetlands areas, and of marine and coastal areas, especially areas of particular importance for wildlife biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes, while ensuring that any sustainable use is fully consistent with conservation outcomes, recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories.

Action 1

Make clear border demarcation for all wildlife reserves and reserved hunting areas and update their maps and biodiversity information.

Timeframe: 2025 – 2026.

Geographical coverage/level: Eastern states, River Nile state and South Kordofan state.

Estimated budget: US\$ 10000000.

Body responsible for implementation and reporting: Wildlife Conservation Forces (WCF).

Action 2

Establish new terrestrial and marine protected areas and reserving new wetland areas and joining Ramsar Convention sites.

Time frame: 2026 – 2030.

Geographical coverage/level: South Kordofan, White Nile, Red Sea and Blue Nile states.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: WCF.

Action 3

Establish new equipped offices for wildlife management in different localities.

Timeframe: 2026 - 2030

Geographical coverage/level: Different states.

Estimated budget: US\$ 10000000.

Body responsible for implementation and reporting: WCF.

Action 4

Develop and produce awareness materials and organize awareness raising activities to raise awareness and engagement of local communities around wildlife reserves and areas with high importance in the conservation of wildlife.

Timeframe: 2025 – 2027.

Geographical coverage/level: Some states.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: WCF.

Action 5

Develop national guidelines categorizing protected areas based on international categories of protected areas such as IUCN and RAMSAR.

Time frame: 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 10000000.

Body responsible for implementation and reporting: WCF.

Action 6

Establishment of Community-Based Natural Resource Management (CBNRM) Framework.

Timeframe: 2026-2028.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: WCF.

iii. Component target aligning with national target 4:

By 2030, the extinction of known threatened wild species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained, as well as maintain and restore the genetic diversity, including through *in situ* and *ex situ* conservation and sustainable management practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence.

Action 1

Conduct a comprehensive survey to identify all species that are exposed to extinction.

Timeframe: 2025 – 2026.

Geographical coverage/level: Some states.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: Wildlife Conservation Forces (WCF).

Action 2

Conduct activities to raise awareness of stakeholders and decision makers towards supporting wildlife conservation issues.

Timeframe: 2026 – 2027.

Geographical coverage/level: National and state levels.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: WCF.

Action 3

Translocate and restore a number of extinct large wild animals and release them into their former and suitable habitats.

Timeframe: 2028 - 2030

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: WCF.

Action 4

Establish buffer zones on the borders of protected areas to reduce human-wildlife conflict.

Timeframe: 2027 – 2030.

Geographical coverage/level: Some protected areas.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: WCF.

Action 5

Establish captive breeding centre for rare and extinct species, and a genebank unit to maintain genetic diversity.

Timeframe: 2028 – 2029.

Geographical coverage/level: National level.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: WCF.

Action 6

Develop an action plan for management of wild plant and animal species for medicinal uses, and for reducing human-wildlife conflicts and safe-coexistence

Timeframe: 2026 – 2030.

Geographical coverage/level: National level.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: WCF.

Action 7

Develop *ex-situ* wildlife conservation strategy.

Timeframe: 2026 – 2028.

Geographical coverage/level: National level.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: WCF.

Action 8

Establish model rescue and rehabilitation centres for priority wildlife species.

Timeframe: 2028 – 2030.

Geographical coverage/level: National level.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: WCF.

iv. Component target aligning with national target 5:

Ensure that the use, harvesting and trade of wildlife species in Sudan is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.

Action 1

Update / Approve wildlife law, including regulations to control harvesting and trade of wild species and setting strong punishments for both illegal trade and hunting.

Time frame: 2026.

Geographical coverage/level: National level.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: WCF.

Action 2

Develop and operationalize a national e CITES permitting and enforcement system integrated with Sudan's export platforms

Timeframe: 2026.

Geographical coverage/level: National level.

Estimated budget: US\$ 10000000.

Body responsible for implementation and reporting: WCF.

v. Component target aligning with national target 6:

By 2030, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment, especially in protected areas and wetlands.

Action 1

Conduct a study on invasive alien species affecting wild life ecosystem in protected areas.

Timeframe: 2025 – 2026.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: Wildlife Research Centre.

Action 2

Establish an invasive species control and monitoring unit in Dinder National Park.

Timeframe: 2026 – 2027.

Geographical coverage/level: Dinder National Park.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: WCF.

Action 3

Develop materials and conduct activities to promote awareness on halting invasive alien species introduction through public media and social media.

Time frame: 2025 - 2027

Geographical coverage/level: National level.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: WCF.

vi. Component target aligning with national target 7:

By 2030, reduce pollution from all sources, to levels that are not harmful to wildlife and ecosystem functions and services, by means of reducing excess nutrients lost to the environment, reducing the overall risk from pesticides through integrated pest management based on science, taking into account food security and livelihoods, and working towards eliminating plastic pollution especially in wild habitats.

Action 1

Organize periodical litter cleaning activities, especially plastic collection campaigns, in terrestrial and marine parks to reduce the existing amount of plastic litter.

Timeframe: 2025 – 2027.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Wildlife Conservation Forces (WCF).

Action 2

Disseminate litter containers in the villages of local communities in and around protected areas.

Timeframe: 2025 – 2028.

Geographical coverage/level: All National Parks.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: WCF.

Action 3

Develop materials and conduct awareness campaigns for school pupils and in public markets on the harmful effects of the use of pesticides and others on the environments of wild animals, and provide prizes in recognition for best performances.

Timeframe: 2025 - 2027

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: WCF.

vii. Component target aligning with national target 8:

By 2030, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, including through nature-based solutions and ecosystem-based approaches, while minimizing negative impacts of climate change on wildlife ecosystems, and fostering positive climate impacts, so as to maintain their integrity and functioning.

Action

Reforestation of degraded areas around protected areas, as well as planting mangrove forests to participate in reducing global warming.

Timeframe: 2025 - 2030

Geographical coverage/level: Some states.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: WCF.

viii. Component target aligning with national target 9:

Ensure that federal and state governments in Sudan, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable wildlife-based production and consumption activities, including products and services, keeping the impacts of use of wildlife resources well within safe ecological limits, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.

Action 1

Develop wildlife sustainable use policy.

Timeframe: 2025 – 2026.

Geographical coverage/level: National level.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: Wildlife Conservation Forces (WCF).

Action 2

Develop action plan for wildlife resources production and consumption.

Timeframe: 2026 – 2027.

Geographical coverage/level: National level.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: WCF.

Action 3

Conduct awareness activities on wildlife wise and sustainable use for all stakeholders.

Timeframe: 2025 - 2027

Geographical coverage/level: All states.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: WCF.

ix. Component target aligning with national target 11:

Restore, maintain and enhance nature's contributions to people, including wildlife ecosystem functions and services, such as the regulation of air, water and climate, and pollination, through adopting and implementing nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature.

Action 1

Conduct research on wetlands functions and services.

Timeframe: 2025 – 2027.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Environmental Studies Institute.

Action 2

Collect pasture-plant seeds from protected areas and spread them outside these areas for livestock.

Timeframe: 2025 – 2028.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: WCF.

Action 3

Implement Ecosystem-Based Wildlife Conservation Plans in key protected and buffer zones.

Timeframe: 2026 – 2030.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 20000000.

Body responsible for implementation and reporting: WCF.

x. Component target aligning with national target 12:

Ensure increasing the area and quality of, access to, and benefits from green and blue spaces in urban areas sustainably, by mainstreaming the conservation and sustainable use of biodiversity, including wild habitats, and ensure biodiversity-inclusive urban planning, improving human health and well-being and connection to nature, and contributing to inclusive and sustainable urbanization and to the provision of ecosystem functions and services.

Action

Develop plans and implement activities to protect and promote the use the naturally existing wild habitats, such as forests, within and around urban areas.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide, in main cities.

Estimated budget: US\$ 5000000.

Body responsible for implementation and reporting: WCF.

xi. Component target aligning to national target 13:

By 2030, the genetic diversity of wild fauna and flora, including socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources of wildlife species, as well as traditional knowledge associated with such genetic resources, and facilitating appropriate access to genetic resources.

Action

Develop strategic plan for protection of wild fauna and flora genetic diversity of the Sudan and the associated traditional knowledge.

Time frame: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: WCF.

xii. Component target aligning with national target 14:

Sustainable use and conservation of terrestrial and aquatic wildlife should be integrated into national and local development, poverty reduction strategies, environmental impact assessment and planning processes, and the wildlife values should be integrated within all government levels and across all sectors in the country.

Action

Conduct awareness and interest raising activities about the values of the wildlife biodiversity for the decision makers as well as local communities in order to encourage including them in strategies and plans, including for poverty reduction.

Timeframe: 2025 – 2028.

Geographical coverage/level: National and in some states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: WCF.

xiii. Component target aligning with national target 18:

By 2030, at latest, incentives, including subsidies, harmful to wildlife biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, and are integrated into the national development plans for conservation and sustainable use of wildlife ecosystems services.

Action 1

Conduct study to identify negative and positive incentives affecting wildlife biodiversity.

Timeframe: 2025 – 2026.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: WCF.

Action 2

Initiate establishment of a trust fund to encourage local communities and private sector to raise wild animals with economic returns as well as to plant productive trees to increase their income.

Timeframe: 2025 – 2026.

Geographical coverage/level: Some states.

Estimated budget: US\$ 2000000.

Body responsible for implementation and reporting: WCF.

xiv. Component target aligning with national target 20:

Knowledge, the science base and technologies relating to wildlife biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Action 1

Introduce and implement Spatial Monitoring and Reporting Tool (SMART) management system in all national parks in Sudan.

Timeframe: 2025 – 2027.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 2000000.

Body responsible for implementation and reporting: WCF.

Action 2

Establish geographical information systems (GIS) in, and provide drones, GPS devices and telecommunication devices for all national parks.

Timeframe: 2026 – 2030.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: WCF.

Action 3

Participate in specialized training courses outside the country for officers and non-commissioned officers of the Wildlife Conservation Forces.

Timeframe: 2025 – 2030.

Geographical coverage/level: All protected areas.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: WCF.

xiv. Component target aligning with national target 21:

By 2030, at the latest, people are aware of the values of biodiversity of wildlife, marine and wetland areas ecosystems, and the steps they can take to conserve and use them sustainably, and all related information and knowledge should be available and freely accessible for people including decision makers, public and local communities. In addition to that the knowledge, practices and technologies of indigenous peoples and local communities should only be accessed with their free and prior informed consent in accordance with national legislations.

Action 1

Establish web-based platform for wildlife conservation data-base and information.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Wildlife Conservation Forces (WCF).

Action 2

Establish electronic library on wildlife.

Timeframe: 2026 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: WCF.

Action 3

Develop and distribute awareness materials such as brochures, magazines and maps to raise public awareness on wildlife biodiversity.

Time frame: 2025 – 2028.

Geographical coverage/level: All states.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: WCF.

8.2.5 Marine Biodiversity

Followings are the actions to attain the component targets under the marine biodiversity component:

i. Component target aligning with national target 1:

By 2030, the rate of loss of all natural habitats, including marine habitats, is brought down by at least 25%, and degradation and fragmentation of wildlife habitat is significantly reduced, while respecting the rights of indigenous peoples and local communities.

Action 1

Conduct the necessary studies to evaluate the current status of areas that constitute unique marine areas suffering from degradation and fragmentation.

Timeframe: 2025 - 2027

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Institute of Marine Research (IMR).

Action 2

Conduct the necessary studies to identify the reasons and causes behind the loss of marine habitats in order to be treated.

Timeframe: 2026 – 2028.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Institute of Marine Research (IMR).

Action 3

Develop and implement special plans to stop the loss in marine habitats by treating the reasons causing this degradation.

Timeframe: 2027 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: HCENR.

ii. Component target aligning with national target 2:

By 2030, at least 10 percent of areas of degraded marine and coastal ecosystems are under effective restoration, in order to enhance ecosystem services related to water, and contribute to health, livelihoods and well-being, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

Action 1

Establish a consultation process on innovative solutions to halt marine degradation and restore ecosystems.

Timeframe: 2025 - 2027

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 2

Implementation of training activities for all stakeholders on coral reef restoration, and restoration of mangrove and seagrass.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR.

Action 3

Develop, promote and implement marine restoration projects on coral reef, mangrove and seagrass restoration in degraded areas.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 600000.

Body responsible for implementation and reporting: HCENR.

iii. Component target aligning with national target 3:

By 2030, at least 15 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.

Action 1

Develop and implement programmes to improve effective and equitable management in the existing two marine protected areas in Dungonab Bay and Mukkawar Island, and Sangneb Marine National Parks.

Timeframe: 2025 - 2030

Geographical coverage/level: Sudanese Red Sea state.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 2

Raising public awareness for local communities existing around the protected area in Dungonab Bay and Mukkawar Island Marine National Park to effectively engage them in conservation activities.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: HCENR.

Action 3

Conduct a wide consultation process among all stakeholders on development of proposals for new marine protected areas.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR.

iv. Component target aligning with national target 4:

By 2030, the human induced extinction of known threatened species has been prevented and conservation status, particularly of those most in decline, has been improved and sustained, as well as to maintain and restore the genetic diversity within and between populations of marine species to maintain their adaptive potential including through *in situ* and *ex situ* conservation and sustainable management practices.

Action 1

Conduct the necessary studies to identify endangered indigenous range species in marine ecosystem.

Timeframe: 2025 - 2030

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: IMR.

Action 2

Strengthen and promote the existing marine environmental monitoring programme applied by IMR for coral reef habitats including fish, mangroves, seaweeds, turtles, mammals and birds, in addition to physicochemical properties.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: IMR.

Action 3

Establishment of a marine genetic resources unit and a genebank.

Timeframe: 2025 – 2028.

Geographical coverage/level: Red Sea state.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: IMR.

Action 4

Establishment of national oceanographic data centre.

Timeframe: 2025 – 2030.

Geographical coverage/level: Red Sea state.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: IMR.

v. Component target aligning with national target 5:

By 2030, all marine fish and invertebrate stocks, marine plants and trade of marine wild species are managed and harvested sustainably, legally and applying ecosystem-based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, marine fisheries have no significant adverse impacts on threatened species and vulnerable marine ecosystems, and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.

Action 1

Conduct comprehensive fish stock assessment study.

Timeframe: 2025 - 2030

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: Marine Fisheries Administration (MFA).

Action 2

Review and develop regulations that encourage sustainable fishing, and to avoid over-fishing.

Timeframe: 2025 – 2028.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Marine Fisheries Administration.

Action 3

Develop a plan for implementation of Ecosystem Approach Fishery Management.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Marine Fisheries Administration.

vi. Component target aligning with national target 6:

By 2030, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment especially in marine water systems.

Action 1

Establishment of a laboratory unit for analysing the ballast water to detect and identify invasive alien species.

Timeframe: 2025 – 2027.

Geographical coverage/level: Red Sea state.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: Sea Ports Corporation.

Action 2

Create effective regular monitoring programme/system for investigation of invasive alien species in the ballast water discharging in Bashair (1 and 2) terminals for exported oil.

Timeframe: 2025 – 2030.

Geographical coverage/level: Red Sea state.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: IMR.

Action 3

Develop awareness materials and implement a public awareness programme on the invasive species for decision makers and other stakeholders.

Timeframe: 2025 – 2027.

Geographical coverage/level: Red Sea state.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: HCENR.

vii. Component target aligning with national target 7:

Reduce marine pollution risks and the negative impacts of pollution from all sources by 2030, to levels that are not harmful to marine biodiversity and ecosystem functions and services, considering cumulative effects, including: (a) by reducing oil pollution (b) by reducing the overall risk from hazardous and harmful chemicals by at least half (c) by preventing, reducing, and working towards eliminating plastic pollution.

Action 1

Establishment of marine pollution laboratory.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: IMR.

Action 2

Review and improve the national response plan for managing marine oil pollution incidents, oil spills and hazardous materials in Sudan.

Timeframe: 2025 – 2028.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: IMR.

Action 3

Develop a national action plan for the sustainable management of marine litter in Sudan.

Timeframe: 2025 – 2028.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: IMR.

Action 4

Develop effective reception facilities system in the Sudanese ports.

Timeframe: 2025 – 2027.

Geographical coverage/level: Red Sea state.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Sea Ports Corporation.

Action 5

Review and apply control regulations to reduce the adverse impacts of gold mining to environmentally acceptable levels.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

viii. Component target aligning with national target 8:

By 2030, the multiple anthropogenic pressures on coral reefs in Sudan, and other vulnerable marine ecosystems impacted by climate change are minimized, so as to maintain their integrity and functioning.

Action 1

Conduct the necessary studies to evaluate current state of coral reef and other vulnerable marine ecosystems impacted by climate change.

Timeframe: 2025 – 2028.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: IMR.

Action 2

Develop and implement a Coral Reef Bleaching Response Plan.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 350000.

Body responsible for implementation and reporting: IMR.

Action 3

Apply Integrated Ecosystem Approach Management regime, including climate change adaptation measures, covering all marine responsible bodies.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: HCENR.

ix. Component target aligning with national target 9:

Ensure that by 2030, marine management and use of marine wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on marine biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.

Action 1

Conduct activities to raise public awareness about Integrated Ecosystem Approach Management in marine and coastal environment.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: HCENR.

Action 2

Develop and implement activities to combat the illegal trade of shells and coral reef parts and provide alternative livelihoods for local communities and traders.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 600000.

Body responsible for implementation and reporting: Marine Fisheries Administration.

x. Component target aligning with national target 10:

By 2030, ensure that areas under marine aquaculture, fisheries and mangrove forests are managed sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices, and other innovative approaches.

Action 1

Apply suitable fishing gears innovation to reduce impacts of fisheries on marine biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Marine Fisheries Administration.

Action 2

Formation of bodies to involve the local communities in conservation activities of mangrove forests and encourage them apply sustainable use.

Timeframe: 2025 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

xi. Component target aligning with national target 11:

By 2030, restore, maintain and enhance marine nature's contributions to people, including marine ecosystem functions and services, such as the regulation of air and reduction of disease risk, as well as protection from natural hazards and disasters, through marine nature-based solutions and/or marine ecosystem-based approaches for the benefit of all people and nature.

Action 1

Organize activities to raise public awareness on Integrated Coastal Zone Management (ICZM) in marine and coastal environment.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 350000.

Body responsible for implementation and reporting: HCENR.

Action 2

Establish a unit of Integrated Coastal Zone Management (ICZM).

Timeframe: 2026 – 2030.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 600000.

Body responsible for implementation and reporting: HCENR.

xii. Component target aligning with national target 18:

By 2030, at the latest, incentives, including subsidies, harmful to marine biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of marine biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio-economic conditions.

Action 1

Conduct the necessary studies to identify the incentives, including subsidies, harmful to marine biodiversity.

Timeframe: 2025 – 2027.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Marine Fisheries Administration.

Action 2

Develop and apply effective policies for making a balance between the government subsidies for fishing in order to avoid overfishing that lead to decline in fish stocks.

Timeframe: 2025 – 2028.

Geographical coverage/level: Sudanese Red Sea coast.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Marine Fisheries Administration.

8.2.6 Inland Waters and Wetlands Biodiversity

Followings are the component targets and actions under the inland waters and wetlands biodiversity:

i. Component target aligning with national target 1:

By 2030, ensure that all wetland areas in Sudan are under participatory, integrated and biodiversity inclusive spatial planning in order to bring down their loss rate by at least 25%, while respecting the rights of indigenous peoples and local communities.

Action

Develop wetlands biodiversity strategic action plan.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: HCENR.

ii. Component target aligning with national target 2:

By 2030, areas of degraded inland waters and wetlands ecosystems in Sudan that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, in order to enhance biodiversity and ecosystem functions and services, ecological integrity and connectivity.

Action 1

Organize a consultation process on methodologies for restoration of degraded inland waters ecosystems, including the wetlands, for sustainable utilization of natural resources that provide potential food, fodder and medicinal value of aquatic plants.

Timeframe: 2026 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR.

Action 2

Mapping all existing mangrove stands and degraded sites.

Timeframe: 2026 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 120000.

Body responsible for implementation and reporting: HCENR.

Action 3

Conduct a national assessment study to identify, map and prioritize the critical sites used by migratory water birds as stopover sites, in order to plan for restoring the degraded ones.

Timeframe: 2026 - 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: HCENR.

iii. Component target aligning with national target 3:

By 2030, at least 15% of inland waters and wetlands areas, especially areas of particular importance for biodiversity and ecosystem functions and services in Sudan, are effectively conserved and managed through effectively and equitably managed, area-based conservation measures, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation.

Action 1

Establish new protected areas, game reserves and sanctuaries to represent all ecological zones and states and adopting international categorization of protected areas, with special attention to inclusion of inland fresh water (khors and wadis), as well as specifically establishing protected areas for the following habitats:

a. One of the non-Nilotic lakes such as Kundi, b. Wadi Alalagi.

Timeframe: 2025 - 2028

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

Action 2

Formulate new management plans for protected areas that have no management plans to improve the management effectiveness.

Timeframe: 2025 - 2027

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 700000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

Action 3

Declare new RAMSAR wetlands.

Timeframe: 2026- 2028

Geographical coverage/level: National.

Estimated budget: US\$ 4500000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

iv. Component target aligning with national target 4:

By 2030, the extinction of known threatened species in the in-land waters and wetlands in Sudan has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.

Action 1

Assess the threat status of endangered fish and mammals' species outside the protected areas including the main threats to the threatened species, and restore endangered species.

Timeframe: 2025 - 2026

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

Action 2

Conduct an assessment study to identify if any of the other inland waters' species are threatened and conduct habitat restoration as management action to reduce extinction risk, in particular for threatened species.

Timeframe: 2025 - 2027

Geographical coverage/level: Country-wide..

Estimated budget: US\$ 750000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

Action 3

Apply existing approaches as pilot activities to prevent extinction, such as application of precaution measures, including closed areas/closed seasons, and reduce catch / unit efforts.

Timeframe: 2026 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: General Directorate for Fishery and Aquaculture.

v. Component Target aligning with national target 6:

By 2030, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment in inland waters and wetlands systems in Sudan.

Action 1

Conduct assessment study to identify and manage pathways of the introduction of alien invasive species in the inland waters and wetlands.

Timeframe: 2025 - 2026

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Ministry of Irrigation and Water Resources.

Action 2

Apply biological and cultural control mechanisms to eradicate invasive alien species that are already been found having adverse effects on biodiversity of inland waters and wetlands ecosystems.

Timeframe: 2025 - 2027

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 750000.

Body responsible for implementation and reporting: Ministry of Irrigation and Water Resources.

Action 3

Conducting activities to upgrade capacities on invasive alien species in wetlands.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

vi. Component Target aligning with national target 7:

By 2030, pollution risks to wetlands and fresh water systems have been reduced to levels that are not harmful to biodiversity and ecosystem functions and services.

Action 1

Conduct activities to raise the awareness of the community to enhance their role in enforcement of environmental laws to combat pollution in inland waters and wetlands.

Time frame: 2025 - 2026

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

Action 2

Reduce the adverse impacts of traditional as well as organized gold mining on inland waters and wetlands to environmentally acceptable levels through;

- Local governments to raise awareness, facilitate registration, and enforce rules in an effort to enhance ecologically friendly mining.
- Concerned bodies of mining to develop strategies to mitigate harmful environmental effects.
- Conduct study on the effects of mining on the environment in selected areas of mining to provide a better understanding of mining communities' attitudes and perceptions towards the impact of gold mining activities on ecosystem services, as well as their willingness to participate in a recovery programme for improving ecosystem services in order to sustain rural livelihoods.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

Action 3

Develop guidelines to combat pollution in wetlands.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

vii. Component Target aligning with national target 8:

By 2030, ensure minimizing the impact of climate change on wetlands biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solutions and/or ecosystem-based approaches.

Action

Conduct studies on the impact of climate change on wetlands biodiversity.

Time frame: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Institute of Environmental Studies

viii Component target aligning with national target 10:

By 2030, ensure that areas under agriculture, aquaculture, fisheries and forestry in inland waters and wetlands are managed and harvested sustainably, in particular through the sustainable use of biodiversity, including through a substantial increase of the application of biodiversity friendly practices contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services.

Action 1

Conduct assessment study to identify the factors that hinder application of regulations, which encourage sustainable fishing, and avoid over-fishing to reach a point where fishing has no adverse effects on the ecosystem, and poses no threats on endangered species through awareness raising and the application of biodiversity friendly practices such as fishing gears.

Timeframe: 2025 - 2026

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: General Directorate for Fishery and Aquaculture.

Action 2

Design an effective ecological monitoring system.

Timeframe: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: General Directorate for Fishery and Aquaculture.

Action 3

Develop and implement joint activities on agriculture, aquaculture, fisheries and forestry in wetlands to ensure sustainable management using biodiversity friendly practices.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

ix. Component target aligning with national target 12:

By 2030, increase the area and quality of, and connectivity of, access to, and benefits from wetland spaces in urban and densely populated areas sustainably, by mainstreaming the conservation and sustainable use of wetland biodiversity in urban planning.

Action

Develop proposals to integrate wetlands in the urban planning of some specific cities.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

x. Component target aligning with national target 14:

Ensure the full integration of inland waters and wetlands biodiversity and its multiple values into policies, regulations, planning and development processes, poverty eradication strategies, strategic environmental assessments, environmental impact assessments and, as appropriate, national accounting, within and across all levels of government and across all sectors, in particular those with significant impacts on inland waters and wetlands biodiversity, progressively aligning all relevant public and private activities, and fiscal and financial flows with the goals and targets of this NBSAP.

Action 1

Conduct economic valuation of conservation and sustainable use of inland waters and wetlands ecosystems and biodiversity in order to incorporate it into national development plans, poverty reduction strategy, environmental impact assessment (EIA) and national accounting.

Timeframe: 2026 - 2028

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR.

Action 2

Conduct non-class activities to raise awareness and interest of the concerned bodies in the educational institutes in order to encourage them to incorporate biodiversity, including inland waters and wetlands biodiversity economic accounting, in their curricula.

Timeframe: 2026 – 2030.

Geographical coverage/level: All states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

Action 3

Train civil servants in transforming biodiversity components, including inland waters and wetlands biodiversity, into items of monetary value.

Time frame: 2026 – 2028.

Geographical coverage/level: All states.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 4

Develop awareness materials and conduct activities to raise the awareness and create interest on the role of wetlands in the environment at all levels of stakeholders.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

xi. Component target aligning with national target 16:

By 2030, at the latest, federal and state governments, business and stakeholders at all levels in Sudan have taken steps to achieve or have implemented plans for sustainable consumption of inland waters and wetlands resources in the country by establishing supportive policy, legislative or regulatory frameworks, improving education and access to relevant and accurate information and alternatives, and by 2030, significantly reducing overconsumption and substantially reducing waste generation, in order for all people to live well in harmony with nature.

Action

Develop plan for sustainable consumption of inland waters and wetlands resources.

Timeframe: 2025 - 2026

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: General Directorate for Fishery and Aquaculture.

xii. Component Target aligning to national target 19:

By 2030, substantially and progressively increase the level of financial resources from all sources, in an effective, timely and easily accessible manner, including domestic, international, public and private resources for effectively implementing the NBSAP, including the actions under the inland waters and wetlands biodiversity.

Action

Develop project proposals on inland waters and wetlands biodiversity to implement the actions on conservation and sustainable use of inland waters biodiversity and wetlands biodiversity.

Timeframe: 2026 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 350000.

Body responsible for implementation and reporting: HCENR.

xiii. Component Target aligning to national target 20:

By 2030, knowledge, the science base and technologies relating to aquatic biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, accessed, and widely shared and transferred, and applied, and capacities of relevance built, developed and strengthened.

Action 1

Conduct capacity-building activities on management and sustainable use of wetland biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 2

Conduct research, monitoring and inventorying activities on wetlands .

Time frame: 2027- 2029.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: HCENR.

xiv. Component target aligning with national target 21:

By 2030, raise the awareness on inland waters and wetlands biodiversity, and ensure that the best available data, information and knowledge on inland waters and wetlands biodiversity in Sudan are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of such biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management.

Action 1

Conduct a national status assessment of natural inland water resources including aquatic biota of the Nile Basin and non-Nilotic inland water ecosystems.

Timeframe: 2025 - 2027

Geographical coverage/level: All states.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: HCENR.

Action 2

Publish data and information on inland waters and wetlands biodiversity in the Website of HCENR and the Clearing House Mechanism of biodiversity.

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

Action 3

Conduct awareness-raising activities on the importance of inland water and wetlands biodiversity conservation for decision makers, practitioners and the public including local communities.

Time frame: 2026 – 2030.

Geographical coverage/level: All states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

Action 4

Conduct awareness-raising activities on monitoring, research and knowledge management for inland waters and wetlands biodiversity.

Time frame: 2025 – 2030.

Geographical coverage/level: National and all states.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR.

Action 5

Rehabilitate databases and documentation systems of relevance as post-war activities to facilitate access to relevant and accurate information on inland waters biodiversity.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 6

Organize and run a consultation process to decide on how to establish centre for research and information on wetland biodiversity and initiate it.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 7

Conduct a comprehensive baseline study for all inland waters and wetlands in Sudan and revise and upgrade the taxonomy of their biota and document their known and potential uses.

Time frame: 2026- 2029.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: Institute of Environmental Studies.

xv. Component target aligning with national target 22:

Ensure the full, equitable, inclusive, effective and gender-responsive representation and participation in decision-making on issues related to inland waters and wetlands biodiversity, and access to justice and information related to biodiversity by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge.

Action 1

Arrange to ensure that the indigenous peoples and local communities are represented, considering gender perspective, by at least 10% in bodies of decision-making processes, and access to justice and information related to biodiversity, respecting their cultures and rights over lands, territories, resources, and traditional knowledge.

Time frame: 2025 - 2030

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: HCENR.

Action 2

Build capacities and raise awareness to enhance representation and participation of indigenous peoples and local communities in decision-making on issues related to inland waters and wetlands biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: HCENR.

8.2.7 Insect and Microorganism Biodiversity

Following are the actions to attain the component targets under the insect and microorganism biodiversity component:

i. Component Target aligning with national target 4:

By 2030, conservation measures for known and threatened species of insects and microorganisms should be put in place, and their conservation status should be improved, especially for the most low-lying species by developing a nation-wide insects and microorganisms management plan.

Action 1

Conduct a survey and studies to determine and assess the level of threatened and beneficial insect and microorganism species.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Plant Protection Directorate (PPD), Ministry of Agriculture.

Action 2

Establishing apiaries for rearing bees, and laboratories for rearing predator insects in crop production areas.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Ministry of Animal Resources.

Action 3

Establish a national microbial culture collection laboratory to survey, collect, classify and conserve the indigenous microorganism genetic diversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: National Research Centre.

ii. Component target aligning with national target 6:

By 2030, alien and invasive insects and microorganisms and their pathways are identified and prioritized, mechanisms are developed to prevent the introduction of new invasive insect and microorganism species, priority species are controlled, and measures are in place to manage and control the introduction and establishment of harmful species.

Action 1

Capacity building and training to use biological methods to control the invasive alien species in the country.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: PPD.

Action 2

Develop and implement effective response procedures for the prevention of new potential invasive species.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: PPD.

iii. Component target aligning with national target 7:

By 2030, use of chemical pesticides reduced by 30% as well as the use of more hazardous chemicals, including through the full implementation of the integrated pest management, taking into consideration that farmland birds and insects, particularly pollinators, are key indicators of the health of agroecosystems and are vital for agricultural production and food security.

Action 1

Develop and endorse a plan for the federal as well as the states' authorities to reduce/remove incentives/subsidies or impose penalties for activities that pollute the natural habitats of terrestrial, inland waters and marine flora and fauna.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 2

Develop a national plan to enhance the use of integrated pest management.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: National Council for Pesticides.

Action 3

Develop a national plan in collaboration with relative authorities to make a strong restriction or banning of some extremely and highly toxic insecticides use to control insect pests and find out appropriate alternative control patterns less harmful to biodiversity and beneficial organisms.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: National Council for Pesticides.

iv. Component target aligning with national target 9:

Ensure that the management and use of insects and microorganisms are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-

based activities, products and services that enhance biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.

Action 1

Conduct research on the role of indigenous knowledge in supporting and enhancing insect and microorganism biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

Action 2

Develop risk assessment and management programmes and guidelines for newly introduced insect and microorganism species.

Time frame: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Ministry of Agriculture.

Action 3

Conduct studies and surveys to providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 4

Conduct insects for food and feed programme by adoption of mass rearing concept for some insect infecting crops such as desert locust, tree locusts and bugs, as alternative source of protein to be consumed as food by human and feed for poultry

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: Department of Crop Protection, University of Khartoum.

v. Component target aligning with national target 19:

By 2030, develop cost effective insect and microorganisms' management programmes.

Action

Develop projects proposals to implement actions on conservation and sustainable use of insect and microorganisms.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: PPD.

vi. Component target aligning with national target 20:

By 2030, develop intensive research programmes regarding the impacts of insects and microorganisms on biodiversity.

Action 1

Training of technicians to recognize and deal with different types of insects and microorganisms.

Timeframe: 2025– 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 550000.

Body responsible for implementation and reporting: PPD.

Action 2

Conduct research on the use of traditional knowledge in the development and implementation of measures to manage insects and microorganism species.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: PPD.

Action 3

Strengthen the existing insect taxonomy unit at the ARC to conduct surveys and research on the status of insects in the country.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: Agricultural Research Corporation.

vii. Component target aligning with national target 21

By 2030, promote awareness on the threats to biological diversity related to insects and microorganisms.

Action 1

Develop a database on insects and microorganisms' genetic resources in the country.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: PPD.

Action 2

Develop awareness materials and conduct awareness raising activities using different fora and media to disseminate information about the insect and microorganism biodiversity among targeted groups.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: PPD.

Action 3

Develop plan to encourage media organizations and extension workers to participate in dissemination of information about the impact of harmful insect and microorganism species.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: PPD.

Action 4

Organize non-class activities to encourage education institutions to incorporate issues of insect and microorganism biodiversity into their educational curricula.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: PPD.

Action 5

Develop a plan for involvement of all stakeholders in insects and microorganisms' biodiversity management programmes.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: PPD.

8.2.8 Access and Benefit Sharing Aspects related to Biodiversity

Following are the actions set to attain the component targets under the access and benefit sharing (ABS) aspects related to biodiversity:

i. Component target aligning with national target 5:

Ensure that the customary sustainable use of wild species by indigenous peoples and local communities is respected and protected.

Action 1

Develop community protocols on ABS to respect and protect customary sustainable use by indigenous peoples and local communities of their genetic resources, including wild species.

Timeframe: 2026 - 2028

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: HCENR – Competent National Authority (CNA).

Action 2

Develop communication, education and public awareness materials on the value and contributions of customary sustainable use by indigenous peoples and local communities of wild species.

Timeframe: 2026 - 2028

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR – CNA.

ii. Component target aligning with national target 13:

Take effective legal, policy, administrative and capacity-building measures at all levels, as appropriate, to ensure the fair and equitable sharing of benefits that arise from the utilization of Sudanese genetic resources, and from digital sequence information on genetic resources, as well as from the traditional knowledge associated with such genetic resources, and facilitating appropriate access to genetic resources in Sudan, and by 2030, facilitating a significant increase of the benefits shared, in accordance with applicable international access and benefit-sharing instruments and the national legislation.

Action 1

Expedite the endorsement and adoption of Access and Benefit Sharing legal framework to have a fully functional ABS system, as this legal framework is in the last stage of the endorsement and adoption process by the legislative authority.

Timeframe: 2025 - 2026

Geographical coverage/level: National.

Estimated budget: US\$ 5000.

Body responsible for implementation and reporting: HCENR.

Action 2

Put in place the necessary institutional structures and administrative systems for ABS, including establishment of Competent National Authority (CNA), designation of checkpoints, in accordance with the ABS legal framework and Nagoya Protocol, and implement legislative measures including development of Prior Informed Consent (PIC) and Mutually Agreed Terms (MAT) for facilitating appropriate access to genetic resources, digital sequence information on genetic resources, and traditional knowledge associated with genetic resources.

Timeframe: 2025 - 2026

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

Action 3

Publish the information on legislative and administrative measures and institutional arrangements through the Access and Benefit-sharing Clearing-House Mechanism (ABS-CHM).

Timeframe: 2025 - 2030

Geographical coverage/level: National.

Estimated budget: US\$ 25000.

Body responsible for implementation and reporting: HCENR - NCA.

iii. Component target aligning with national target 15:

Take legal, administrative or policy measures to encourage and enable business, and in particular to ensure that large and transnational companies and financial institutions to report on compliance with access and benefit-sharing regulations and measures.

Action

Enforce the ABS legal framework to encourage compliance with access and benefit-sharing legal framework and regulations.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 0.

Body responsible for implementation and reporting: HCENR.

iv. Component target aligning with national target 19:

Include provisions in the national biodiversity finance plans for the implementation of the Nagoya Protocol in the country, as well as taking into account the resource mobilization for the Nagoya Protocol as a source of funding for the implementation of relevant actions in the NBSAP.

Action

Develop Project proposals to support the implementation of the Nagoya Protocol and the national legislation.

Timeframe: 2026 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: HCENR - NCA.

v. Component target aligning with national target 20:

Strengthen capacity-building and development, access to and transfer of technology, and promote development of, and access to innovations and technical and scientific cooperation, including through South-South, and North-South cooperation, to meet the needs for effective implementation of the Nagoya Protocol in Sudan, as well as fostering joint technology development and joint scientific research programmes for conservation and sustainable use of biodiversity as benefit sharing mechanisms, among others, and strengthening scientific research and monitoring capacities.

Action 1

Train and raise awareness of relevant stakeholders, including the business sector and the research community, to effectively participate in the implementation of the Protocol and other legally binding instruments of relevance.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: HCENR - CNA.

Action 2

Build capacities of indigenous peoples and local communities (IPLCs) on ABS issues to support the implementation of the provisions of the Protocol related to indigenous peoples and local communities, including granting or refusing to grant prior informed consent (PIC), developing minimum requirements for mutually agreed terms (MAT) for sharing of benefits arising from the utilization of traditional knowledge associated with genetic resources.

Time frame: 2026 – 2028.

Geographical coverage/level: at all states levels.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: HCENR - CNA.

Action 3

Train stakeholders including local communities to negotiate mutually agreed terms (MAT).

Timeframe: 2025 – 2026.

Geographical coverage/level: at national and all states levels.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: HCENR - CNA.

Action 4

Train and build capacity of relevant stakeholders to monitor the utilization of genetic resources, including the establishment of checkpoints.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 700000.

Body responsible for implementation and reporting: HCENR - CNA.

vi. Component target aligning with national target 21:

Ensure that the best available data, information and knowledge are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity, and to strengthen communication, awareness-raising, education, monitoring, research and knowledge management and, also in this context, traditional knowledge, innovations, practices and technologies of indigenous peoples and local communities should only be accessed with their free, prior and informed consent in accordance with national legislation.

Action 1

Aggregate and publish data and information on benefit sharing in the Benefit Sharing Clearing House Mechanism (ABS -CHM).

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR - CNA.

Action 2

Document and preserve traditional knowledge, innovations, and practices of indigenous peoples and local communities associated with genetic resources to ensure that these knowledges only be accessed with their free, prior and informed consent in accordance with national legislation.

Timeframe: 2027 – 2028.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 3500000.

Body responsible for implementation and reporting: HCENR - CNA.

Action 3

Establish a protection system to protect traditional knowledge associated with genetic resources in order to be accessed with the free, prior and informed consent of indigenous peoples and local communities in accordance with national legislation.

Timeframe: 2026 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: HCENR - CNA.

Action 4

Develop awareness materials and conduct awareness activities on the Nagoya Protocol, and relevant instruments and legislations for educational sectors.

Timeframe: 2026 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: HCENR - CNA.

vii. Component target aligning with national target 22:

Ensure the full, equitable, inclusive, effective and gender-responsive representation and participation in decision-making on issues related to access and benefit sharing, and access to justice and information related to biodiversity, by indigenous peoples and local communities, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge.

Action

Arrange to ensure that at least 10% of the indigenous peoples and local communities, taking into consideration gender issue, are represented in bodies involved in the decision-making processes, and access to justice and information related to biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 0.

Body responsible for implementation and reporting: HCENR - CNA.

8.2.9 Pollution Aspects related to Biodiversity

Following are the set of actions to attain the component targets under the pollution aspects related to biodiversity:

i. Component target aligning with national target 7:

Reduce pollution risks and the negative impact of pollution from all sources, by 2030, to levels that are not harmful to biodiversity and ecosystem functions and services, considering cumulative effects, including: (a) by reducing excess nutrients lost to the environment by at least half, including through more efficient nutrient cycling and use; (b) by reducing the overall risk from pesticides and highly hazardous chemicals by at least half, including through integrated pest management, based on science, taking into account food security and livelihoods; and (c) by preventing, reducing, and working towards eliminating plastic pollution.

Action 1

Applying of integrated pest management programme concentrating on the green-houses pests through the use of new trends of pest control.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 2000000.

Body responsible for implementation and reporting: Integrated Pest Management Centre, ARC.

Action 2

Conduct studies on formulation of identified released indigenous bio-pesticides, and test their efficacy on different agricultural pests.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 10000000.

Body responsible for implementation and reporting: Centre of Pesticides and Plant Health, Faculty of Agriculture, University of Khartoum.

Action 3

Develop a national plan in collaboration with the National Pesticides Council and HCENR to make a strong restriction or banning of some extremely and highly toxic pesticides use to control Quelea

birds invading farms, specifically Fenthion avicide, and to find out appropriate alternative avicide less harmful to biodiversity.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: HCENR.

Action 4

Removal of chemical-contaminated soils resulting from the abuse of agrochemicals and the chemicals used in gold mining sectors, by importation of specific incinerators or appropriate modern chemical treatment techniques, and degrading chemical-contaminated soil using bioremediation and/or biodegradation techniques.

Time frame: 2026 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 100000000.

Body responsible for implementation and reporting: Excellence Centre of Pesticides and Plant Health, Faculty of Agriculture, University of Khartoum.

Action 5

Organize awareness activities on agrochemical negative impacts on biodiversity and ecosystems for different stakeholders in the agricultural sector and public health sector, including farmers, distributors, employees and relative occupational fields, to raise the ideal knowledge regarding the use, handling and application of chemicals in general.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: HCENR.

Action 6

Avoiding the intensive use of non-selective herbicides that affect and damage all species of weeds and plants by using of environment friendly herbicides such as selective herbicides, laser technique, agronomic practices, mechanical control and microbial control..

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: PPD.

Action 7

Rearing mass cultures of predator and parasitoids and release them whenever needed, to avoid application of synthetic chemicals to control pests..

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 500000

Body responsible for implementation and reporting: Department of Crop Protection, University of Khartoum.

ii. Component target aligning with national target 12:

Significantly increase the presence and proportion of green spaces in cities and densely populated areas, and adopting technologies and means to reduce automobile emissions, including by using electric cars and mass transportation means, as well as sound management of chemicals and waste to reduce pollution risks harmful to biodiversity and ecosystem functions.

Action 1

Conduct awareness activities to demonstrate the danger of automobile exhaust emissions as a dominant source of ambient air pollution, particularly in densely populated urban environments.

Timeframe: 2025 – 2028.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Customs forces.

Action 2

Conduct capacity building activities on applying Sudanese and international standard emission limits and testing methods.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Customs Forces.

Action 3

Bann or impose high restriction on the use of methyl bromide as fumigator to control store pests in storages or goods used for export purposes and find alternative method safer for environment and biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: PPD.

iii. Component target aligning with national target 14:

Developing strong policies and obligatory legislations to limit and restrict the use of pesticides hazardous to biodiversity and ecosystems services and functions in control of pests, and operationalizing of existing relative conventions by internalizing and integrating them into national policies and legislations.

Action 1

Review and update the national legislations on hazardous pesticides, chemicals and other wastes in order to implement the existing international relative conventions.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: HCENR.

Action 2

Set specific policies and legislations regarding the use of plastic bags to reduce associated risks, considering positive incentives for those in compliance with the set regulations.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

Action 3

Set specific policies to develop waste recycling technologies to reduce associated risks of plastic and hazardous materials

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 750000

Body responsible for implementation and reporting: PPD.

iv. Component target aligning with national target 15:

Take legal, administrative or policy measures to encourage and enable business related to mining, oil fields and exporters and importers of hazardous materials to reduce pollution risks harmful to biodiversity and ecosystem functions.

Action 1

Conduct awareness activities on the risks and effects associated with the chemicals used in gold mining sectors, particularly artisanal mining sectors, and the impacts of using of these chemicals on biodiversity.

Timeframe: 2025 – 2028.

Geographical coverage/level: National in mining areas.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: HCENR.

Action 2

Develop gold mining legislations, and encourage decision makers to ratify Minamata Convention to stop using mercury in gold mining processing.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

Action 3

Ratify and implement the Minamata Convention to limit the use of mercury in artisanal gold mining activities and to find environment friendly methods in gold mining extraction.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: HCENR.

Action 4

Develop and implement Strategic Approach to International Chemicals Management (SAICM) strategy to reduce and manage the production and importing of chemicals based on their needs and priority in the country.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

v. Component target aligning with national target 20:

Strengthen capacity-building and development, access to and transfer of technology on reducing and treating the risks and effects associated with the chemicals use in different activities and their impacts on the biodiversity, and to set good plans on ground to mitigate the associated risks and hazards.

Action 1

Organize a regular international scientific visits, meetings and knowledge exchange programmes for toxicological specialists and other researchers in the field to transfer recent technologies related to risks associated with hazardous wastes.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 2

Conduct training programmes on recycling of chemicals and hazardous waste removal treatments targeting chemicals and pesticides specialists.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

vi. Component target aligning with national target 21:

Ensure that the best available data, information and knowledge about pollution status are accessible to decision makers, practitioners and the public.

Action 1

Establish a documentation system containing pollution data, information and knowledge.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: HCENR.

Action 2

Establish an information website as one platform for pollution affairs authorities.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

8.2.10 Climate Change Impacts on Biodiversity

Following are the actions set to attain the component targets under the impacts of climate change on biodiversity:

i. Component target aligning with national target 8:

Maximize resilience of ecosystems, which have high biodiversity and greatest capacity to buffer climate change impacts and adapt with, including by 2030, the multiple anthropogenic pressures on coral reefs in Sudan, and other vulnerable ecosystems impacted by climate change are minimized, so as to maintain their integrity and functioning.

Action

Incorporate related elements of the national adaptation plan for climate change into policies and programmes for biodiversity conservation, in forestry, rangelands, coastal and marine and inland waters and wetlands ecosystems.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 60000.

Body responsible for implementation and reporting: HCENR.

ii. Component target aligning with national target 19:

Development of funding mobilization mechanisms for assessment and adaptations to climate change impacts on biodiversity.

Action

Development of project proposals to buffer climate change impacts on biodiversity based on the national resource mobilization plan for the implementation of the NBSAP.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

iii. Component target aligning with national target 20:

By 2030, knowledge, the science base and technologies relating to impacts of climate change on biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

Action 1

Undertake a detailed vulnerability assessment of impacts of climate change on biodiversity in Sudan.

Time frame: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: HCENR.

Action 2

Conduct studies and develop reports to define how to transfer appropriate technologies that minimize negative impacts of climate change on biodiversity.

Timeframe: 2027 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

iv. Component target aligning with national target 21:

Development and enhancement of awareness programmes about the impacts of climate change on biodiversity in Sudan.

Action 1

Develop and design awareness raising and communication materials on impact of climate change on biodiversity.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 300000.

Body responsible for implementation and reporting: HCENR.

Action 2

Establish information centre to launch awareness raising campaigns and information dissemination activities about biodiversity conservation under stress of climate change.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: Ministry of Culture and Information.

Action 3

Design and implement programmes to raise awareness and interest through non-class activities in general and high education institutes on climate change and its impacts on biodiversity.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: Ministry of Education.

8.2.11 Biosafety and Biotechnology Aspects related to Biodiversity

Following are the actions set to attain the component targets under the biosafety and biotechnology aspects related to biodiversity:

i. Component target aligning with national target 4:

Modern biotechnology methods and techniques should adequately be used to maintain genetic diversity and minimize genetic erosion of cultivated plants and farmed and domesticated animals.

Action 1

Establish *in-vitro* conservation facilities for conservation of cultivated plant genetic resources within the relevant genebanks.

Timeframe: 2025 – 2028.

Geographical coverage/level: National.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: APGRC.

Action 2

Conducting studies and research on the possibility of using biotechnology to conserve wildlife and other genetic resources.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: Ministry of Higher Education and Scientific Research.

ii. Component target aligning with national target 7:

By 2030, necessary steps are taken by federal and state governments, the private sector and other stakeholders to utilize biotechnology to reduce the use of pesticides by developing plant varieties that are resistant to insects and diseases, which will help in reducing pollution from the use of chemicals.

Action

Raise the capacity of the biosafety National Competent Authority for monitoring and risk management at different stages prior to, during and post to the testing and release of any genetically modified varieties resistant to pests and/or diseases for agricultural production.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: HCENR.

iii. Component target aligning to national target 10:

By 2030, necessary steps are taken by federal and state governments, the private sector and other stakeholders to utilize biotechnology in sustainable production with maximum biosafety precautions and measures.

Action 1

Establishment of incentive programmes for expansion in commercialization of new genetically modified crops of high economic value and low and manageable negative impacts on the environment.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 270000.

Body responsible for implementation and reporting: HCENR.

Action 2

Development and increase in the production of biotechnological products, such as *in-vitro* mass propagation of some cultivated crops and forest trees, including threatened genotypes, in order to enhance productivity and increase areas under agricultural production or conservation on a sustainable basis.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: HCENR.

iv. Component target aligning with national target 14:

Integration of modern biotechnology benefits for biodiversity conservation and sustainable use in agricultural and socio-economic development strategies and plans.

Action

Review and update policies, plans and laws to the extent they are consistent with the national biosafety law, and to develop necessary bylaws and regulations.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 270000.

Body responsible for implementation and reporting: HCENR.

v. Component target aligning with national target 17:

By 2030, development of institutional and human capacities on modern biotechnology and its beneficial roles, as well as on the biosafety measures, for conserving the biodiversity and using it sustainably.

Action 1

Conduct studies and consultations to assess the present biosafety status in Sudan according to the requirements and guidelines of Cartagena Protocol and the national legislation in order to identify gaps, constraints and problems and develop a future national plan of action.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 270000.

Body responsible for implementation and reporting: HCENR.

Action 2

Develop and build capacity in biosafety containment, confined use and field trials.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 3000000.

Body responsible for implementation and reporting: HCENR.

Action 3

Develop biosafety standard operating procedures (SOPs).

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

Action 4

Conduct activities at high policy levels to raise the awareness and interest in order to gain and strengthen political support for the biosafety issues.

Timeframe: 2025 – 2029.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

Action 5

Development of the capacity for the system of handling biosafety notifications and the subsequent actions, including risk assessment and decision-making processes.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 800000.

Body responsible for implementation and reporting: HCENR.

Action 6

Establishment and operationalization of a system for public information, education and participation on biosafety matters.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 750000.

Body responsible for implementation and reporting: HCENR.

Action 7

Provide necessary support to organize and enhance participation and coordination at regional level on issues related to biosafety.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 650000.

Body responsible for implementation and reporting: HCENR.

Action 8

Improve GMO detection and accreditation laboratories.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 1500000.

Body responsible for implementation and reporting: HCENR.

Action 9

Establishment of biosafety institutional committees.

Time frame: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 250000.

Body responsible for implementation and reporting: HCENR.

Action 10

Conduct necessary study and consultation on the Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety to decide on the accession of Sudan to this protocol.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

vi. Component target aligning with national target 19:

Mobilizing financial support for monitoring and evaluation of the use of biotechnology, and addressing risks from GMOs on biodiversity.

Action

Develop project proposals to implement the biosafety and biotechnology related actions.

Timeframe: 2025 – 2027.

Geographical coverage/level: National.

Estimated budget: US\$ 50000.

Body responsible for implementation and reporting: HCENR.

vii. Component target aligning with national target 21:

Developing mechanisms and methods to access the available data, information and knowledge on modern biotechnologies, their applications, and products, as well as on biosafety rules and measures, with necessary transparency in the exchange of information, and rapid access to obtaining information.

Action

Establish the Sudan biosafety electronic platform, and launch the Sudan biosafety clearing house.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: HCENR.

8.2.12 Health Aspects of relevance to Biodiversity

Following are the actions set to attain the component targets under the health aspects of relevance to biodiversity:

i. Component target aligning with national target 2:

Ecosystems that provide essential services, including services contributing to health, livelihoods and well-being, are restored and safeguarded, in order to enhance biodiversity and ecosystem functions and services and ecological integrity, supporting human health, and tending to reduce pandemics and other disease risks.

Action

Develop a comprehensive restoration plan through compilation of restoration plans of different biodiversity components in one document in order to optimize co-benefits of restoration activities for positive health impacts.

Timeframe: 2025 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: HCENR.

ii. Component target aligning with national target 4:

Ensure effective management to halt species extinction, protect genetic diversity, and manage human-wildlife conflicts through improving the regulations, taking into consideration the management of the use and trade of wildlife, and reducing human-wildlife conflict, in order to reduce exposure of people to animal species that carry high risk for infectious disease emergence.

Action 1

Approve national policy and strategy and updated law of wildlife, with consideration of the role of species in the production of medicines and reduction of human-wildlife conflict.

Time frame: 2026 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 5000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

Action 2

Develop an action plan by the concerned authorities to reduce human-wildlife conflict at a national level.

Timeframe: 2025 – 2025.

Geographical coverage/level: National.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

iii. Component target aligning with national target 5:

Ensure sustainable, safe and legal harvesting and trade of wildlife species, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spillover, applying the ecosystem approach.

Action 1

Develop regulations to avoid the unsustainable and illegal use of wildlife species, and to ensure provision of wildlife functions such as medicinal products.

Timeframe: 2025 – 2025.

Geographical coverage/level: National.

Estimated budget: US\$ 20000.

Body responsible for implementation and reporting: Wildlife Conservation Forces.

Action 2

Build institutional capacities to apply prevention measures for reducing the risk of pathogen spillover through provision of hygiene equipment.

Timeframe: 2025 – 2030.

Geographical coverage/level: National and State level.

Estimated budget: US\$ 400000.

Body responsible for implementation and reporting: One Health Platform.

iv. Component target aligning with national target 6:

Reduce the introduction of and / or mitigate the impacts of invasive alien species on biodiversity and ecosystem services, by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, including those hazardous to human, animal and plant health, reducing the rates of introduction and establishment of other known or potential invasive alien species, which is necessary to maintain or restore services provided by ecosystems.

Action

Conduct assessment study to identify and manage pathways of the introduction of invasive alien species (IAS) to reduce the introduction of IAS that are hazardous to human, animal, and plant health and environment.

Timeframe: 2025 – 2026.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

v. Component target aligning with national target 7:

Reduce pollution to levels that are not harmful to biodiversity across all ecosystems contributing to better health for humans, animals and plants.

Action 1

Conduct awareness raising activities on the negatives of excess nutrients, pesticides, hazardous waste, chemicals, and plastic on human, animal health and environment.

Timeframe: 2025 – 2027.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: One Health Platform.

Action 2

Develop medical waste disposal plans including provision of necessary equipment to avoid inappropriate use, and to ensure disposal of medical waste.

Timeframe: 2025 – 2028.

Geographical coverage/level: National and State level.

Estimated budget: US\$ 10000000.

Body responsible for implementation and reporting: Ministry of Health.

vi. Component target aligning with national target 9:

Ensure that the management and use of wild species are sustainable, thereby providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity, that will enable people to continue to realize benefits from these species, such as food and nutrition, medicine and other uses.

Action 1

Develop regulations on management of the use of, and trade in wildlife, so that it is safe from human health perspective, by removing species that are of high-risk for disease emergence from wildlife trade.

Timeframe: 2025 – 2026.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: Wildlife Authority.

Action 2

Convene a forum to exchange experiences and views on matters related to use of, and trade on wild species.

Timeframe: 2026 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Ministry of Health.

vii. Component target aligning with national target 10:

Enhance biodiversity and sustainability in agriculture, aquaculture, fisheries, and forestry contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services.

Action 1

Develop national dietary guidelines to promote diverse and sustainable use of foods, local crops and livestock, and fisheries.

Timeframe: 2025 – 2026.

Geographical coverage/level: National.

Estimated budget: US\$ 150000.

Body responsible for implementation and reporting: Food Security Directorate.

Action 2

Promote for introducing organic and eco-farming for promotion of sustainability in agriculture, with necessary certification for this system.

Time frame: 2026 – 2030.

Geographical coverage/level: National.

Estimated budget: US\$ 200000.

Body responsible for implementation and reporting: Ministry of Agriculture.

viii. Component target aligning with national target 11:

Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters.

Action 1

Conduct campaigns to raise awareness of the value of ecosystem functions and services to health and wellbeing across different community groups.

Timeframe: 2025 – 2027.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 1000000.

Body responsible for implementation and reporting: HCENR.

Action 2

Conduct a study to identify the benefits of biodiversity for the health of people, wildlife, and the environment, including its use intrinsic values.

Timeframe: 2026 – 2027.

Geographical coverage/level: Country-wide.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: HCENR.

ix. Component target aligning with national target 12:

Increase green and blue spaces in urban and densely populated areas and ensure biodiversity-inclusive urban planning for improving human health and well-being and connection to nature, and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services.

Action

Advocate with concerned authorities to consider establishment of, and expansion in green and blue spaces in the post conflict/war rehabilitation plans for cities, in order to enhance human health and wellbeing through green and blue spaces.

Timeframe: 2025 – 2026.

Geographical coverage/level: All states.

Estimated budget: US\$ 500000.

Body responsible for implementation and reporting: Ministry of Health.

x. Component target aligning with national target 17:

Strengthen biosafety measures against risks to biodiversity and human and animal health.

Action

Formation of institutional biosafety committees in health institutions and relevant sectors of one health platform to support multisectoral coordination mechanism, where potential benefits and risks from biotechnology applications could be assessed from health and environmental perspectives.

Timeframe: 2025 – 2026.

Geographical coverage/level: National and state levels.

Estimated budget: US\$ 100000.

Body responsible for implementation and reporting: HCENR.

Part III

Implementation Matters

Implementation Matters

A number of matters are dealt with as important for ensuring effective implementation of the NBSAP, including securing necessary financial, human and physical resources. In this Part, these matters are handled in a relatively detailed manner to ensure the well and full understanding for their roles and impacts during the implementation process. They include the following:

- Matters and elements to be considered for effective implementation of the NBSAP.
- Financial resources' needs and estimated budgets for implementation.
- Capacity building and development needs and implementation plan.
- Proposal for gender mainstreaming during NBSAP implementation.
- Roles of indigenous peoples and local communities in the NBSAP implementation.
- Monitoring system and framework.

Further information and details are given in the following chapters.

Chapter 9

Towards Effective Implementation of the NBSAP (2025-2030)

In order to ensure effectively implementing the NBSAP during 2025-2030, the actions set under different components and related aspects have been analysed in a way to identify the priority level for each action, opportunities to enhance its implementation, risks that may hinder the implementation, as well as challenges that should be taken into account during the implementation process.

Setting priorities among different actions proposed under either of the components and related aspects has been accomplished through consideration of the importance of the action *per se* in the country, as well as its relative importance compared to the other actions.

Opportunities, risks and challenges were identified according to the definitions that “An **opportunity** is a favourable circumstance with the potential for positive outcomes, while **risk** is an uncertainty that can lead to either negative consequences (a threat) or positive outcomes (an opportunity). A **challenge** is a difficulty or obstacle that must be overcome to achieve a goal, often reframed from a potential weakness to an area for growth and improvement”.

Detailed descriptions for priority levels, opportunities, risks and challenges across different targets, biodiversity components or related aspects, and actions are given in *Appendix 2*. They are generally summarised in the following:

9.1 Priority levels

While the absolute majority of 62% out of the total set actions, which are 304 actions, are considered of high importance, only 7% are categorised of low priority level. The rest (31%) are classified within a medium level of priority.

9.2 Opportunities

Different circumstances are reported available as opportunities for successful implementation of the actions under different biodiversity components and related aspects. They include existence of different competent institutes in the country such research centres, universities, governmental bodies and non-governmental organisations with mandates and experiences on relevant topics. Moreover, the availability of national scientific and technical expertise on a number of relevant issues is among those opportunities reported with a number of actions.

Also, availability of some international organisations that can provide or facilitate accessing necessary funding has been reported as great opportunities for implementation of a number of actions, with some cases where previous experiences and established links with these organisations are already known. Among those are also the situations where Sudan is a party to a number of relevant conventions such the Nagoya Protocol on Access to Genetic Resources, the International Treaty on Plant Genetic Resources for Food and Agriculture, and the RAMSAR Convention on Wetlands.

The availability of full drafted documents such as some of policies and legislations waiting for final approval provide good opportunities for enhancing the adoption of policy related and legal measures as proposed in some actions. Among those, for example, are the national Access and Benefit Sharing Legal Framework, the proposed national Plant Genetic Resources Law, and the amended Wildlife Law.

9.3 Risks

Dozens of risks are indicated as uncertainties, which may stop, hinder or slow down the implementation processes of different actions, and resulting at the end in failures to realize the specified targets. On top of these is the current war in the country covering vast areas and resulting in a state of political unrest and instability. Among the consequences of this war is the possible negative impacts on the environment in general and the biodiversity in specific. The ongoing armed conflicts and fighting in some parts of the country such as in Darfur and Kordofan regions, to the west, may render these areas inaccessible for carrying out some of the activities, including for germplasm collecting, or ensuring effective management of present protected areas, or retarding the establishment of new ones, or working with local communities in these areas.

Another set of risks specified revolve around the uncertainty of securing the required funding to implement a considerable number of actions. Lack of funding from national sources, or insufficiency of funding, even from external sources, are among the major risks that may retard the implementation processes. Moreover, inadequacy of qualified personnel in some fields may render it impossible to effectively implement some of the actions, unless effective capacity development activities are conducted on relevant areas.

Lack of necessary awareness among some of high policy makers is specified together with weak coordination between concerned parties as factors that may lead to ranking an action at a low priority in the agenda of the concerned bodies. Bureaucratic constraints may also constitute risks for timely and effectively implementing a number of actions, unless sufficient awareness is raised among those involved.

9.4 Challenges

Among the top challenges to face are convincing the policy makers and decision takers to effectively support the implementation processes of the NBSAP, as well as others to be involved in the implementation. However, designing the right awareness materials to the right target groups is very challenging in this regard. Overcoming language barriers is a challenge to consider when working with indigenous peoples and local communities for enhancing conservation and sustainable use of biodiversity in the local ecosystems. It is also highly challenging to ensure involving the right stakeholders with strong coordination between them.

Addressing the right aspects with the right ways of tackling is challenging when developing or amending policies or legislations. Identifying the right specifications and sources when planning for obtaining new equipment, or establishing new structures is also very challenging for ensuring effective implementation of some actions.

Chapter 10

Financial Resources Needs for the Implementation of the NBSAP (2025-2030)

The financial resources needed for the implementation of the NBSAP between 2025 and 2030 are estimated for each of the set actions (*Appendix 1*). They are categorized according to the different national targets under either of the set four national goals, which are:

- Goal A: Protect and Restore (Reduce Threats to Biodiversity and Enhance its Conservation).
- Goal B: Prosper with Nature (Enhance Sustainable Use of Biodiversity).
- Goal C: Share Benefits Fairly (Access and Benefit Sharing).
- Goal D: Invest and Collaborate (Ensure Adequate Means of Implementation).

10.1 Budgets estimated to attain different goals

Budgets needed to implement any set of actions for either of these goals are calculated per each biodiversity component or related aspects. *Appendix 3* shows details and totals of budgets estimated for those actions set to address related national targets for either of the biodiversity components and related aspects under either of the national goals. Combined details on budget needs as per different goals, components or related aspects are shown in Table 10.1. Therefore, a total budget of (US\$ 409,525,000) is needed, of which the maximum needed budget is for implementing the actions to attain the national goal A, which is (US\$ 283,955,000), indicating the highest importance of this goal on reducing threats on biodiversity and enhancing its conservation in Sudan. Those actions are far relatively costly than the second group of actions aiming to realizing goal D on availing adequate means of implementation, including capacity building activities, and developments of project proposals, and conducting necessary researches and enhancing scientific collaborations, which in all will be costing (US\$ 96,930,000).

Moreover, a total of (US\$ 20,000) is already secured to develop a national gender plan of action for biodiversity, which is the only cross cutting action to attain the national target 23 on gender equality during the NBSAP implementation (*Appendix 1*).

However, a total (US\$ 2,355,000) will also be needed to implement the monitoring framework for measuring the progress in the implementation of this NBSAP (*Appendix 7*).

Table 10.1. Total estimated budgets across different national goals and biodiversity components or related aspects

National Goal	Biodiversity Component or related Aspects	Total National Targets addressed	Total Actions Proposed	Total Budget Estimated (US\$)
Goal A	Cultivated Plant Agrobiodiversity	4	14	3070000
	Range Plant and Animal Agrobiodiversity	4	7	2075000
	Forest Biodiversity	4	13	42095000
	Wildlife Biodiversity	7	24	83100000

National Goal	Biodiversity Component or related Aspects	Total National Targets addressed	Total Actions Proposed	Total Budget Estimated (US\$)
	Marine Biodiversity	8	20	7550000
	Inland Waters and Wetlands Biodiversity	8	18	11620000
	Insect and Microorganism Biodiversity	2	5	4300000
	Pollution Aspects related to Biodiversity	2	8	114420000
	Climate Change Impacts on Biodiversity	2	5	3400000
	Biosafety and Biotechnology Aspects related to Biodiversity	4	5	1720000
	Health Aspects related to Biodiversity	4	6	10605000
	Sub-Total		125	283955000
Goal B	Cultivated Plant Agrobiodiversity	4	6	1800000
	Range Plant and Animal Agrobiodiversity	1	1	500000
	Forest Biodiversity	1	3	3400000
	Wildlife Biodiversity	2	5	1800000
	Marine Biodiversity	2	5	1950000
	Inland Waters and Wetlands Biodiversity	2	4	1100000
	Insect and Microorganism Biodiversity	1	3	1200000
	Access and Benefit Sharing Aspects related to Biodiversity	1	1	200000
	Biosafety and Biotechnology Aspects related to Biodiversity	2	3	3520000
	Health Aspects of Relevance to Biodiversity	5	9	3020000
	Sub-Total		40	18490000
Goal C	Cultivated Plant Agrobiodiversity	3	5	420000

National Goal	Biodiversity Component or related Aspects	Total National Targets addressed	Total Actions Proposed	Total Budget Estimated (US\$)
	Access and Benefit Sharing Aspects related to Biodiversity	4	8	9730000
	Sub-Total		13	10,150,000
Goal D	Cultivated Plant Agrobiodiversity	10	18	2090000
	Range Plant and Animal Agrobiodiversity	7	7	1450000
	Forest Biodiversity	6	15	28940000
	Wildlife Biodiversity	10	15	35650000
	Marine Biodiversity	7	10	5100000
	Inland Waters and Wetlands Biodiversity	7	16	5700000
	Insect and Microorganism Biodiversity	6	13	2450000
	Access and Benefit Sharing Aspects related to Biodiversity	3	6	4950000
	Pollution Aspects related to Biodiversity	6	13	5770000
	Climate Change Impacts on Biodiversity	2	2	160000
	0	0	0	0
	Biosafety and Biotechnology Aspects related to Biodiversity	3	10	4570000
	Health Aspects of Relevance to Biodiversity	1	1	100000
	Sub-Total		126	96,930,000
Grand Total			304	409,525,000

10.2 Estimated Budgets across different Biodiversity Components and Related Aspects

Table 10.2 shows the estimated budgetary needs across the different biodiversity components as needed to implement all actions across the different national goals. Accordingly, the maximum budget needed is for conservation and sustainable use of wildlife biodiversity at a total (US\$ 120,550,000), followed by the forest biodiversity (US\$ 74,435,000, which reflects the pressing need to exert substantial efforts to ensure the conservation of such components being covering a wide range of natural ecosystems.

The pollution aspects have been estimated to need more than US\$ 120,000,000 to address those issues of relevance causing major destructive impacts on the environment in general and the biodiversity in specific in a country like Sudan. However, most of such amount will be going to acquiring necessary equipment such as incinerators for hazardous chemicals.

Table 10.2. Total estimated budgets across different biodiversity components and related aspects

Biodiversity Component or Related Aspects	Budget Estimates across different National Goals US\$				Total Budget US\$
	Goal A	Goal B	Goal C	Goal D	
Cultivated Plant Agrobiodiversity	3070000	1800000	420000	2090000	7,380,000
Range Plant and Animal Agrobiodiversity	2075000	500000	0	1450000	4,025,000
Forest Biodiversity	42095000	3400000	0	28940000	74,435,000
Wildlife Biodiversity	83100000	1800000	0	35650000	120,550,000
Marine Biodiversity	7550000	1950000	0	5100000	14,600,000
Inland Waters and Wetlands Biodiversity	11620000	1100000	0	5700000	18,420,000
Insect and Microorganism Biodiversity	4300000	1200000	0	2450000	7,950,000
Access and Benefit Sharing Aspects related to Biodiversity	0	200000	9730000	4950000	14,880,000
Pollution Aspects related to Biodiversity	114420000	0	0	5770000	120,190,000
Climate Change Impacts on Biodiversity	3400000	0	0	160000	3,560,000
Biosafety and Biotechnology Aspects related to Biodiversity	1720000	3520000	0	4570000	9,810,000
Health Aspects of Relevance to Biodiversity	10605000	3020000	0	100000	13,725,000
Total	283,955,000	18,490,000	10,150,000	96,930,000	409,525,000

10.3 Possible Sources of Funding

A number of national, regional or international bodies are indicated as being possible sources for funding or can be playing facilitating roles in this regard. They include, for examples, the following:

- Sudan Government (Ministry of Finance).
- Global Environment Facility (GEF).
- Benefit Sharing Fund of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA – BSF).
- Climate Technology Centre and Network (CTCN).
- Consultative Group on International Agricultural Research (CGIAR).
- Global Crop Diversity Trust (Crop Trust).
- Green Climate Fund (GCF).
- Intergovernmental Authority on Development (IGAD).
- International Fund for Animal Welfare (IFAW).
- International Union for Conservation of Nature (IUCN).
- Least Developed Countries Fund (LDCF).
- Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA)
- World Bank Group (WBG).
- World-Wide Fund for Nature (WWF).
- Different UN agencies such as FAO, UNDP, UNEP and UNESCO.
- Different International Development Cooperation Agencies Such as JICA (Japan), GIZ (Germany), USAID (United States of America), Sida (Sweden) and FINIDA (Finland).
- European Union (EU),

Chapter 11

Capacity Building and Development Needs and Implementation Plan within the Context of the NBSAP (2025-2030)

According to the Long-Term Strategic Framework for Capacity-Building and Development, which has been adopted by the fifteenth meeting of the Conference of the Parties (COP 15) to support nationally determined priorities for the implementation of the Kunming-Montreal Global Biodiversity Framework (KMGBF), capacity development is defined as “the ability of people, organizations and societies as a whole to achieve the set biodiversity-related goals and action targets”. It is, therefore, understood as “the process whereby people, organizations and society as a whole, unleash, strengthen, create, adapt and maintain capacity over time to achieve positive biodiversity results”.

Being guided and bound by the general mission, national goals and national targets of the present Sudan’s NBSAP for the period of 2025-2030, capacity building and development have been forming the back bone for the whole body of such strategy and action plan. This needs no more to prove than to notice that 50% the set actions in this NBSAP are of capacity building and development nature.

11.1 Overview of the set capacity building and development actions

The Sudan’s NBSAP (2025-2030) contains 152 actions (50%) on capacity building and development out of a total of more than 300 actions covering different aspects. They are categorised under three main categories of capacity building and development, which are:

- i. Awareness raising and training.
- ii. Policies, strategies, plans and legislations.
- iii. Structures, institutions, systems and equipment.

Detailed descriptions of such capacity needs on the different categories are shown in the attached Matrix within *Appendix 4*. Total numbers of actions proposed under each category are almost closer to each other, where they are 55 under awareness and training, 47 under policies, strategies, plans and legislations, and 50 under structures, institutions, systems and equipment, indicating a major finding that enhancing conservation and sustainable use of biodiversity in Sudan still need major capacity development interventions. This wouldn’t be achieved without building and further developing the capacities of the individuals, organizations and the society as a whole, including through building and developing individual human capacities, creating enabling environments through developing and adopting relevant policies, strategies, plans and legislations, as well as creating necessary organizational set-ups through establishing important structures and systems that are adequately equipped to fulfil their missions and mandates.

11.2 Levels and types of capacity needs

According to the Long-Term Strategic Framework for Capacity Development, capacity development “exists at different interconnected levels”, and “many organizations use the following three-level delineation: enabling environment, organizational and individual”, which is accordingly has been adopted in this NBSAP. On the other hand, two types of capacities are needed, as proposed by the said framework, including the technical capacities, (which are specific to a particular sector or thematic area), and functional capacities, (which are needed across the board regardless of the sector or area).

Below are summarised overviews on levels and types of capacities needed under the different categories according to the present NBSAP:

11.2.1 Awareness raising and training

In terms of awareness and training capacities, the absolute majority of actions are categorized at the individual level with 75%, while only 8% are considered at enabling environment level being targeting raising awareness on broad issues among different stakeholders, including policy makers and communities, to help in creating the necessary enabling environments for functioning. However, they are categorised at organizational level in some cases (17%), when the training or awareness activities are targeting groups of people among different organizations to raise their capacities in understanding and accommodating new ideas.

While 73% of the actions are considered as technical, about 27% are considered functional, since they are targeting to creating enabling conditions, or aspiring and engaging groups of individuals in the whole functioning of the society or organizations, rather than only raising their technical capabilities.

11.2.1.1 Topics for awareness raising and training activities

Various topics are proposed to be addressed during different awareness raising and training activities across the different biodiversity components and targets. Examples of such topics include the following:

- Effective participation and engagement of local communities.
- Impacts of climate change on biodiversity
- Adverse impacts of traditional as well as organized gold mining on inland waters and wetlands.
- Negative impacts of excess nutrients, pesticides, hazardous waste, chemicals and plastic on biodiversity.
- Importance of preventing losses in rangelands.
- Wildlife wise and sustainable use.
- Incorporation of biodiversity and economic accounting in the curricula.
- Integrated Coastal Zone Management (ICZM).
- Values of ecosystem functions and services to health and wellbeing.
- Sustainable use of wetland biodiversity.
- Awareness and interest raising at high policy level on biosafety issues.
- Training and capacities on monitoring the utilization of genetic resources, including the establishment of checkpoints.
- Training on forest biodiversity conservation.
- Training on combating and managing invasive alien species
- Training on plant identification, population biology, ethno-botany, use of geographical information systems (GIS), and molecular tools.

11.2.1.2 Target groups

Various groups are to be targeted by the different awareness raising and training actions, including:

- Decision makers and takers at high policy level.

- Local communities.
- Staff of specialized technical agencies.
- Staff of other governmental agencies.
- Private sector.
- Members of NGOs and civil society organizations.
- Academic and educational institutes staff.
- Students and pupils.

11.2.2 Policies, strategies, plans and legislations

About 60% of the proposed actions in terms of policies, strategies, plans and legislations are sub-categorised as enabling environment level, being on development and enforcement of national policies, strategies or legislations on matters related to biodiversity conservation, sustainable use or access and benefit sharing.

While 89% of the proposed actions are of functional nature, 11% are considered of technical nature, being on specific capacities of very technical nature such as planning for adopting specific activities for anti-bleaching of coral reef.

11.2.3 Structures, institutions, systems and equipment

All proposed actions are of organisational nature, being dealing with creating new structures, establishing new institutions, adopting new systems, or acquiring new equipment; all to enable the concerned organizations to effectively function. However, in one case that deals with establishing a certification system for eco-farming, both enabling environment and organizational levels are to be considered, since such a system involve having right policies, legislation as well as procedures.

About 52% of these actions are considered of technical type being dealing with specific technical interventions, as specific systems to be adopted, or specific equipment to be acquired. On the other hand, the rest (48%) are considered of functional nature being dealing with establishing new units or institutions, or even adopting new structures, as partnership structures to support collaborative research.

11.3 Implementation plan

All capacity building and development actions are proposed to be implemented during the period of 2025-2030 if sufficient funds, which are estimated to be (US\$ 230,195.000) in total, are made available. Implementation agencies include main implementing agency that is responsible for reporting, in collaboration with some other agencies as per each action. Details on the different items in relation to implementation are included in *Appendix 4*.

11.3.1 Awareness raising and training

The absolute majority of the set actions on awareness raising and training should start immediately during 2025, indicating their high urgency and the immediate needs for them. The rest of actions are planned to be initiated or conducted the years to follow starting from 2026. Some of the actions are planned to be fully conducted during one year, such as training on using remote sensing in the assessment of rangelands, while others are proposed to be conducted during three to five years (from 2025-2030), such as human capacity development on conservation and sustainable use of PGRFA, awareness on impacts of climate change on

biodiversity at different levels, and awareness and interest raising at high policy level on biosafety issues.

Quite a range of agencies are proposed to be main implementing and reporting agencies for awareness and training actions, including for examples:

- Ministry of Agriculture.
- Higher Council for Environment and Natural Resources.
- Agricultural Plant Genetic Resources Conservation and Research Centre.
- Forests National Corporation.
- Wildlife Conservation Forces.

A total of (US\$ 36,930,000) is estimated as full budget required to fully conduct all actions for raising awareness and training on matters related to biodiversity.

11.3.2 Policies, strategies, plans and legislations

Most of the actions on policies, strategies, plans and legislation (64%) are proposed to be initiated as soon as possible during the first year (2025), indicating the great importance and high urgency level of them. While some actions (11%) are proposed to be conducted within one year, such as updating/approving of the wildlife law and regulations to control harvesting and trade of wild species, others (23%) are proposed to be completed within five years (2025-2030), such as developing and adopting a coral reef bleaching response plan. The rest of the actions are proposed to be implemented within years ranging between two to four years.

A number of agencies will be responsible for implementation of these actions as main implementing and reporting agencies such as Ministry of Animal Resources, Ministry of Agriculture, Ministry of Industry, Institute of Marine Research, General Directorate of Fisheries, National Pesticides Council and Sea Ports Corporation.

A total of (US\$ 25,050,000) is estimated as full budget required to fully conduct all actions on capacity development in terms of policies, strategies, plans and legislations on matters related to biodiversity in Sudan.

11.3.3 Structures, institutions, systems and equipment

A total of 70% of capacity development actions set in terms of structures, institutions, systems or equipment are planned to be initiated in 2025, indicating the more urgency for either of them. On the other hand, only 8% of them are proposed to be accomplished within only one year, such as establishing a web-based platform for wildlife conservation data-base and information, while 50% of them are planned to be implemented within the five years from 2025 to 2030, such as establishing an *ex-situ* conservation system for critically threatened forest species. The rest of actions are to be implemented within a range of 2-4 years.

A number of agencies will be responsible for implementation of these actions as main implementing and reporting agencies such as Ministry of Health, Ministry of Energy and National Centre for Research.

A total of (US\$ 168,215,000) is estimated as full budget required to fully conduct all actions on capacity development in terms of structures, institutions, systems or equipment on matters related to biodiversity in Sudan. This is in fact the greatest budget required among the different categories of capacity development needs, indicating how costly will be to build and develop

such physical and structural capacities for conservation and sustainable use of biodiversity in Sudan. As an example, acquiring incinerators and using appropriate modern chemical treatment techniques, and bioremediation and/or biodegradation techniques is estimated to cost alone one hundred million dollars.

Chapter 12

Proposals to ensure Gender Mainstreaming during the Implementation of the NBSAP (2025-2030)

National target 23 is about ensuring the gender equality in the implementation of the NBSAP, with major focus on women and girls, which is in full alignment with the global target 23 of the Kunming-Montreal Biodiversity Framework. It reads as following:

“Ensure gender equality in the implementation of the NBSAP in Sudan through a gender responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity”.

This target is, therefore, emphasising on the participation of women and girls in the implementation of the NBSAP equally with other groups, especially in the opportunities, capacities and in meaningful and informed participation and leadership at all levels of action and decision making related to biodiversity.

12.1 How to ensure the gender mainstreaming in the NBSAP implementation?

The Sudan’s NBSAP (2025-2030) will be implemented through 304 actions, across which there should be concerns about ensuring the effective participation of women and girls, whenever, wherever and however it is appropriate. Nevertheless, a number of actions have been identified as being major actions on which it is very necessary to ensure such participation. They are composed of 42 actions under different biodiversity components and related aspects, and are distributed over 16 national targets. They address the different objectives of the CBD, with the majority are related to conservation (64%), while the rest are of relevance to sustainable use (17%), and access and benefit sharing (7%), with some actions related more than one objective at the same time (12%). Actions are proposed for consideration during the implementation of either of these actions to ensure equal opportunities, equal capacities and/or effective meaningful and informed participation. *Appendix 5* contains full details of these actions with the related proposals to be considered during the implementation to ensure gender mainstreaming.

12.2 Proposals to ensure gender mainstreaming during implementation

A number of measures are proposed in correspondence to each of the actions in order to ensure the gender mainstreaming during the implementation of such actions, with due consideration of the required elements of equal opportunities, equal capacities and effective participation in decision making. These measures are summarised in the following.

12.2.1 Equal opportunities

The absolute majority of the actions are related to human capacity building through raising awareness or training activities. Equal opportunities for gender participation are proposed to be ensured through involving women and or girls with a proportion of 50% of the participants in almost all activities.

12.2.2 Equal capacities

Equal capacities of women and/or girls participating in whatever related activities are proposed to be ensured through:

- Balancing education and experience levels among candidate participants by facilitating/conducting gender-disaggregated data collection.
- Ensure that gender experts are included in processes such as development of awareness materials.
- Using standard, well-known, and local terminologies and simple wording as well as using visuals, audios, and interactive approaches during the relevant activities.

12.2.3 Full, equitable, meaningful and informed participation and leadership

The full, equitable, meaningful and informed participation and leadership are proposed to be ensured through the following measures:

- Participation of women in at least 30% of the participants in the development of the education and public awareness materials, or whatever similar processes.
- Ensuring that women are represented by at least 30% of the indigenous peoples and local communities that are represented in bodies of decision-making processes, and access to justice.

Chapter 13

Roles of Indigenous Peoples and Local Communities in the Implementation of the Sudan's NBSAP (2025-2030)

National Target 22 of the present NBSAP deals with ensuring the full and effective participation of indigenous peoples and local communities (IPLCs) in matters related to biodiversity in Sudan. It states:

“Ensure the full and effective participation of indigenous and local communities in Sudan, at all relevant levels, and their access to justice and information related to biodiversity, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as women and girls, children and youth, and persons with disabilities, and ensure the full protection of environmental human rights defenders”.

It is, therefore, necessary to consider this throughout the implementation processes of the NBSAP across the different actions. However, a number of actions have been identified as specifically being strongly associated with these IPLCs, whom are perceived to play major roles in the implementation of such actions.

13.1 Global Context

In November 2024 the COP 16 of the parties to the CBD decided “to adopt the programme of work on Article 8(j) and other provisions of the Convention on Biological Diversity related to indigenous peoples and local communities to 2030, ..., prioritizing those tasks that contribute directly to the timely, full and effective implementation of the Kunming-Montreal Global Biodiversity Framework”. The tasks included in the programme are composed of eight elements, covering the following aspects:

- i. Conservation and restoration,
- ii. Sustainable use.
- iii. Sharing of benefits.
- iv. Knowledge and culture.
- v. Implementation and monitoring.
- vi. Effective participation.
- vii. Human rights.
- viii. Access to funding.

Among specific objectives of this programme is “to ensure the full and effective participation of indigenous peoples and local communities at all stages and levels of the *implementation of KMGBF*, thereby ensuring an ongoing recognition of the close association that indigenous peoples and local communities have with biological diversity and the Convention and its Protocols”.

The responsibilities to implement this programme are to be shared at international, regional and national levels, including the parties to the CBD.

13.2 Roles of IPLCs within the National Context

Envisaged roles by the IPLCs in Sudan are identified across a number of actions of the present NBSAP. Details of such actions with other related information are included in *Appendix 6*.

They are categorized according to the different national targets of relevance, under different biodiversity components or related aspects. Further information on the type of intervention by the specified action and the CBD objective of relevance are given. Moreover, the relation with the said programme is highlighted in terms of specific element(s) and task(s) the action will be serving. Further proposals, if any, to ensure the effective participation of the IPLCs within the concerned action are given.

13.3 Overview of the NBSAP actions including roles by the IPLCs

Fourteen actions are specifically identified with explicit roles by the IPLCs to play in their implementation. They are distributed among six biodiversity components and related aspects, which are cultivated plant agrobiodiversity, wildlife biodiversity, marine biodiversity, inland waters and wetlands biodiversity, insect and microorganism biodiversity and access and benefit sharing aspects related to biodiversity. They are categorized under eight national targets.

They intervene across a number of issues including effective participation, access and benefit sharing, awareness raising and training and knowledge documentation. They are parallelly distributed among the three objectives of the CBD; conservation, sustainable use and access and benefit sharing.

They are also parallelly distributed over a number of elements of the programme of work on Article 8(j) and other provisions of the Convention on Biological Diversity related to indigenous peoples and local communities. These elements include conservation and restoration, sustainable use of biological diversity, sharing of benefits, knowledge and culture and full and effective participation of IPLCs

Some proposals are given to ensure the effectiveness of the roles of the IPLCs with respect to some actions, including, for examples, considering organizing awareness activities during the implementation processes, involving individuals from the IPLCs during some of preparatory activities, encouraging forming of committees representing IPLCs during the implementation, when appropriate, and ensuring balanced participation of the IPLCs in activities involving others.

Chapter 14

Monitoring Framework for the Implementation of the NBSAP (2025-2030)

A monitoring framework/system has been developed and adopted as was completed during the process of Assessment of National Monitoring System and Development of Monitoring Action Plan, which was carried out during the year 2024 as part of the Early Action project to implement KNGBF in Sudan.

A set of indicators are adopted at the national targets level, as well as national indicators at the actions level. Those indicators at the target levels include headline indicators, binary indicators, component indicators and complementary indicators, which are all well detailed in *Appendix 7*. National indicators, which are those related to the different actions are considered part of the system. Examples for such national indicators are shown in *Appendix 7*, with the full details included in *Appendix 1* of this action plan.

Agencies responsible for the implementation of the proposed monitoring system in terms of ministries and other institutes and organizations are also well detailed in *Appendix 7*. Budgets needed are detailed per either of the items as also shown. However, the total estimated budget is (US\$ 2,355,000).

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Appendices

Appendix 1

Actions set to attain different national targets, and their estimated budgets, indicators and implementing bodies

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
National Target 1 By 2030, the rate of loss of all natural habitats in Sudan is brought down by at least 25 per cent, and degradation and fragmentation are significantly reduced through participatory, integrated and biodiversity inclusive spatial planning, and/or effective management processes, while respecting the rights of indigenous peoples and local communities					
Establish range enclosures in identified areas, to prevent over grazing and early grazing	Range Plant and Animal Agrobiodiversity	500000	Number of enclosures established per year	Range and Pasture General Directorate	Ministry of Finance, Community organizations
Develop awareness materials and conduct awareness activities on importance of preventing losses in rangelands		200000	Number and type of awareness materials developed, and number of awareness activities carried out	Range and Pasture General Directorate (RPGD)	Ministry of Finance, Community organizations
Activate the Rangeland Act 2015 for conservation, protection, sustainable use of rangelands		100000	Trend in adoption by customary and government courts of the law	RPGD	Ministry of Justice and Judiciary
Conduct pilot activities for using water harvesting techniques to increase soil moisture content for restoration		100000	Total areas restored using water harvesting technique	RPGD	Ministry of Irrigation
Develop and implement programmes for applying	Forest Biodiversity	150000	Trend in increase of forest cover	Forests National Corporation (FNC)	Ministry of Agriculture

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
sustainable land management practices such as rotational grazing, agroforestry and contour ploughing in some targeted areas					
Conduct assessment studies to identify degraded forest areas and prioritize sites for restoration		300000	Results of the conducted studies	FNC	Local community organizations
Conduct a survey on wildlife biodiversity to identify the most affected areas by land and sea uses leading to wildlife loss	Wildlife Biodiversity	3000000	Results of the survey in terms of identified areas	Wildlife Conservation Forces (WCF)	Research centres, universities
Develop effective action plans to address the detected types of loss causes		500000	Existence of the plans	WCF	Research centres, universities
Take actions to effectively enforce law by improvement of wildlife-antipoaching unit performance		5000000	Number of patrolling units fully equipped and work in the field	WCF	
Participation in training courses outside the country on effective wildlife management		2000000	Number of officers and rangers trained	WCF	Research centres, universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct the necessary studies to evaluate the current status of areas suffering from degradation and fragmentation	Marine Biodiversity	300000	Number and results of the studies conducted	Institute of Marine Research (IMR)	Faculty of Marine Sciences and Fisheries (FMSF), Red Sea Fisheries Research Station (RSFRS), Marine Fisheries Administration (MFA), HECNR
Conduct the necessary studies to identify the reasons and causes behind the loss of marine habitats		200000	Number and results of the studies conducted	IMR	FMSF, RSFRS, MFA
Develop and implement special plans to stop the loss in marine habitats		400000	Existence of the plans, and the trend in the reduction in the rate of loss of habitats	IMR	IMR, FMSF, RSFRS, MFA, the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA)
Develop wetlands biodiversity strategic action plan	Inland Waters and Wetlands Biodiversity	250000	Existence of the strategic action plan	HCENR	Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry, Range and Pasture Administration, Universities, Research Centres

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
National Target 2: Ensure that, by 2030, at least 10% of degraded terrestrial, inland water, coastal and marine ecosystems in Sudan that provide essential services, including services related to water, and contribute to health, livelihoods, wellbeing and climate, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.					
Seed broadcasting in degraded range lands, removal of harmful and unpalatable plants, and digging of water spots along pastoral paths	Range Plant and Animal Agrobiodiversity	500000	Areas covered by broadcasted seeds, and number of wells dug	RPGD	Ministry of Finance
Establishment of a system for managing the water bodies, particularly hafirs, in order to share the water resource management and to avoid conflicts, and at the same time to ensure the ability Ministry of Irrigation and Water Resources to sustain and maintain the hafirs.		75000	Number of water bodies (hafirs) under proper management	RPGD	Ministry of Irrigation and Water Resources
Establish a consultation process on innovative solutions to halt marine degradation and restore ecosystems	Marine Biodiversity	300000	Number and type of innovative solutions agreed upon	HCENR	

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Implementation of training activities on coral reef, mangrove and seagrass restoration		200000	Number and type of training activities conducted	HCENR	
Develop, promote and implement marine restoration projects on coral reef mangrove and seagrass restoration in degraded areas		600000	Number of developed and implemented marine restoration projects	HCENR	IMR, FMSF, RSFRS, MFA, PERSGA
Organization of a consultation process on methodologies for restoration of wetlands biodiversity	Inland Waters and Wetlands Biodiversity	200000	Results of the consultation in terms of identified methodologies	HCENR	Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry, Range and Pasture
Mapping all existing mangrove stands and degraded sites		120000	Number and sites of degraded mangrove stand	HCENR	WCF, WRC, FNC
Conduct a national assessment study to identify, map and prioritize the critical sites used by migratory water birds as stopover sites in order to		250000	Number and sites of critical stopover sites for migratory water birds identified, mapped and prioritized	HCENR	WCF, Wildlife Research Centre (WRC)

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
plan for restoring the degraded ones					
Develop a comprehensive restoration plan through compilation of restoration plans of different biodiversity components	Health Aspects of relevance to Biodiversity	200000	Existence of a biodiversity restoration plan incorporating health aspects	HCENR	Ministry of Agriculture and Forestry, FNC, Range Directorate, Ministry of Health, Ministry of Finance
National Target 3: Ensure by 2030, that at least 15 per cent of terrestrial, inland water and coastal and marine areas in Sudan, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area based conservation measures, and integrated into the wider landscapes and seascapes, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, and recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories					
Make clear border demarcation for all wildlife reserves and game sanctuaries and update their maps and their biodiversity information	Wildlife Biodiversity	10000000	Trend in progress in the demarcation operation, and updating of the data base and maps	WCF	Research centres, universities, Ministry of Finance
Establish new terrestrial and marine protected areas and declaring new Ramsar sites in wetland areas		5000000	Number of new protected areas declared	WCF	
Construct new equipped offices for wildlife management in different protected areas		10000000	Number of new wildlife offices established at locality level and well working.	WCF	

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Development of awareness materials and organization of awareness raising activities for local communities		1000000	Number and types of awareness materials developed and activities conducted	WCF	
Develop national guidelines categorizing protected areas based on international categories of protected areas such as IUCN and RAMSAR		10000000	Existence of the guidelines to categorizing protected areas	WCC	
Establishment of Community-Based Natural Resource Management (CBNRM) Framework		100000	Existence of a Community-Based Natural Resource Management (CBNRM) Framework	WCF	
Develop and implement programs to improve effective and equitable management in Dungonab Bay and Mukkawar Island, and Sanganeb Marine National Parks	Marine Biodiversity	300000	Number of implemented marine programmes, and trend in improving effective and equitable management in Marine National Parks	HCENR	WCF, HECNR, IMR, FMSF, MFRS, MFA, PERSEGA
Raising public awareness for local communities existing around Dungonab Bay and Mukkawar Island Marine National Parks		1500000	Trend in the raising of the awareness of local communities around the parks	HCENR	WCF, HECNR, IMR, FMSF, MFRS, MFA, PERSEGA

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct a wide consultation process on development of proposals for new marine protected areas		200000	Results of the consultation on establishment of new protected areas	HCENR	WCF, IMR, FMSE, MFRS, MFA, PERSEGA
Establish new protected areas, game reserves and sanctuaries to represent all ecological zones and states with special attention to inclusion of inland fresh water (khors and wadis) and for the non-Nilotic lakes such as Kundi, and for Wadi Alalagi	Inland Waters and Wetlands Biodiversity	1000000	Number of new protected areas established	Wildlife Conservation Forces (WCF)	HCENR, local communities, private sector, Ministry of Finance
Formulate new management plans for protected areas that have no management plans to improve the management effectiveness		700000	Number of new management plans formulated	Wildlife Conservation Forces	HCENR, local communities, private sector, Ministry of Finance
Declare new RAMSAR wetlands		4500000	Number of New RAMSAR wetlands declared	WCF	HCENR
National Target 4					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Ensure by 2030, that urgent management actions are taken to prevent the extinction of known threatened species, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species, including cultivated plants and domesticated animals, and to improve and sustain their conservation status, particularly of those most in decline, including through <i>in-situ</i> and <i>ex-situ</i> conservation practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence					
On-farm conservation of PGRFA through community genebanks	Cultivated Plant Agrobiodiversity	500000	Number of community genebanks established	APGRC	State ministries of agriculture extension departments
Building physical, human, financial, institutional and legal capacities for conservation of PGRFA		1000000	Trends in building different capacities	APGRC	Ministries of Agriculture, Finance, Justice, HCENR
Human capacity building activities on areas of relevance to conservation and sustainable use of PGRFA		500000	Number of staff trained on different areas	APGRC	International, regional and national biodiversity organizations, universities
Collection and re-collection of PGRFA from all over the country		300000	Number of species and accessions collected	APGRC	State ministries of agriculture extension departments
Repatriation of Sudanese PGRFA conserved abroad		30000	Number of accessions repatriated	APGRC	International, regional and national genebanks
Safe duplications of accessions held by the APGRC inside and outside the country		50000	Number of accessions duplicated for safety purpose	APGRC	Svalbard Global Seed Vault, Global Crop Diversity Trust
Restoration of traditional varieties back into war and disaster-affected areas		50000	Number of farmers involved and varieties used for restoration	APGRC	State ministries of agriculture extension departments

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conducting research on crop genetic diversity		200000	Number of accessions and traits studied	APGRC	Research Stations and centres
Carry out well-coordinated comprehensive surveys and assessments all over the country for all field and horticultural crops		1000000	Number of surveys conducted	Ministry of Agriculture.	ARC, State ministries of agriculture, APGRC
Collect indigenous range plant genetic resources for <i>ex-situ</i> conservation in the national gene bank	Range Plant and Animal Agrobiodiversity	200000	Number of accessions collected	APGRC	State ministries of agriculture
Carry out necessary actions for registration of 10% of proposed forests as reserved forests and be reforested using mainly indigenous species such as <i>Acacia senegal</i> , <i>Acacia nilotica</i> and <i>Khaya senegalensis</i>	Forest Biodiversity	14000000	Percentage of forests registered as reserved forests	FNC	ARC, HCENR
Implement <i>ex situ</i> conservation measures for critical threatened forest species		5000000	Number of forest species <i>ex situ</i> conserved	FNC	ARC, HCENR
Provide training and capacity-building for community members		1000000	Percentage of local community members trained	FNC	Universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
involved in conservation activities					
Gazette registration of identified biodiversity species reserves of forest trees		35000	Number of registered gazetted forest reserves	FNC	Gazette authority
Conduct a comprehensive survey to identify all species that are exposed to extinction	Wildlife Biodiversity	3000000	Results of the survey	WCF	Research centres, universities, Ministry of Finance
Conduct activities to raise awareness of stakeholders and decision makers towards wildlife conservation issues		250000	Number and type of awareness activities conducted	WCF	
Translocate and restore a number of extinct mega-fauna to their former and healthy habitats		1000000	Number of species translocated and released in the nature	WCF	
Make buffer zones at protected areas borders to reduce human-wildlife conflict		5000000	Percentage of increase in areas of buffer zones around protected areas	WCF	
Establish captive breeding centre for rare and extinct species and a genebank unit to maintain genetic diversity		5000000	Existence of the centre and the genebank	WCF	

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop an action plan for management of wild plant and animal species for medicinal uses, and for reducing human-wildlife conflicts and safe-coexistence		800000	Existence of the action plan for management of wild plant and animal species	WCF	HCENR
Develop <i>ex-situ</i> wildlife conservation strategy		100000	Existence of endorsed national <i>ex situ</i> conservation strategy	WCF	HCENR, WRC
Establish model rescue and rehabilitation centres for priority wildlife species		500000	Number of model rescue and rehabilitation centres established	WCF	WRC, universities
Conduct the necessary studies to identify endangered indigenous range species in marine ecosystem	Marine Biodiversity	400000	Number and results of studies conducted to identify endangered indigenous range species	IMR	HECNR, FMSF, RSFRS, MFA, PERSGA
Strengthen and promote the existing marine environmental monitoring program applied by IMR for coral reef habitats		800000	Level of improvement in the existing marine environmental monitoring programme	IMR	HECNR, FMSF, RSFRS, MFA, PERSGA
Establishment of marine genetic resources unit and genebank		1000000	Existence of the genebank	IMR	HECNR, FMSF, RSFRS, MFA, PERSEGA

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Establishment of national oceanographic data centre		800000	Existence of a national oceanographic data centre	IMR	HECNR, FMSF, RSFRS, FA, PERSGA, National Information Data Centre
Assess the threat status of endangered fish and mammals' species outside the protected areas and restore endangered species	Inland Waters and Wetlands Biodiversity	400000	Results in terms of threats identified, and percentage of restoration	WCF	HCENR, Fishery Administration, Wildlife Research Centre
Conduct an assessment study to identify if any of the inland waters' species are threatened and conduct habitat restoration as management action		750000	Results of the study in terms of threatened species identified, and percentage of habitat restoration	WCF	HCENR, Fishery Administration, Wildlife Research Centre
Apply existing approaches as pilot activities to prevent extinction such as closed areas/closed seasons, reduce catch/ unit efforts		500000	Number and type of approaches applied	General Directorate for Fisheries and Aquatic Lives	
Conduct a survey and studies to determine and assess the level of threatened and beneficial insect and microorganism species	Insect and Microorganism Biodiversity	500000	Results of the survey and studies un terms of identified species	Plant Protection Directorate (PPD)	HCENR, research centres, universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Establishing apiaries for rearing bees, and laboratories for rearing predator insects in crop production areas		200000	Number of apiaries and rearing laboratories established	Ministry of Animal Resources	Ministry of Agriculture, research centres and universities
Establish a national microbial culture collection laboratory to survey, collect, classify and conserve the indigenous microorganism genetic diversity		3000000	Existence of the national culture collection	National Research Centre.	Ministry of Finance, Ministry of Health, Ministry of Agriculture, universities, research centres
Establishment of <i>in-vitro</i> conservation facilities for conservation of cultivated plant genetic resources within the relevant genebanks	Biosafety and Biotechnology Aspects related to Biodiversity	1000000	Existence of PGR <i>in-vitro</i> conservation facilities	APGRC	Ministry of Agriculture and Forestry, Ministry of Finance, Bioversity International
Conducting studies and research on the possibility of using biotechnology to conserve wildlife and other genetic resources		250000	Results of the studies and researches on the subject	Wildlife Research Centre	ARC, Ministry of Higher Education and Scientific Research
Approve national policy and strategy and updated law of wildlife with consideration of the role of wild species in the	Health Aspects of relevance to Biodiversity	5000	Existence of adopted national policy of wildlife	Wildlife Conservation Forces	HCENR, Ministry of Justice, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
production of medicines and reduction of human-wildlife conflict					
Develop an action plan by the concerned authorities to reduce human-wildlife conflict at a national level		100000	Existence of national action plan	Wildlife Conservation Forces	HCENR, One Health Platform, Ministry of Finance
National Target 5 Ensure that the use, harvesting and trade of wild species in Sudan is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities					
Update / approve wildlife law, including regulations to control harvesting and trade of wild species and setting strong punishments for both illegal trade and hunting	Wildlife Biodiversity	300000	Existence of an updated law in this regard	WCF	Ministry of Justice
Develop and operationalize a national e CITES permitting and enforcement system integrated with Sudan’s export platforms		10000000	Existence of a functional national e CITES permitting platform Percentage of CITES-regulated trade processed through the e-system Number of suspicious or	WCF	

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
			illegal shipments flagged by the system		
Conduct comprehensive fish stock assessment study	Marine Biodiversity	1000000	Results of the fish stock study	Marine Fisheries Administration (MFA)	IMR, HECNR, , FMSF, MFRS, PERSEGA
Review and improve/develop regulations that encourage sustainable fishing, and avoidance of over-fishing		150000	Number of regulations reviewed and improved/developed	MFA	Ministry of Justice, IMR, HECNR, FMSF, RSFRS, PERSGA
Develop a plan for implementation of Ecosystem Approach Fishery Management		500000	Ecosystem Approach Fishery Management operational	MFA	IMR, FMSF, RSFRS, FA, PERSGA
Develop community protocols on ABS to respect and protect customary sustainable use of the genetic resources including wild species	ABS Aspects related to Biodiversity	3000000	Number of community protocols developed	HCENR - NCA	Ministry of Justice, Ministry of Agriculture, Ministry of Animal Wealth
Develop communication, education and public awareness materials on the value and contributions of customary sustainable use by indigenous peoples and		200000	Number and type of awareness materials developed	HCENR - NCA	Local communities, Ministry of Education, Ministry of Agriculture, Ministry of Culture and Information

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
local communities of wild species					
Develop regulations to avoid the unsustainable and illegal use of wildlife species, and to ensure provision of wildlife functions such as medicinal products	Health Aspects of relevance to Biodiversity	20000	Existence of law regulations on wildlife	Wildlife Conservation Forces	Ministry of Justice, local communities
Build institutional capacities to apply prevention measures for reducing the risk of pathogen spill-over through provision of hygiene equipment		400000	Trend in the improvement of institutional capacities on the matter	One Health Platform	Ministry of Finance
National Target 6 Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species (IAS) on biodiversity and ecosystem services in Sudan by identifying and prioritizing their pathways, controlling or eradicating the priority species, and putting in place measures to manage pathways to prevent their introduction and establishment, and reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent by 2030					
Awareness raising activities among different stakeholders on the issue of IAS	Cultivated Plant Agrobiodiversity	100000	Number and types of activities conducted on the issue	Ministry of Agriculture	Forests National Corporation (FNC), ARC
Conducting a study on IAS and its impacts on agrobiodiversity		100000	Existence of, and accessibility to the results of the study	ARC	Universities and other research centres

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Empowerment of the plant quarantine authority at borders and points of entry		150000	Trend in the status of the capacities of the plant quarantine at borders and points of entry	Plant Protection Directorate	Ministry of Justice
Production of an inventory of invasive alien species		10000	Availability of the inventory on IAS	Ministry of Agriculture	ARC, FNC, HCENR
Developing participatory projects/ programmes targeting priority IAS		50000	Number of project proposals completed and submitted	Ministry of Agriculture	ARC, HCENR
Conduct activities to eradicate invasive alien species that are already been found having adverse effects on biodiversity	Forest Biodiversity	7000000	Percentage of reduction in areas occupied by IAS	FNC	ARC, community organizations
Develop effective systems and tools for monitoring and evaluation of invasive alien species		700000	Systems and tools in place	FNC	Research centres, international forest organizations
Provide training and capacity-building to local communities in a process for combating invasive alien species		140000	Number of communities and individuals trained	FNC	Research centres, local community organizations
Conduct a study on invasive alien species affecting wild life ecosystem in protected areas	Wildlife Biodiversity	1500000	Results of the studies	Wildlife Research Centre	WCF, research centres, universities, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Establishment of an invasive species control and monitor unit in Dinder National Park		3000000	Existence of the unit	WCF	
Develop materials and conduct activities to promote awareness on halting invasive alien species introduction		5000000	Number and types of awareness materials developed and activities conducted	WCF	
Establishment of a laboratory unit for analysing the ballast water to detect and identify invasive alien species	Marine Biodiversity	400000	The laboratory unit being operational	Sea Ports Corporation	Marine Control Department, HCENR, FMSF, MFRS, PERSGA, MFA
Create effective regular monitoring program/system for investigation of invasive alien species in the ballast water discharging in Bashair (1 and 2) terminals for exported oil		300000	Regular monitoring being active	IMR	Marine Control Department, HECNR, FMSF, MFRS, PERSGA, MFA
Develop awareness materials and implement a public awareness program on the invasive species for decision makers and other stakeholders		150000	Number and type of awareness materials and activities conducted	HCENR	Marine Control Department, HECNR, FMSF, RSFRS, PERSGA, MFA

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct assessment study to identify and manage pathways of the introduction of alien invasive species	Inland Waters and Wetlands Biodiversity	300000	Results of the study in terms of the pathways identified	Ministry of Irrigation	HCENR, WCF, Ministry of Animal Resources and Fishery, local communities, Ministry of Finance
Apply biological and cultural control mechanisms to eradicate invasive alien species that are already been found in inland water ecosystems		750000	Trends in eradication of IAS	Ministry of Irrigation	FNC, Wildlife Authority, Range Directorate, research centres,
Conducting activities to upgrade capacities on invasive alien species in wetlands		500000	Trend in capacity upgrading	HCENR	Institute of Environmental Studies, Sudanese National Commission of UNESCO, Sudanese Environmental Conservation Society (SECS), Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry
Capacity building and training to use biological control to control invasive alien species in the country	Insect and Microorganism Biodiversity	300000	Number and type of capacity building and training activities conducted	Plant Protection Directorate (PPD)	Ministry of Agriculture, Ministry of Health

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop and implement effective response procedures for the prevention of new potential invasive species		100000	Existence of the response procedures, and trend in preventing new IAS	PPD	Ministry of Health
Conduct assessment study to identify and manage pathways of, and reduce the introduction of alien invasive species that hazardous to human, animal and plant health and environment	Health Aspects of relevance to Biodiversity	100000	Number of IAS pathways identified and managed	HCENR	FNC, WCF, RPGD, HCENR, Ministry of Health, Ministry of Animal Resources, research centres, Ministry of Finance
National Target 7 By 2030, pollution, including from excess nutrients, pesticides and plastic, has been brought to levels that are not harmful to biodiversity and ecosystem functions and services, by reducing to half excess nutrients lost to environment, and risks from pesticides and other chemicals, through more efficient nutrient cycling and use, and integrated pest management, and working towards eliminating plastic pollution					
Awareness raising activities among farmers about the risks associated with excess use of pesticides	Cultivated Plant Agrobiodiversity	30000	Number of awareness activities conducted on the issue and farmers participated	Department of Agricultural Extension	Farmers organizations, ARC
Conducting a study on the effect of excess use of pesticides on agro-biodiversity		50000	Existence of, and accessibility to the results of the study	ARC	Ministry of Agriculture, universities, research institutes
Development of project proposals on using integrated pest management		10000	Number of project proposals developed and submitted	ARC	Ministry of Agriculture, Farmers organizations

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Establishment of agro-chemicals committees		10000	Number of agro-chemicals committees established in different states	Ministry of Agriculture	ARC, state ministries of agriculture, universities
Organize periodical litter cleaning activities, in terrestrial and marine parks to reduce the existing amount of plastic litter	Wildlife Biodiversity	500000	Trend in reduction of plastic litter	WCF	Local community leaders, NGOs
Distribute litter containers in and around protected areas		300000	Trend in reduction of litter	WCF	
Development materials and conduct awareness campaigns for school pupils and public markets on pesticide use and others		500000	Number and type of awareness materials developed and activities conducted	WCF	
Establishment of marine pollution laboratory	Marine Biodiversity	800000	Existence of the marine pollution laboratory	IMR	Marine Control Department, HECNR, Faculty of Marine Sciences and Fisheries (FMSF), Red Sea Fisheries Research Station (RSFRS), PERSGA, MFA
Review and improve the national response plan for managing oil pollution		150000	Trend in the improvement of the national response plan	IMR	Marine Control Department, HECNR,

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
incidents, oil spills and hazardous materials in Sudan					FMSF, RSFRS, PERSGA, MFA
Develop a national action plan for the sustainable management of marine litter in Sudan		200000	Existence of the national action	IMR	Marine Control Department, HECNR, FMSF, RSFRS, PERSGA, MFA
Develop effective reception facilities system in the Sudanese ports		150000	Effective reception facilities existence	HCENR	Marine Control Department, HECNR, FMSF, RSFRS, PERSGA, MFA
Review and apply control regulations to reduce the adverse impacts of gold mining to environmentally acceptable levels		100000	Level of application of the control regulations	HCENR	Marine Control Department, HECNR, FMSF, RSFRS, PERSGA, MFA, Sea Ports Corporation
Conduct activities to raise the awareness of the community to enhance their role in enforcement of environmental laws to combat pollution in inland waters	Inland Waters and Wetlands Biodiversity	100000	Number and type of awareness activities organized	HCENR	Ministry of Agriculture, Ministry of Justice, Ministry of Mining, local communities, and NGOs, Ministry of Finance
Reduce the adverse impacts of traditional as well as organized gold mining on inland waters to environmentally acceptable		500000	Number and type of activities conducted, and trend in the reduction in the impacts of mining on environment	HCENR	Ministry of Agriculture, Ministry of Justice, Ministry of Mining, local communities, and

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
levels through a number of activities					NGOs, private sector, Ministry of Finance
Develop guidelines to combat pollution in wetlands		100000	Existence of the guidelines	HCENR	Institute of Environmental Studies, Sudanese National Commission of UNESCO, Ministry of Irrigation and Water Resources, Wildlife Research Centre
Develop and endorse a plan to reduce/remove incentives/subsidies or impose penalties for activities that pollute the natural habitats	Insect and Microorganism Biodiversity	100000	Existence of the plan on the issue	Ministry of Agriculture	Ministry of Animal Resources, Wildlife Research Centre, Ministry of Irrigation and Water Resources
Develop a national plan to enhance the use of integrated pest management		50000	Existence of the national plan on the issue	National Council for Pesticides	Ministry of Agriculture, Agricultural Research Corporation, universities
Develop a national plan to make a strong restriction or banning of some extremely and highly toxic insecticides use and find out appropriate alternative control patterns less		500000	Existence of national plan to ban and to make restriction of extremely hazardous pesticides	National Council for Pesticides	ARC, universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
harmful to biodiversity and beneficial organisms					
Applying of integrated pest management program concentrating on the green-houses pests through the use of new trends of pest control	Pollution Aspects related to Biodiversity	2000000	Number of green houses in which IPM conducted	Integrated Pest Management Centre, ARC	Departments of crop and plant protection in faculties of agriculture, Customs Authority, National Pesticides Council
Conduct studies on formulation of identified released indigenous bio-pesticides and test their efficacy on different agricultural pests		10000000	Results of the studies conducted on the subject	Centre of Pesticides and Plant Health, Faculty of Agriculture, University of Khartoum	Ministry of Agriculture, Customs Laboratory, National Research Centre, HCENR
Develop a national plan to make a strong restriction or banning of some extremely and highly toxic pesticides use to control Quelea birds invading farms, specifically Fenthion avicide, and to find out appropriate alternative less harmful to biodiversity		400000	Existence f the national plan to ban Fenthion avicide	HCENR	National Pesticides Council
Removal of chemicals contaminated soil resulting from the abuse of		100000000	Number of chemical incinerators imported,	Centre of Pesticides and Plant Health,	Ministry of Agriculture, National Pesticide Council, HCENR

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
agrochemicals and the chemicals used in gold mining by incinerators or chemical treatment modern techniques, and degrading chemical-contaminated soil using bioremediation and/or biodegradation techniques			and type of treatment techniques used	Faculty of Agriculture, University of Khartoum	
Organize awareness activities on agrochemical negative impacts on biodiversity and ecosystems to raise the ideal knowledge regarding the use, handling and application of chemicals in general		800000	Number and type of awareness activities conducted on the issue	HCENR	Ministry of Minerals, Ministry of Agriculture, National Pesticides Council, IPM centre in ARC
Avoiding the intensive use of non-selective herbicides by using of environment friendly herbicides, laser technique, agronomic practices, mechanical control and microbial control		1000000	Number and type of new environment friendly techniques officially released and adopted	PPD	ARC, universities
Rearing mass cultures of predator and parasitoids and release them whenever needed, to avoid application		500000	Numbers and/or size of mass cultures reared and released	Department of Crop Protection, U. of K.	ARC

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
of synthetic chemicals to control pests					
Raise the capacity of the biosafety National Competent Authority for monitoring and risk management at different stages of testing and release of GM varieties resistant to pests and/or diseases	Biosafety and Biotechnology Aspects related to Biodiversity	150000	Trend in the improvement of the capacities of the NCA	HCENR-NCA	ARC and other research centres, universities
Conduct awareness raising activities on the negative effects of excess nutrients, pesticides, hazardous waste, chemicals, and plastic on human and animal health and environment	Health Aspects of relevance to Biodiversity	200000	Number and type of awareness activities conducted on the issue	One Health Platform	Ministry of Health, Ministry of Justice, Ministry of Finance
Develop medical waste disposal plans including provision of necessary equipment to avoid inappropriate use, and to ensure disposal of medical waste		10000000	Existence of the medical waste disposal plans	Ministry of Health	State ministries of Health, Ministry of Finance
National Target 8 Minimize the impact of climate change and ocean acidification on biodiversity in Sudan, including the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems, and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, so					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
as to maintain their integrity and functioning, and enhance the contribution of biodiversity to carbon stocks, through conservation and restoration					
Development of one national harmonized programme addressing the issues of climate change impacts on biodiversity	Cultivated Plant Agrobiodiversity	20000	The availability of the national programme	HCENR	Ministry of Agriculture
Conducting research and breeding programmes addressing adaptation to climate change using PGRFA		500000	Results of the research and breeding activities	ARC	Research institutes and universities
Establish meteorological stations for monitoring climate and weather conditions at different rangeland sites in order to get prepared with any necessary plans and actions	Range Plant and Animal Agrobiodiversity	500000	Number of Meteorological stations established	RPGD	Ministry of Finance, National Corporation for Meteorology
Conduct activities to promote the use of climate-resilient tree species and drought-tolerant crops in regions affected by climate change in reforestation and agricultural initiatives	Forest Biodiversity	8000000	Trend in areas planted with climate-resilient trees	FNC	HCENR, NGOs

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop and implement activities on climate-smart land management practices, such as agroforestry, soil conservation, and water management techniques in regions prone to soil erosion and water scarcity		3500000	Trend in expansion in use of climate-smart techniques	Ministry of Agriculture and Forestry	Research centres, universities, NGOs
Establishment of early warning systems and community-based adaptation measures for climate-related disasters		120000	Existence of operational early warning system, and number of early warning units established	Higher Council for Civil Defence	Meteorological Corporation, Community organizations, United Nations Office for Disaster Risk Reduction
Conduct necessary activities to monitor and evaluate the effectiveness of adaptation measures in enhancing ecosystem resilience and biodiversity conservation		800000	Number and type of activities conducted on the issue	Forestry National Corporation	Research centres, universities, NGOs
Reforestation of degraded areas around protected areas, as well as planting mangroves forests	Wildlife Biodiversity	3000000	Areas reforested	WCF	FNC, local community leaders
Conduct the necessary studies to evaluate current state of coral reef and other	Marine Biodiversity	400000	Results on current state of coral reef and others	IMR	HECNR, FMSF, MFRS, PERSGA, MFA

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
vulnerable marine ecosystems impacted by climate change					
Develop and implement Coral Reef Bleaching Response Plan		350000	Level of implementation of the Coral Reef Bleaching Response Plan	IMR	HECNR, FMSF, MFRS, PERSGA, MFA
Apply Integrated Ecosystem Approach Management regime, including climate change adaptation measures		400000	Level of application of the Integrated Ecosystem Approach Management regime	HCENR	HECNR, FMSF, MFRS, PERSGA, MFA
Conduct studies on the impact of climate change on wetlands biodiversity	Inland Waters and Wetlands Biodiversity	500000	Results of the studies in terms of climate change impacts	Institute of Environmental Studies	HCENR, Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry
Incorporate related elements of the national adaptation plan for climate change into policies and programmes for biodiversity conservation	Impact of Climate Change on Biodiversity	60000	Levels of incorporation of the NAP in policies and programmes	HCENR	Ministry of Justice, Ministry of Agriculture and Forestry, Ministry of Animal Wealth, Ministry of Irrigation and Water Resources, research centres
National Target 9					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
By 2030, at the latest, national and state governments in Sudan, business and stakeholders at all levels have taken steps to achieve or have implemented plans to ensure sustainable use of wild species, and have kept the impacts of use of natural resources well within safe ecological limits, while protecting and encouraging customary sustainable use by indigenous peoples and local communities					
Conducting germplasm collection missions targeting Crop Wild Relatives (CWR)	Cultivated Plant Agrobiodiversity	200000	Number of CWR accessions collected	APGRC	State ministries of agriculture
Exploring the potential of CWR through research on identification of valuable traits		50000	Results of research activities conducted	APGRC	Research centres and universities
Documentation of information on CWR and associated indigenous knowledge		50000	Trend of progress on documentation of CWR and associated knowledge	APGRC	State ministries of agriculture
Develop wildlife sustainable use policy	Wildlife Biodiversity	250000	Policy document existence	WCF	HCENR, NGOs
Development of action plan for wildlife resources production and consumption		250000	Existence of the action plan	WCF	
Conduct awareness activities on wildlife wise and sustainable use		300000	Number and type of awareness activities conducted	WCF	
Conduct activities to raise public awareness on the Integrated Ecosystem Approach Management in	Marine Biodiversity	250000	Number of awareness activities conducted	HCENR	IMR and others

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
marine and coastal environment.					
Develop and implement activities to combat the illegal trade of shells and coral reef parts and provide alternative livelihoods for local communities and traders		600000	Number of activities conducted, and alternatives provided	MFA	IMR, RSFRS
Conduct research on the role of indigenous knowledge in supporting and enhancing insect and microorganism biodiversity, and protecting and encouraging customary sustainable use	Insect and Microorganism Biodiversity	100000	Research results on the issue	HCENR	Research centres, universities
Develop risk assessment and management programs and guidelines for newly introduced species		100000	Existence of the risk assessment and management plans and guideline	Ministry of Agriculture	Research centres, universities
Conduct studies and surveys to providing social, economic and environmental benefits for people, including through sustainable biodiversity-based activities, products		300000	Results of the surveys and studies conducted on the subject	HCENR	Research centres, universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
and services that enhance biodiversity					
Conduct insects for food and feed programme by adoption of mass rearing concept for some insect infecting crops such as desert locust, tree locusts and bugs, as alternative source of protein to be consumed as food by human and feed for poultry		800000	Existence of ready edible insect food and feed	Department of Crop Protection, U. of K.	
Develop regulations on management of the use of, and trade in wildlife, so that it is safe from human health perspective by removing species in wildlife trade that are high-risk for disease emergence	Health Aspects of relevance to Biodiversity	100000	Existence of the regulations on the subject	Wildlife Conservation Forces	Wildlife Research Centre, Ministry of Justice, private sector, Ministry of Finance
Convene a forum to exchange experiences and views on matters related to use of, and trade on wild species		150000	Results of the forum on the matter	Ministry of Health	Ministry of Finance, WCF
National Target 10 Ensure, by 2030, that areas under agriculture, aquaculture, fisheries and forestry in Sudan are managed sustainably, through the sustainable use of biodiversity, and biodiversity-friendly practices, contributing to the resilience and long-term efficiency and productivity of these production					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services					
Development of agricultural policy that is based on the sustainability of resources	Cultivated Plant Agrobiodiversity	50000	Availability of the agricultural policy	Ministry of Agriculture	HCENR
Identification of appropriate farmers' varieties/landraces for multiplication and/or developing new breeding populations		50000	Number of farmers; varieties identified and multiplied	APGRC	State ministries of agriculture, research centres
Extending formal and sustainable agricultural extension programs into the rain-fed sector		50000	Trends in the expansion of agricultural extension in the rain-fed areas	Ministry of Agriculture	ARC, state ministries of agriculture
Conduct and strengthening research on the problems of shifting cultivation, crop rotation in the traditional farming systems		100000	Results of research on the related subjects	ARC	Research centres, state ministries of agriculture
Establish an early warning system to predict, identify and control potential sources of adverse impacts on agrobiodiversity		1000000	Early warning system is in place	Ministry of Agriculture	Ministry of Finance, HCNER, ARC

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct programmes for transplanting evergreen range species from areas, where they are well established, to deserted areas	Range Plant and Animal Agrobiodiversity	500000	New areas covered with evergreen range species	RPGD	Local community organizations
Rehabilitation and establishment of forest plantations in degraded traditional rain-fed areas	Forest Biodiversity	2000000	Trend in increase in rehabilitated areas with forest plantations	FNC	Ministry of Finance, NGOs
Initiation of community engagement programs and training of community members on sustainable practices		200000	Number of communities engaged, and percentage of community members trained	Relevant state government	FNC, NGOs, community organizations
Implement agroforestry demonstration plots to showcase sustainable land use practices		1200000	Number of agroforestry plots established	Agricultural Extension Department	Research centres, farmers' organizations
Apply suitable fishing gears innovation to reduce impacts of overfishing on marine biodiversity	Marine Biodiversity	200000	Number and type of fishing gears applied	MFA	IMR, FMSF, RSFRS, PERSGA, MFA, HECNR
Formation of bodies to involve the local communities in conservation activities and		100000	Number of bodies formed involving local communities	HCENR	HECNR, IMR, FMSF, RSFRS, PERSGA, MFA

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
sustainable use of mangrove forests					
Conduct assessment study to identify the factors that hinder application of regulations, which encourage sustainable fishing, and avoidance of over-fishing	Inland Waters and Wetlands Biodiversity	50000	Results of the study in terms of factors identified, and trend in the application of regulations	General Directorate for Fisheries and Aquatic Lives	HCENR, Ministry of Animal Resources, Ministry of Justice, Ministry of Agriculture, Ministry of Finance
Design an effective ecological monitoring system		500000	Existence of a designed monitoring system	General Directorate for Fisheries and Aquatic Lives	HCENR, Ministry of Animal Resources, Ministry of Agriculture, Ministry of Finance, Council for Strategic Planning
Develop and implement joint activities on agriculture, aquaculture, fisheries and forestry in wetlands to ensure sustainable management using biodiversity friendly practices		500000	Number of joint activities developed and implemented	HCENR	Ministry of Agriculture, Ministry of Animal Resources and Fishery, Wildlife Research Centre
Establishment of incentive programmes for expansion in commercialization of new GM crops of high economic value and low	Biosafety and Biotechnology Aspects related to Biodiversity	270000	Trend in the commercialization of new GM crops with low and manageable	HCENR	Ministry of Agriculture, ARC, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
and manageable negative impacts on the environment			negative impact on environment		
Development and increase in the production of biotechnological products, such as <i>in-vitro</i> mass propagation, to enhance productivity and increase areas under agricultural production or conservation on a sustainable basis		250000	Trend in the production of biotechnological products enhancing productivity and conservation of biodiversity	ARC	HCENR, National Centre for Research
Develop national dietary guidelines to promote diverse and sustainable use of foods, local crops and livestock, and fisheries	Health Aspects of relevance to Biodiversity	150000	Existence of national dietary guidelines	Food Security Directorate	Ministry of Agriculture and Forestry, Ministry of Animal Resources, Ministry of Finance
Promote for introducing organic and eco-farming for promotion of sustainability in agriculture, with necessary certification for this system		200000	Trend of use and adoption of organic and eco-farming	Ministry of Agriculture	State ministries of agriculture, Ministry of Animal Wealth and Fisheries, Ministry of Finance, private sector
National Target 11: Restore, maintain and enhance nature’s contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct research on wetlands functions and services	Wildlife Biodiversity	500000	Results of the research conducted	Environmental Studies Institute	Wildlife Research Centre, universities, range directorate
Collect pasture-plant seeds from protected areas and spread them outside these areas for livestock		500000	Trend in the increase of pasture lands	WCF	
Implement Ecosystem-Based Wildlife Conservation Plans in key protected and buffer zones.		20000000	Number and type of key protected and buffer zones applying Ecosystem-Based Wildlife Conservation Plans	WCF	HCENR
Organize activities to raise public awareness on Integrated Coastal Zone Management (ICZM) in marine and coastal environment	Marine Biodiversity	350000	Number and type of awareness activities organized on ICZM	HCENR	IMR, FMSF, MFRS, PERSGA, MFA, the Government of Red Sea state
Establish a unit of Integrated Coastal Zone Management (ICZM)		600000	Existence of the ICZM unit	HCENR	IMR, FMSF, MFRS, PERSGA, MFA, the Government of Red Sea state
Conduct campaigns to raise awareness of the value of ecosystem functions and services to health and	Health Aspects of relevance to Biodiversity	1000000	Number and type of campaigns conducted on the issue,	HCENR	Ministry of Agriculture and Forestry, Ministry of Animal Resources, Wildlife Conservation Forces, Marine

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
wellbeing across different community groups					Research Institute, ARC, universities, Ministry of Finance
Conduct a study to identify the benefits of biodiversity for the health of people, wildlife, and the environment, including its use intrinsic values		500000	Results of the study conducted on the issue	HCENR	Ministry of Agriculture and Forestry, Ministry of Animal Wealth and Fisheries, Wildlife Conservation Forces, Marine Research Institute, ARC, universities, Ministry of Finance
National Target 12: Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas in Sudan sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services					
Develop plans and implement activities to protect and promote the use the naturally existing wild habitats within and around urban areas	Wildlife Biodiversity	5000000	Trend in the integration of naturally existing habitats in urban planning	WCF	City municipals, state Ministries of Infrastructure
Develop proposals to integrate wetlands in the urban planning of some specific cities	Inland Waters and Wetlands Biodiversity	50000	Number of proposals developed	HCENR	City municipals, state Ministries of Infrastructure

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct awareness activities to demonstrate the danger of automobile exhaust emissions as a dominant source of ambient air pollution, in densely populated urban environments	Pollution Aspects related to Biodiversity	500000	Number and type of awareness activities conducted	Customs Forces	Ministry of Industry, Institute of Environmental Studies, HCENR
Conduct capacity building activities on applying Sudanese and international standard emission limits and testing methods		100000	Number and type of capacity building activities conducted on the subject	Customs Forces	Ministry of Industry, Institute of Environmental Studies, HCENR
Bann or impose high restriction on the use of methyl bromide as fumigator to control store pests in storages or goods used for export purposes and find alternative method safer for environment and biodiversity		20000	Number and content of decisions issued on this issue	PPD	National Pesticides Council, Ministry of Agriculture, Ministry of Commerce
Advocate with concerned authorities to consider establishment of, and expansion in green and blue spaces in the post	Health Aspects of relevance to Biodiversity	500000	Trend in the adoption of green and blue spaces in the urban planning of some cities	Ministry of Health	HCENR, One Health Platform, cities municipals, Ministry. of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
conflict/war rehabilitation plans for cities					
National Target 13 Take effective legal, policy, administrative and capacity building measures at all levels in Sudan, to fully implement the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, and other international instruments of relevance, in order to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources originating from Sudan, and from digital sequence information on such genetic resources, as well as traditional knowledge associated with these genetic resources, and facilitating appropriate access to such genetic resources, in accordance with applicable international access and benefit sharing instruments					
Building capacity, human and institutional for regulating access to plant genetic resources and digital sequence information, sharing of benefit arising from their utilization	Cultivated Plant Agrobiodiversity	100000	Presence of regulations and capacities for handing issues of access to PGRFA	APGRC	Ministry of Agriculture, HCENR
The official endorsement of the existing proposed national PGR legislation		20000	Entry into force of the national PGR legislation	Ministry of Agriculture	APGRC, Ministry of Justice
Approval of the already proposed national legislation for protection of plant varieties and breeders' rights		50000	Entry into force of the plant varieties protection and breeder's rights legislation	Ministry of Agriculture	ARC, Ministry of Justice
Conducting awareness raising activities on access		100000	Number of awareness raising activities conducted	APGRC	Ministry of Agriculture, public media

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
to plant genetic resources and sharing of benefits					
Development of strategic plan for protection of wild fauna and flora genetic diversity	Wildlife Biodiversity	100000	Existence of the strategic plan	WCF	Research centres, universities, HCENR, Ministry of Finance
Expedite the endorsement and adoption of Access and Benefit Sharing legal framework by the legislative authority	ABS Aspects related to Biodiversity	5000	Entry into force of the ABS legislation	HCENR	Legislative Authority
Put in place the necessary institutional structures and administrative systems for ABS, such as National Competent Authority (NCA) and designation of checkpoints, and implement legislative measures such as development of Prior Inform Consent (PIC) and Mutually Agreed Terms (MAT)		100000	Existence of ABS institutional structures and administrative systems	HCENR	Ministry of Finance
Publish the information on legislative and administrative measures and institutional arrangements through the		25000	Availability on the ABS-CHM of the specified information	HCENR - NCA	Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Access and Benefit-sharing Clearing-House Mechanism (ABS-CHM)					
National Target 14 Ensure by 2030, that biodiversity and its values have been integrated into national, state and local development and poverty reduction strategies, planning and developmental processes, strategic environmental assessments, and environmental impact assessments, and are being incorporated into national accounting, as appropriate, and reporting systems					
Development and adoption of a national policy and strategic action plan for the conservation and sustainable use of cultivated plant agro-biodiversity	Cultivated Plant Agrobiodiversity	50000	Presence of the national policy and strategic action plan on plant agrobiodiversity	APGRC	Ministry of Agriculture, Ministry of Finance and Economic Planning, HCENR
Train civil servants in transforming agrobiodiversity components into items of monetary value		30000	Number of civil servants trained on the issue	HCENR	Universities, APGRC
Organization of non-class activities to encourage universities to incorporate agrobiodiversity and its economic valuation in their curricula		50000	Number of non-class activities organized on the issue in the universities	Ministry of Agriculture	APGRC, universities
Development of strategic action plan for conservation and sustainable use of range and animal agro-	Range Plant and Animal Agrobiodiversity	200000	Existence of the strategic action plan	Ministry of Animal Resources	Ministry of Economic Planning, research centres and universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
biodiversity as a tool for integrating the issue in the national development strategies and plans					
Develop awareness materials and conduct activities to raise the awareness and interest at high policy levels	Forest Biodiversity	200000	Number and type of awareness materials developed, and activities conducted	FNC	ARC
Organize activities for integration of forest biodiversity conservation agenda into the Forests National Corporation (FNC) development plans		40000	Trend of integration of forest biodiversity into FNC plans	FNC	HCENR
Develop legal framework(s) for ecosystem service valuation and integrate them into national and sectoral accounts.		50000	Number and types of legal frameworks developed for ecosystem service valuation and being integrated into national and sectoral accounts	FNC	Ministry of Justice, Ministry of Finance
Conduct awareness and interest raising activities about the values of the wildlife biodiversity for the decision makers and communities	Wildlife Biodiversity	500000	Number and type of awareness and interest raising activities conducted	WCF	NGOs, Ministry of Tourism, National Training Council

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct economic valuation of conservation and sustainable use of inland water ecosystems and biodiversity	Inland Waters and Wetlands Biodiversity Wetlands Biodiversity	200000	Results of the economic valuation for inland waters biodiversity	HCENR	Fishery Administration, Ministry of Finance and National Economy, Ministry of Agriculture, Ministry of Higher Education
Conduct non-class activities to raise awareness and interest of the concerned bodies in the educational institutes in order to encourage them to incorporate biodiversity in their curricula		500000	Number and type of non-class activities conducted on the issue	HCENR	Ministry of Higher Education, universities, Ministry of Finance and National Economy, Ministry of Agriculture and Forestry
Train civil servants in transforming biodiversity components, including inland waters biodiversity, into items of monetary value		300000	Number of civil service trainees trained on the issue	HCENR	Ministry of Finance and National Economy, and Ministry of Agriculture and Forestry, Ministry of Higher Education and Scientific Research
Develop awareness materials and conduct activities to raise the awareness and create interest on the role of wetlands in the environment		50000	Number and types of awareness materials developed and activities conducted	HCENR	Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry, Universities, National Commission of UNESCO

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Review and update the national legislations on hazardous pesticides, chemicals and other wastes in order to implement the existing international relative conventions	Pollution Aspects related to Biodiversity	800000	Existence of a reviewed updated legislation on the matter	HCENR	National Pesticides Council
Set specific policies and legislations regarding the use of plastic bags to reduce associated risks		50000	Existence of policies and legislation on the matter	HCENR	Ministry of Industry, Ministry of Justice
Set specific policies to develop waste recycling technologies to reduce associated risk of plastic and hazardous materials		750000	Number and types of policies set in this regard	PPD	HCENR
Review and update policies, plans and laws to the extent they are consistent with the biosafety law, and to develop necessary bylaws	Biosafety and Biotechnology Aspects related to Biodiversity	270000	Number of policies and plans reviewed and updated, and number and type of bylaws developed	HCENR-NCA	Ministry of Justice, Ministry of Agriculture, Ministry of Animal Resources, Ministry of Health
National Target 15: Take legal, administrative or policy measures to encourage and enable business in Sudan, and in particular to ensure that large and transnational companies and financial institutions: - Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains and portfolios; - Provide information needed to consumers to promote sustainable consumption patterns; - Report on compliance with access and benefit-sharing regulations and measures, as applicable;					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production					
Enforce the ABS legal framework to encourage compliance with access and benefit-sharing legal framework and regulations	ABS Aspects related to Biodiversity	0	Number of bodies reporting on compliance with the legal framework	HCENR	
Conduct awareness activities on the risks and effects associated with the chemicals use in gold mining sectors, and the impacts of using of these chemicals on biodiversity	Pollution Aspects related to Biodiversity	800000	Number and type of awareness activities conducted on the matter	HCENR	Ministry of Mining
Develop gold mining legislations, and encourage decision makers to ratify Minamata Convention to stop using mercury in gold mining processing		50000	Existence of a developed legislation on the issue, and entry into force of the Minamata Convention for Sudan	HCENR	Ministry of Justice, Faculties of Chemistry, Ministry of Mining
Ratify and implement the Minamata Convention to limit the use of mercury in artisanal gold mining activities and to find environment friendly methods in gold mining extraction.		20000	Deposition of the ratification instrument for Minamata Convention at concerned authority	HCENR	Legislative authority

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop and implement of Strategic Approach to International Chemicals Management (SAICM) strategy to reduce and manage the production and importing of chemical based on their needs and priority in the country		500000	SAICM strategy in place	HCENR	
National Target 16: Ensure that by 2030, the national and state governments, business and stakeholders at all levels in Sudan have taken steps to achieve or have implemented plans for sustainable consumption, and people are encouraged in the meantime to make sustainable consumption choices, and to reduce waste, including by improving education and raising awareness on alternatives, in order to keep the impacts of use of natural resources well within safe ecological limits					
Conduct studies on rangelands capacities	Range Plant and Animal Agrobiodiversity	300000	Results of the studies conducted	Range Directorate	State ministries of agriculture, and local community organizations
Implement a national certification and labelling scheme and consumption awareness for sustainably sourced forest products	Forest Biodiversity	900000	National certification and labelling scheme in place	FNC	Ministry of Agriculture. Ministry of Justice
Develop plan for sustainable consumption of inland water resources	Inland Waters and Wetlands Biodiversity	250000	Existence of the plan for sustainable consumption	General Directorate for Fisheries and Aquatic Lives	HCENR, research centres, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
National Target 17 Establish, strengthen capacity for, and implement in Sudan biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity, and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention					
Conduct studies and consultations to assess the present biosafety status in Sudan	Biosafety and Biotechnology Aspects related to Biodiversity	270000	Results of the studies and consultations on the issue	HCENR	Research centres, universities, experts
Develop and build capacity in biosafety containment, confined use and field trials		3000000	Trend in the improvement of the capacities in the specified aspects	HCENR-NCA	ARC, other research institutes
Develop biosafety standard operating procedures (SOPs)		50000	Number and type of SOPs developed	HCENR-NCA	
Conduct activities at high policy levels to raise the awareness and interest in order to gain and strengthen political support for the biosafety issues		100000	Number and type of activities conducted on the issue at high policy levels	HCENR	Council of Ministries
Development of the capacity for the system of handling biosafety notifications and the subsequent actions, including risk assessment and decision-making process		800000	Trend in the capacity improvement of the system for handling the specified aspects	HCENR-NCA	Biosafety Technical Committee

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Establishment and operationalization of a system for public information, education and participation on biosafety matters		750000	Trend in the actual involvement and participation of the public in biosafety matters	HCENR	Ministry of Finance, Ministry of Culture and Information, Civil society organizations
Provide necessary support to organize and enhance participation and coordination at regional level on issues related to biosafety		650000	Trend in the level of participation and coordination at regional level	HCENR	Regional related organizations
Improve GMO detection and accreditation laboratories		1500000	Trend in the improvement in the biosafety laboratories	HCENR	Biotechnology and Biosafety Research Centre of the ARC, research institutes
Establishment of biosafety institutional committees		250000	Number and type of biosafety institutional committees established	HCENR	Research institutes, Ministries of Agriculture, Animal Resources, Health, Commerce...
Conduct necessary study and consultation on the Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety to decide on the		50000	Results of the study and consultation on the matter	HCENR	Research institutes, Ministries of Agriculture, Animal Wealth, Health, Commerce...

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
accession of Sudan to this protocol					
Formation of institutional biosafety committees in health institutions and relevant sectors of one health platform to support multisectoral coordination mechanism	Health Aspects of relevance to Biodiversity	100000	Number of institutional biosafety committees formed	HCENR	Ministry of Health, Ministry of Agriculture, Ministry of Animal Wealth and Fisheries, research institutes, universities
National Target 18: Ensure that, by 2030 at the latest, incentives, including subsidies, harmful to biodiversity are identified, eliminated, phased out or reformed, starting with the most harmful, in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socioeconomic conditions					
Conduct studies on the impact of negative and positive incentives for range and animal agro-biodiversity	Range Plant and Animal Agrobiodiversity	100000	Results of the study in terms of negative and positive incentives	Ministry of Animal Resources	Ministry of Finance, local community organizations
Conduct comprehensive review and assessment of all current forest-related incentives and subsidies	Forest Biodiversity	700000	Results of the assessment in terms of identified incentives and subsidies	FNC	FNC
Development and implementation of scheme for providing incentives and benefits to communities involved in sustainable		8000000	Number and type of incentives and benefits developed and implemented	FNC	HCENR, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
management of forest resources					
Develop and start implementing a national scheme for providing subsidies to encourage the development and use of alternative energy sources		1600000	Trend of use of new energy sources alternative to firewood and charcoal	Ministry of Energy	FNC
Production and distribution of free or subsidized seedlings to encourage rural communities to establish community forests		5000000	Number of free or subsidized tree seedlings distributed	FNC	State ministries of agriculture, local community organizations
Conduct study to identify negative and positive incentives affecting wildlife biodiversity	Wildlife Biodiversity	200000	Results of the study in terms of identifying incentives and subsidies	WCF	Wildlife Research Centre, universities, Ministry of Finance
Initiate establishment of a trust fund to encourage local communities and private sector to breed wildlife species to increase their income		2000000	Trust fund operational	WCF	
Conduct the necessary studies to identify the incentives, including subsidies, harmful to marine biodiversity	Marine Biodiversity	300000	Number and results of the studies conducted in terms of identified incentives and subsidies	MFA	HCENR, IMR, FMSF, RSFRS, PERSGA, the Government of Red Sea state, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop and apply effective policies for making a balance between the government subsidies for fishing and avoidance of overfishing		150000	Existence of policies, and number of working boats and fish stock level	MFA	HCENR, IMR, FMSF, RSFRS, PERSGA, the Government of Red Sea state, Ministry of Finance
National Target 19 Substantially increase and mobilize financial resources for effectively implementing the National Biodiversity Strategy and Action Plan of Sudan from all sources, such as from domestic, international, public and private resources, including by significantly increasing domestic resource mobilization, facilitated by the preparation and implementation of a national biodiversity finance plan or similar instruments according to national needs, priorities and circumstances, while enhancing the effectiveness, efficiency and transparency of resource provision and use					
Development of project proposals for implementation of different actions related to cultivated plant agrobiodiversity	Cultivated Plant Agrobiodiversity	20000	Number of project proposals developed and submitted	APGRC	HCENR
Conducting activities to encourage farmers and indigenous people for contributing to provide and managing financial resources for community plant agro-biodiversity conservation activities		30000	Number of related activities conducted	HCENR	State ministries of agriculture, community-based organizations
Develop project proposals for implementation of actions on conservation and	Range Plant and Animal Agrobiodiversity	150000	Number of project proposals developed and submitted	Ministry of Animal Resources	Ministry of Finance, research centres and universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
sustainable use of range plant and animal agro-biodiversity					
Develop project proposals and establish partnerships with international donors and agencies	Forest Biodiversity	200000	Number of project proposals developed and submitted, and partnerships established	FNC	Research centres, HCENR
Develop and implement project proposal using public-private partnerships		3000000	Number of project proposals developed in partnership with private sector	FNC	Research sectors, private sector
Launch awareness campaigns to promote private and corporate donations for biodiversity conservation		400000	Trend in awareness on the issue	FNC	Media, private sector
Develop project proposals on inland waters biodiversity to implement the actions on inland waters biodiversity	Inland Waters and Wetlands Biodiversity	200000	Number and type pf project proposals developed and submitted	HCENR	Research centres, local communities, Ministry of Finance
Develop project proposals on conservation and sustainable use of biodiversity in wetlands		150000	Number and type of project proposals developed and submitted	HCENR	Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry, Universities,

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
					National Commission of UNESCO, universities
Develop projects proposals to implement actions on conservation and sustainable use of insect and microorganisms	Insect and Microorganism Biodiversity	50000	Number of project proposals developed and submitted	PPD	HCENR, Ministry of Agriculture
Develop Project proposals to support the implementation of the Nagoya Protocol and the national legislation	ABS Aspects related to Biodiversity	150000	Number and type of project proposals developed and submitted	HCENR - NCA	APGRC, Ministry of Agriculture, Ministry of Animal Wealth, research centres
Development of project proposals to buffer climate change impacts on biodiversity based on the national resource mobilization plan for the implementation of the NBSAP	Impacts of Climate Change on Biodiversity	100000	Number and type of project proposals developed and submitted	HCENR	Ministry of Finance, Ministry of Agriculture, Ministry of Animal Wealth, research centres
Develop project proposals to implement the biosafety and biotechnology related actions	Biosafety and Biotechnology Aspects related to Biodiversity	50000	Number and type of project proposals developed and submitted	HCENR	Ministry of Agriculture, Ministry of Animal Resources, Ministry of Finance, research institutes, universities
National Target 20					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Improvement of the knowledge and science base on the biodiversity in Sudan, and information sharing mechanisms, through capacity building and development, access to and transfer of technology, access to innovations, technical and scientific cooperation, joint technology development and joint scientific research programmes for the conservation and sustainable use of biodiversity					
Rehabilitation of the documentation system of the APGRC	Cultivated Plant Agrobiodiversity	200000	The genebank documentation system operating	APGRC	HCENR, International and external organizations of relevance
Conduct training activities to enhance technical capacities on knowledge and information sharing		100000	Number of training activities conducted, and number of staff members trained	HCENR	APGRC, International and external organizations of relevance
Conduct research on plant agro-biodiversity related issues such as characterization and evaluation of PGRFA		150000	Results of characterization and evaluation for PGRFA	APGRC	Research centres, universities
Documentation of indigenous knowledge, practices and technologies that are associated with the PGRFA		150000	Size of indigenous knowledge documented	APGRC	HCENR, State ministries of agriculture, community organizations
Conduct programmes for building capacity for the staff and range office units	Range Plant and Animal Agrobiodiversity	300000	Number of staff trained	Ministry of Animal Resources	Research centres and universities
Organize activities to establish partnerships to support collaborative research and data sharing	Forest Biodiversity	500000	Number and type of partnerships established	FNC	ARC, research centres, universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Physical and human capacity building for conservation and sustainable use of forest genetic resources		400000	Number of trainees trained	Ministry of Agriculture and Forestry	HCENR, research centres, universities
Introduce and implement Spatial Monitoring and Reporting Tool (SMART) management system in all national parks in Sudan	Wildlife Biodiversity	2000000	SMART operational in all parks	WCF	National Communication Corporation, Ministry of Finance
Establish GIS systems in, and provide drones, GPS devices and telecommunication devices for all national parks		500000	Number of GIS, GPS devices and drones supplied	WCF	
Participation in specialized training courses outside the country for protected areas staff		1500000	Number of staff members participated in training courses outside the country	WCF	
Conduct capacity-building activities on management and sustainable use of wetland biodiversity	Inland Waters and Wetlands Biodiversity	300000	Number of capacity building activities conducted	HCENR	Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry, universities, National Commission of UNESCO

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Conduct research, monitoring and inventorying activities on wetlands		1000000	Number of monitoring sites established across priority wetlands Number of academic and research institutions engaged in wetland research. Number of scientific publications, theses, and reports on Sudanese wetlands	HCENR	Universities, research centres
Training of technicians to recognize and deal with different types of insects and microorganisms	Insect and Microorganism Biodiversity	550000	Number of technicians trained	PPD	HCENR, Ministry of Agriculture, Ministry of Finance, ARC
Conduct research on the use of traditional knowledge in the development and implementation of measures to manage insects and microorganism species		100000	Results of the research on the subject	PPD	Research centres
Strengthen the existing insect taxonomy unit at the ARC to conduct surveys and research on the status of insects in the country		250000	Trend in the improvement on the capacities of the unit	Agricultural Research Corporation (ARC)	Universities, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Train and raise awareness of relevant stakeholders, to effectively participate in the implementation of the Nagoya Protocol and other legally binding instruments of relevance	ABS Aspects related to Biodiversity	400000	Number and type of awareness activities conducted on the issue	HCENR - NCA	International and regional organizations, Ministry of Finance, international and national consultants
Build capacities of indigenous peoples and local communities on ABS issues, including granting or refusing to grant prior informed consent (PIC), and developing minimum requirements for mutually agreed terms (MAT)		3000000	Number and type of capacity building activities conducted	HCENR - NCA	International and regional organizations, Ministry of Finance, international and national consultants
Train stakeholders including local communities to negotiate mutually agreed terms		500000	Percentage of stakeholders received training on the issue	HCENR - NCA	International and regional organizations, Ministry of Finance, international and national consultants
Train and build capacity of relevant stakeholders to monitor the utilization of genetic resources, including the establishment of checkpoints		400000	Percentage of stakeholders received training on the issue, and existence of check-points	HCENR - NCA	International and regional organizations, Ministry of Finance, international and national consultants

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Organize a regular international scientific visits, meetings and knowledge exchange programs for toxicological specialists and other researchers in the field	Pollution Aspects related to Biodiversity	300000	Number and type of activities organized on the issue, and number of staff participated	HCENR	Ministry of Higher Education and Scientific Research
Conduct training programs on recycling of chemicals and hazardous waste removal treatments		500000	Number and type of training programs conducted on the issue	HCENR	Ministry of Higher Education and Scientific Research
Undertake a detailed vulnerability assessment of impact of climate change on biodiversity in Sudan	Climate Change Impacts on Biodiversity	1000000	Results of the vulnerability assessment	HCENR	Universities, research institutes, Ministry of Science and Communications
Conduct studies and develop reports to define how to transfer appropriate technologies that minimize negative impacts of climate change on biodiversity		300000	Results of the studies, and number and type of reports developed on the issue	HCENR	Universities, research institutes, Ministry of Science and Communications
National Target 21 Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity in Sudan, and to strengthen communication, awareness raising, education, monitoring, research and knowledge management and, also in this context, the traditional knowledge, innovations and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, and should only be accessed with their free, prior and informed consent in accordance with national legislation					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Establishment and operationalization of a web page for APGRC	Cultivated Plant Agrobiodiversity	20000	Web Site operating	APGRC	HCENR
Organization of awareness campaigns to disseminate any relevant plant agro biodiversity information		100000	Number and type of awareness raising and information dissemination campaigns and activities conducted	Ministry of Agriculture	APGRC, HCENR
Carry out data collection and establish database units and information platforms for range and animal agrobiodiversity	Range Plant and Animal Agrobiodiversity	300000	Existence of databases and information platform	Ministry of Animal Resources	Universities and research centres
Digitize herbarium and forest genetic resources collections to support research and planning	Forest Biodiversity	450000.	Existence of an operational digital biodiversity database linked with national research networks	Forests Research Centre	FNC
Document indigenous knowledge and practices relevant to forest biodiversity		7500000	Level of indigenous knowledge and practices documented	FNC	Universities, research centres, community organization
Establish web-based platform for wildlife conservation data-base and information	Wildlife Biodiversity	100000	Web platform operating	WCF	Ministry of Communication and digital Transformation, Ministry of Finance.
Establish electronic library		250000	Existence of e library	WCF	Ministry of Information

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop and distribute awareness materials such as brochures, magazines and maps to raise public awareness		250000	Number and type of awareness materials developed and distributed	WCF	
Conduct a national status assessment of natural inland water resources including aquatic biota of the Nile Basin and non-Nilotic inland water ecosystems	Inland Waters and Wetlands Biodiversity	1000000	Results of the status assessment	HCENR	HCENR, research centres, National Bureau of Statistics, Ministry of Finance
Publish data and information on inland waters biodiversity in the Website of HCENR and the Clearing House Mechanism of biodiversity		50000	Availability /accessibility of information and reports on the websites	HCENR	Ministry of Finance
Conduct awareness-raising activities on the importance of inland water biodiversity conservation		500000	Number and type of awareness activities conducted	HCENR	Fishery Administration, Ministry of Agriculture, FNC, research centres, universities, Ministry of Finance
Conduct awareness-raising activities on monitoring, research and knowledge management for inland waters biodiversity		200000	Number and type of awareness activities conducted	HCENR	Fishery Administration, Ministry of Agriculture, FNC, research centres, universities, Ministry of Finance

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Rehabilitate databases and documentation systems of relevance as post-war activities to facilitate access to relevant and accurate information		300000	Level of rehabilitation achieved in the databases and documentation systems	HCENR	Fishery Administration, Ministry of Agriculture, FNC, research centres, universities, Ministry of Finance
Conduct a comprehensive baseline study for all inland waters in Sudan and revise and upgrade the taxonomy of their biota and document their known and potential uses		300000	Baseline study outcomes	Institute for Environmental Studies	Research institutes
Organize and run a consultation process to decide on how to establish a centre for research and information on wetlands biodiversity		300000	Results of the consultation on the establishment of the research centre	HCENR	Ministry of Irrigation and Water Resources, Wildlife Research Centre, Ministry of Agriculture and Forestry, Universities, National Commission of UNESCO, universities
Develop a database of insects and microorganisms' genetic resources in the country	Insect and Microorganism Biodiversity	200000	Existence of the database	PPD	Ministry of Agriculture, Ministry of Communication, National Centre of Information
Develop awareness materials and conduct		250000	Number and type of awareness materials	PPD	HCENR, research centres, universities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
awareness raising activities to disseminate information about the insect and microorganism biodiversity			developed and activities conducted		
Develop plan to encourage media organizations and extension workers to participate in dissemination of information about the impact of harmful species		250000	Existence of the plan	PPD	HCENR, Ministry of Information and Culture, Ministry of Communications, NGOs
Organize non-class activities to encourage education institutions to incorporate issues of insect and microorganism biodiversity into their educational curricula		200000	Number and type of non-class activities conducted	PPD	Ministry of Education, Ministry of Higher Education
Develop a plan for involvement of all stakeholders in insects and microorganisms' biodiversity management programs		50000	Existence of the plan on the issue	PPD	HCENR, Ministry of Agriculture, Ministry of Animal resources, research centres, universities
Aggregate and publish data and information on benefit sharing in the ABS -CHM	ABS aspects related to Biodiversity	100000	Availability of data and information on ABS on the ABS-CHM	HCENR - NCA	Ministry of Finance
Document and preserve traditional knowledge,		3500000	Level of documentation of traditional	HCENR - NCA	Ministry of Finance, local communities

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
innovations, and practices of indigenous peoples and local communities associated to genetic resources			knowledge, practices and innovations		
Establish a protection system to protect traditional knowledge associated with genetic resources to be accessed with the free, prior and informed consent		3000000	Existence of the protection system on the issue	HCENR - NCA	Ministry of Finance, Ministry of Justice
Develop awareness materials and conduct awareness activities on the Nagoya Protocol, and relevant instruments and legislations for educational sectors		500000	Number and type of awareness materials developed and activities conducted on the subject	HCENR - NCA	Ministry of Finance, Ministry of Figh Education, research centres, universities
Establish a documentation system containing pollution data, information and knowledge	Pollution Aspects related to Biodiversity	1000000	Existence of operational documentation system	HCENR	Ministry of Communication
Establish an information website as one platform for pollution affairs authorities		100000	Existence of an active web-site of the issue	HCENR	Ministry of Communication
Develop and design awareness raising and communication materials	Impacts of Climate Change on Biodiversity	300000	Number and types of awareness and communication	HCENR	Ministry of Higher Education, Ministry of Science, Ministry of

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
on impacts of climate change on biodiversity			materials designed and developed		Culture and Information, Ministry of Education
Establish information centre to launch awareness raising campaigns and information dissemination activities about biodiversity conservation under the stress of climate change		1000000	Existence of operational information centre	Ministry of Culture and Information	Ministry of Higher Education, Ministry of Science, Ministry of Culture and Information, Ministry of Education
Design and implement programmes to raise awareness and interest through non-class activities in education institutes on climate change and its impacts on biodiversity		800000	Number and type of awareness and interest raising materials developed, and non-class activities conducted	Ministry of Education	HCENR, universities, Ministry of Higher Education and Scientific Research
Establish the Sudan biosafety electronic platform, and launch the Sudan biosafety clearing house	Biosafety and Biotechnology Aspects related to Biodiversity	150000	Existence of the biosafety platform and clearing house	HCENR-NCA	National Information Centre
National Target 22: Ensure the full and effective participation of indigenous and local communities in Sudan, at all relevant levels, and their access to justice and information related to biodiversity, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as women and girls, children and youth, and persons with disabilities, and ensure the full protection of environmental human rights defenders					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Arrange to ensure that the indigenous peoples and local communities are represented, considering gender perspective, by at least 10% in bodies of decision-making processes	Inland Waters Biodiversity	150000	Level of representation of local communities in related bodies	HCENR	Local communities
Build capacities and raise awareness to enhance representation and participation of indigenous peoples and local communities		150000	Trend in awareness towards representation and participation of local communities	HCENR - NCA	Local communities, Ministry of Finance
Arrange to ensure that at least 10% of the indigenous peoples and local communities, are represented in bodies involved in the decision-making processes, and access to justice and information related to biodiversity	ABS Aspects related to Biodiversity	0	Level of representation of local communities in the relevant body	HCENR - NCA	Local communities, state governments, Ministry of Finance
National Target 23: Ensure gender equality in the implementation of the NBSAP in Sudan through a gender responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity					

Action in Summary	Component/Related Aspect	Estimated Budget (US\$)	Indicators for tracking progress	Body responsible for implementation and reporting	Main Collaborators
Develop a national gender action plan for biodiversity		20000	Existence of the action plan	HCENR	Ministries, research institutes, universities, NGS, community-based organizations, women organizations

Appendix 2

Priorities, Opportunities, Risks and Challenges to ensure Effective Implementation of the NBSAP (2025-2030)

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
National Target 1 By 2030, the rate of loss of all natural habitats in Sudan is brought down by at least 25 per cent, and degradation and fragmentation is significantly reduced through participatory, integrated and biodiversity inclusive spatial planning, and/or effective management processes, while respecting the rights of indigenous peoples and local communities					
Range Plant and Animal Agrobiodiversity	Establish range enclosures identified areas, to prevent over-grazing and early grazing	Medium	Awareness of local communities of the importance of a grazing system	Inadequacy of experts on fencing matters Unavailability of sufficient construction materials	Overcoming of the traditional land tenure system that can react negatively to the need for devotion of necessary area to construct fences
	Develop awareness materials and conduct awareness activities on importance of preventing losses in rangelands	Medium	Availability of many options and social media to deliver the messages	Insufficiency of experts to develop the messages	Creating interests among local communities to be engaged in such awareness activities
	Activate the Rangeland Act 2015 for conservation, protection, sustainable use of rangelands	Low	The governmental attitude towards effective implementation of laws	Contradiction or overlapping with other laws and legislation	Raising awareness among pastoralists to accept and respect the law
	Conduct pilot activities for using water harvesting techniques to increase soil moisture content for restoration	High	Opportunities for funding like green great wall in Africa	Rarity of rainfall	Encouraging the communities to accept and participate in using these techniques

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Forest Biodiversity</i>	Develop and implement programme for applying sustainable land management practices such as rotational grazing, agroforestry and contour plough in some targeted areas	High	Availability of technical expertise at FNC. National Forest Inventory data (2020) Existence of the second FRL (2025) Existence of REDD+ Strategy targeting enhancement of biomass carbon stock	Lack of supportive policy framework Potential disruption due to sociopolitical instability in target areas Forests wild fires	Enhancing institutional integration and local governance capacity
	Conduct assessment studies to identify degraded forest areas and prioritize sites for restoration.	Medium	National-level reach National Forest Inventory data (2020)	Accessibility in conflict-affected or remote areas	Solving the problem of data inconsistency or outdated of land cover data Enhancing capacities in data collection, processing and reporting
	Restore degraded habitats through erosion control measures, water conservation techniques, and establishment of wildlife corridors	High	Availability of restoration techniques, best practices and innovations	Insufficient funding and technical capacities	Ensuring inter-agency coordination and long-term commitment

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Wildlife Biodiversity</i>	Conduct a survey on wildlife biodiversity in some states to identify the most affected areas by land and sea uses, which lead to wildlife loss	Medium	Availability of local organization specialized in wildlife surveying such as universities, research centers, WCF	Seasonal inaccessibility due rains, and deteriorated Weak Communications Network	Obtaining necessary baseline data. Securing necessary technical capacity. Overcoming cultural sensitivity Resolving the overlapping jurisdictions between federal, state and local levels
	Develop effective action plans to address the detected types of loss causes identified	Medium	Availability of qualified experts in preparing action plans	Low prioritization at high policy level	Resolving cconflicts of interests
	Take actions to effectively enforce the law by improving the performance of wildlife anti-poaching unit through increasing means of field work such as vehicles and radio communications	High	Availability of wildlife legislation and regulation Sudan is party to a number of relevant conventions such as CITES and Horn of Africa Wildlife Enforcement Network (HAWEN)	Miss use of the communication devices due to poor technical training	Covering vast areas through anti-poaching patrol Changing attitudes of the local communities towards wildlife hunting
	Participate in training courses outside the country on effective wildlife	Medium	Sudan is party to a number of related conventions on	Economic sanctions and money transfer difficulties	Overcoming the English language barrier

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	management for wildlife officers and non-commissioned officers		wildlife management which organize training courses and capacity building activities	Administrative and bureaucratic delays	Ensuring adequate monitoring and follow-up
<i>Marine Biodiversity</i>	Conduct the necessary studies to evaluate the current status of areas that constitute unique marine areas suffering from degradation and fragmentation	High	Existing previous studies Availability of different research centers and Institutions on marine research and production	Insufficient funding Weak research facilities	Covering the large scale of targeted area and complex ecosystems Filling out gaps in the baseline data Overcoming difficulties in data collection
	Conduct the necessary studies to identify the reasons and causes behind the loss of marine habitats in order to be treated	High	Existing previous studies Availability of Research centers and other government institutions	Insufficient funding Weakness in the research facilities	Covering the large scale of targeted area and complex ecosystems Filling out gaps in the baseline data Overcoming difficulties in data collection
	Develop and implement special plans to stop the loss in marine habitats by treating the reasons causing this degradation	Medium	Availability of HCENR, research institutions and other government institutions	Insufficient funding Weakness on awareness and engagement Weakness in coordination between the related institutions	Overcoming logistical hurdles Developing scalable methods for treating the reasons causing this degradation

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
				Weakness of Political will and enforcement	Integrating social and ecological priorities
<i>Inland Waters and Wetlands Biodiversity</i>	Develop wetlands biodiversity strategic action plan	High	Sudan is party to a number of relevant international conventions such as RAMSAR Convention and AEWA that can help in accessing funding assistance Existence of academic and research institutions	Inadequate funding Political instability and armed conflicts	Solving conflicts of interests among the stakeholders Ensuring effective engagement of different stakeholders Filling gaps in baseline data
National Target 2 Ensure that, by 2030, at least 10% of degraded terrestrial, inland water, coastal and marine ecosystems in Sudan that provide essential services, including services related to water, and contribute to health, livelihoods, wellbeing and climate, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable					
<i>Range Plant and Animal Agrobiodiversity</i>	Seed broadcasting in degraded rangelands, removal of harmful and unpalatable plants, and digging of water spots along animal routes	High	A number of NGOs and UN agencies can assist in seed broadcasting and opening of the animal corridors	Frequent drought Inadequacy in number of experts on water harvesting techniques	Ensuring the community participation in effectively maintain the plantations Combating the seasonal fire outbreak

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Establishment of a system for managing the water bodies, particularly hafirs, in order to share the water resource management and to avoid conflicts, and at the same time to ensure the ability to sustain and maintain the hafirs	Low	The integration between agriculture and animal production	Rarity of rainfall	Encouraging communities to accept to devote areas for grazing and animal raising
Marine Biodiversity	Establish a consultation process on innovative solutions to halt marine degradation and restore ecosystems	Medium	Availability of research centres and other government institutions	Insufficient funding Decreasing in numbers of national experts as result of the war	Ensuring full access to data resources during consultation process
	Implementation of training activities for all stakeholders on coral reef restoration, and restoration of mangrove and seagrass	Medium	Availability of the staff of the research centers and other institutions as trainers Effective media	Insufficient funding Decreasing in numbers of national experts as result of the war	Ensuring stakeholders' participation
	Develop, promote and implement marine restoration projects on coral reef mangrove and seagrass restoration in degraded areas	High	Availability of research centres	Insufficient funding Weakness of awareness and engagement Weakness in coordination between the related institutions	Mobilizing necessary resources Overcoming logistical hurdles Developing scalable restoration methods

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
				Lack of political will and enforcement	Integrating social and ecological priorities Ensuring that restoration efforts are scientifically credible and adaptable to climate change
<i>Inland Waters and Wetlands Biodiversity</i>	Organize a consultation process on methodologies for restoration of degraded inland water ecosystems, including wetlands, for sustainable utilization of natural resources that provide potential food, fodder and medicinal value of aquatic plants	High	Availability of guidelines for restoring degraded inland water ecosystems including wetlands Growing awareness and civil society	Financial and technical resources constraints	Finding qualified experts on restoration activities Ensuring coordination of priorities among different stakeholders Ensuring access to updated scientific data
	Conserve and rehabilitate Mangrove wetlands by mapping all existing mangrove stands and degraded sites.	High	Sudan is the party to wetlands RAMSAR convention A number of wetlands declared The ongoing protected areas project in the Red sea	Institutional intersections	Finding qimited qualified taxonomic experts

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Conduct a national assessment study to identify, map and prioritize the critical sites used by migratory water birds as stopover sites, in order to plan for restoring the degraded ones	High	Synergies between multilateral environment agreements Migratory soaring bird project	Unsustainable conservation of water birds and wetlands Continuous decline in the status of migratory and water birds	Combating the coastal area degradation and mangrove deforestation Ensuring high planting success rates
<i>Health Aspects related to Biodiversity</i>	Develop a comprehensive restoration plan through compilation of restoration plans of different biodiversity components in one document in order to optimize co-benefits of restoration activities for positive health impacts	High	Existence Guidelines for drafting the national restoration plans Interest of all stakeholders in developing a restoration plan for specific biodiversity components	Resource limitations, including funding and expertise	Involving diverse stakeholders with varying interests and perspectives, which require effective negotiation, and consensus building Identifying priority species for restoration based on their ecological importance and potential for contributing to ecosystem recovery
National Target 3 Ensure by 2030, that at least 15 per cent of terrestrial, inland water and coastal and marine areas in Sudan, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area based conservation measures, and integrated into the wider landscapes and seascapes, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, and recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories					

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
Wildlife Biodiversity	Make clear border demarcation for all national parks and game reserves and update their maps and biodiversity information	Medium	Protected areas gazette declared with given coordinates National parks maps produced	Human wildlife Conflict Land use disputes	Resolving conflicts of interests among the stakeholders Developing an updated land use plan Enhancing positive attitudes among the local communities and politician about the importance of wildlife biodiversity
	Establish new terrestrial and marine protected areas and reserving new wetland areas and declared as Ramsar sites	High	Sudan joined the Ramsar convention and CITES A number of protected areas proposed and not declared yet	Human population increase at the expense of areas to be protected	Writing good proposals in this regard
	Establish new equipped offices for wildlife management in different localities	Medium	Availability of wildlife personnel Possibility of allocating land areas to establish wildlife offices in the localities	Conflicts between federal and state authorities Low priority for funding	Ensuring sufficient power supply and internet

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop and produce awareness materials and organize awareness raising activities to raise awareness and engagement of local communities around wildlife reserves and areas with high importance in the conservation of wildlife	High	Existence of civil societies and NGOs active in field of wildlife conservation. Participation and engagement of local community leaders Existence of basic schools in most of the rural villages	The rigidity of the local elderly and their refusal to accept awareness-raising ideas for wildlife conservation	Overcoming illiteracy among local communities Designing the right awareness messages for the right targeted groups
	Develop national guidelines categorizing protected areas based on international categories of protected areas such as IUCN and RAMSAR	Medium	Sudan is a party to RAMSAR Convention, IUCN and UNESCO-MAB (Man and Biosphere Reserve) Existence of international guidelines in this regard Availability of national institutions and scientific capacity Existence of Protected Areas	Financial limitations Political disruption Weak legal backing	Strengthening coordination across related sectors Ensuring legal basis for new categories Providing necessary technical capacities Addressing the conflicting land use interests

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			Network and Internationally Recognized Sites		
	Establishment of Community-Based Natural Resource Management (CBNRM) Framework	Medium	Availability of institutional and legal foundations Availability of active community-based governance models	Conflicts and governance instability Weak legal enforcement mechanisms Socioecological pressures	Addressing institutional and capacity gaps Reconciling multiple governance layers Ensuring inclusive representation Sustaining financing Covering data and monitoring gaps
Marine Biodiversity	Develop and implement programs to improve effective and equitable management in the existing two marine protected areas in Dungonab Bay and Mukkawar Island, and Sangneb Marine National Parks	Medium	Existence of Wildlife Conservation Force. HCENR and research centers The ongoing project implemented by HCENR on Strengthened Protected Areas System and Integrated Ecosystem Management in Sudan	Insufficient funding Weakness of awareness and engagement Weakness in coordination between the related institutions. Lack of long-term commitment Weakness of political will and necessary enforcement	Ensuring effective stakeholders' participation Filling out gaps in the baseline data Improving legal frameworks

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Raising public awareness for local communities existing around the protected area in Dungonab Bay and Mukkawar Island Marine National Park to effectively engage them in conservation activities	Meduim	Existence of the Wildlife Conservation Forces and HCENR Availability of the staff of the research centers and other institutions	Insufficient funding	Ensuring effective stakeholders' participations and building trust with them
	Conduct a wide consultation process among all stakeholders on development of proposals for new marine protected areas	Medium	All stakeholders are available	Insufficient funding Decreasing in numbers of national experts as result of the war	Organizing effective consultation that is able to reach to clear recommendations for decision makers
<i>Inland Waters and Wetlands Biodiversity</i>	Establish new protected areas, game reserves and sanctuaries to represent all ecological zones and states and adopting international categorization of protected areas with special attention to inclusion of inland fresh water (khors and wadis), as well as specifically establishing protected areas for the following habitats: a. One of the non-Nilotic lakes such as Kundi, b. Wadi Alalagi.	High	Existence of qualified personnel and supportive teams in the states Established cooperation with universities and research centres for information and data collection Existence of newly drafted policy for protected areas systems	Insecurity due to ongoing armed conflict Limited fund Climate change	Ensuring adequate management capacities and awareness Supporting livelihood and sustainable development of IPLCs Tackling human land-use conflicts

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Formulate new management plans for protected areas that have no management plans to improve the management effectiveness	High	Availability of guidelines for management planning of protected areas National experience in formulating management plans for some protected areas	Insufficient funding	Improving the management, governance and policy framework of inland waters biodiversity Ensuring community engagement
	Declare new RAMSAR wetlands	High	Possible access to financial and technical assistances Sudan is a party to RAMSAR Existence of WCF	Insufficient implementation of protection measures	Ensuring legal and institutional capacities Ensuring necessary Long term monitoring and management fund
National Target 4 Ensure by 2030, that urgent management actions are taken to prevent the extinction of known threatened species, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species, including cultivated plants and domesticated animals, and to improve and sustain their conservation status, particularly of those most in decline, including through in-situ and ex-situ conservation practices, and effectively manage human-wildlife interactions to minimize human-wildlife conflict for coexistence					
<i>Cultivated Plant Agrobiodiversity</i>	Initiation of activities for <i>in-situ</i> and on-farm conservation of plant genetic resources for food and agriculture (PGRFA) in close collaboration with local	Medium	Existence of the Agricultural Plant Genetic Resources Conservation and Research Centre (APGRC), having	Armed conflicts in proposed areas	Convincing local farmers and communities to be actively involved in such activities

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	farmers and communities, through establishment of community genebanks		relation with the international concerned bodies such as ITPGRFA Secretariat and Crop Trust		
	Strengthening, rehabilitation and provision of necessary physical, human and financial capacities, as well as building necessary legal and institutional instruments for conservation and sustainable use of PGRFA	High	Existence of the APGRC, having relation with the international concerned bodies such as ITPGRFA Secretariat and Crop Trust	Continuation of instability situation, and insufficient funding and delayed response for the urgent current rehabilitation needs	Compensation of the lost physical facilities due to war
	Conduct and participate in training and human capacity building activities on areas of relevance to conservation and sustainable use of PGRFA, including plant identification, population biology, ethno-botany, use of geographical information systems (GIS), and molecular tools	Medium	Existence of the APGRC. Existence of training courses opportunities within concerned academic institutions.	Limited resources Limited institutional capacities Poor communication and coordination	Identifying the exact national and international institutes of relevance. Establish appropriate links with them for training and capacity building Identifying appropriate training opportunities Overcome language barriers

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Collection and re-collection of PGRFA from all over the country to fill taxonomic and geographical gaps, as well as the gaps resulting in the germplasm holdings of the APGRC consequent to the current war	High	Existence of the APGRC, having relation with the international concerned bodies such as ITPGRFA Secretariat and Crop Trust	Instability situation specially in targeted areas. Insufficient funding	Identifying appropriate targeted areas and taxa Appropriate timing
	Repatriation of Sudanese PGRFA conserved abroad in international research centres such as those belonging to the Consultative Group on International Agricultural Research (CGIAR)	Medium	Sudan being a party to the ITPGRFA should facilitate such processes with the CGIAR centres as well as with others	Loss or damage of genetic material during transportation Loss of the genetic material in the national genebank due to instability of power supply	Obtaining necessary permits Identifying exact materials to be repatriated as well as the right sources Swift clearance of the materials upon arrival
	Take necessary measures for safe duplications of accessions held by the APGRC inside and outside the country	High	Existence of the Svalbard Global Seed Vault (SGSV)	Lack of access to reliable swift courier	Availability of sufficient qualified staff Obtain necessary permits Readiness within the time of opening of the SGSV

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Restoration of traditional varieties back into war and disaster-affected areas as in Darfur, Kordofan and Blue Nile states	Medium	Existence of germplasm collections from at least Darfur and Kordofan at APGRC Central or Sub-National seed banks	Insecurity in proposed areas due to war	Convincing stakeholders to adopt the restoration process Establishing necessary communications and coordination with the concerned
	Conduct research on crop genetic diversity to determine the level of genetic diversity in order to develop plans for conservation and management and enhance sustainable use	High	Existence of the APGRC Availability of conserved germplasm	Insufficient funding Inadequate infrastructure In-accessibility to technology	Prioritizing based on the type and size of PGRFA collections. Identifying workable mini-sets for further studies Establishing collaborative joint research activities with corresponding institutes inside or outside the country
	Carry out well-coordinated comprehensive surveys and assessments all over the country for all field and horticultural crops	Medium	The existence of the APGRC	Limited funding Limited institutional capacities	Identifying appropriate timing Ensuring engagements of concerned disciplines Availing the qualified staff

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
Range Plant and Animal Agrobiodiversity	Collect indigenous range plant genetic resources for <i>ex-situ</i> conservation in the national gene bank.	High	The current international concerns and efforts to conserve the biodiversity of range plants Existence of a national plant genebank	Inadequacy of experts	Overcoming overgrazing and early grazing that impede the germplasm collection efforts by breaking the plant life cycle
Forest Biodiversity	Carry out necessary actions for registration of 10% of proposed forests as reserved forests and be reforested using mainly indigenous species such as <i>Acacia senegal</i> , <i>Acacia nilotica</i> and <i>Khaya senegalensis</i>	High	Availability of indigenous knowledge on such native species. Availability of vast areas along river Nile and Blue Nile ready for forest interventions	Encroachment by agricultural and commercial interests	Negotiating land tenure and customary land rights with stakeholders
	Implement <i>ex-situ</i> conservation measures for critical threatened forest species	Medium	Existence of national conservation And research centres	Resulting losses in genetic resources and negative impacts on germplasm conservation centres due to war	Increasing the number of specialized expertise in genetic resources management Establishing necessary infrastructure for long-term storage and propagation

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Provide training and capacity building for community members involved in conservation activities	High	Availability of training centres for communities and trained extension agents	Short-term funding cycles threatening sustainability of training efforts	Overcoming cultural and language barriers in knowledge transfer
	Gazette registration of identified biodiversity species reserves of forest trees	High	Experience in registration procedures Availability of information on species in reserves of forests	Difficulty of accessibility to some areas due to war Delays due to bureaucracy	Ensuring sufficient funding Ensuring availability of necessary capacities and facilities . Obtaining adequate baseline data and information on endangered species and habitats
Wildlife Biodiversity	Conduct a comprehensive survey to identify all species that are exposed to extinction	High	Existence of a newly established national species survival committee by SWS in Sudan Availability of the IUCN Red list Availability of professional wildlife scientists and experts	Insufficiency of financial resources Insufficiency of technical resources	Networking with different stakeholders Overcoming human-wildlife conflict Overcoming problems of the roughness of the roads and the difficulty of some terrains that may delay the completion of the survey

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			Existence of previous information on extinct, rare, endemic and endangered species		
	Conduct activities to raise awareness of stakeholders and decision makers towards supporting wildlife conservation issues	Medium	Sudan is party to a number of international treaties and agreements of relevance to wildlife conservation Existence of NGOs such as Sudanese Wildlife Society (SWS) and Sudanese Environment Conservation Society (SECS)	Insufficient financial resources	Ensuring arriving to common understanding among different institutions
	Translocate and restore a number of extinct large wild animals and release them into their former and suitable habitats	Medium	Good relations with South Sudan wildlife authority to ensure cooperation in this regard Eco-tourism in protected areas encourages reintroduction of	Insufficient financial and technical resources Poaching by lawbreakers Insufficient capacities among professional wildlife scientists and experts in	Overcoming the problem of human-wildlife conflict Ensuring sufficient aftercare for translocated animals

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			species like giraffe to attract tourists	reintroduction of extinct species	
	Establish buffer zones on the borders of protected areas to reduce human-wildlife conflict	Low	Existence of protected areas with known borders Availability of natural resources in the protected areas that can be shared and used sustainably by the local communities living around	Human population increase Climate change hazards. Shortage of financial resources	Ensuring conserving wild animals against human interest Improving communities attitudes towards wildlife damage
	Establish captive breeding centre for rare and extinct species, and a genebank unit to maintain genetic diversity	Medium	Existence of some farms established for commercial wildlife production Existence of models of other biodiversity genebanks in Sudan	Insufficient financial and technical resources	Ensuring access to modern technology Filling gaps of knowledge on <i>in-</i> and <i>ex-situ</i> conservation
	Develop an action plan for management of wild plant and animal species for medicinal uses, and for	Medium	Availability of documented medicinal species Existence of expertise	Lack or insufficiency of funding	Ensuring covering regulation and monitoring issues

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	reducing human-wildlife conflicts and safe-coexistence			Conflict of interests among the stakeholders	Establishing baseline data and information
	Develop <i>ex-situ</i> wildlife conservation strategy	Medium	Existence of protected areas network as genetic resource source Availability of skilled personnel in wildlife management Existence of legal and institutional frameworks Existence of supporting international organizations	Political and economic instability	Addressing the different concerns such as site selection, capacity building and logistics
	Establish model rescue and rehabilitation centres for priority wildlife species	Medium	Availability of skilled personnel within Wildlife Conservation Forces Existence of veterinary institutions and universities	Political and economic instability Lack of national policy or legal Frameworks Unavailability of veterinary drugs availability and	Addressing the different concerns such site selection, capacity building and logistics

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			Possibility of community and NGOs engagement	wildlife health capacity	
Marine Biodiversity	Conduct the necessary studies to identify endangered indigenous range species in marine ecosystem	High	Existence of research centres	Insufficient funding Shortage the research facilities	Ensuring access to Indigenous knowledge of relevance Filling gaps in in the baseline data
	Strengthen and promote the existing marine environmental monitoring program applied by IMR for coral reef habitats, including fish, mangroves, seaweeds, turtles, mammals and birds, in addition to physicochemical properties	High	The program is already implemented by IMR and FMSF but needs improving and support in research facilities	Insufficient funding	Ensuring accessibility to monitoring area Making available the necessary research facilities Handling and analysing the large volume of data collected from various sources with robust data management systems
	Establishment of a marine genetic resources' unit and a genebank	High	Availability of database collected by IMR, FMSF, MFRS, and MFA	Insufficient funding Governance gaps	Collecting samples from deep-sea environments Cryopreservation of marine genetic material Ensuring the material's integrity and viability

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Establishment of national oceanographic data centre	High	Availability of relevant database collected by IMR, FMSF, MFRS, and MFA	Insufficient funding Weakness in coordination between the related institutions. Weakness of political will Lack of uniform data policies Inadequate legacy data preservation	Working with high data volume and complexity Ensuring data integration Ensuring data timely accessibility Ensuring data quality and metadata Ensuring data privacy, confidentiality and security
<i>Inland Waters and Wetlands Biodiversity</i>	Assess the threat status of endangered fish and mammals' species outside the protected areas including the main threats to the threatened species, and restore endangered species	High	Existence of qualified personnel and researchers	The difficulty in obtaining accurate data for species with limited populations The high costs associated with restoring and protecting species	Understanding the complex interactions between threats like habitat loss, climate change, pollution, overexploitation, and invasive species
	Conduct an assessment study to identify if any of the inland waters' species are threatened, and conduct habitat restoration as management action to reduce extinction risk, in particular for threatened species	High	Existence of qualified personnel and researchers	Financial constraints	Reducing extinction risk for vulnerable species Improving ecosystem health Engaging the communities in the restoration process

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Apply existing approaches as pilot activities to prevent extinction such as application of precaution measures including closed areas/closed seasons, and reduce catch / unit efforts	High	Past practices existence	Lack of security and military operations in parts of the country may hinder such efforts	Providing mobility and extension means Establishing fishers' associations
<i>Insect and Microorganism Biodiversity</i>	Conduct a survey and studies to determine and assess the level of threatened and beneficial insect and microorganism species	High	Availability of scientists and researchers in different institutes Existence of survey facilitating tools such GIS, GPS, and Remote sensing	Shortage of funds Inadequacy in insect and microorganisms' taxonomy and identifications facilities	Making available adequate materials and tools to conduct the survey and studies
	Establishing apiaries for rearing bees, and laboratories for rearing predator insects in crop production areas.	High	Availability of natural conditions for rearing bees such as plant covers Existence of some apiaries for rearing bees Availability of some insectaries	Shortage in beekeeping technicians	Availing necessary conditions for rearing especially during unfavourable seasons

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Establish a national microbial culture collection laboratory to survey, collect, classify and conserve the indigenous microorganism genetic diversity	High	Existence of a national microbial culture in the Faculty of Science, U. of K.	Limited funds	Ensuring stable and continuous power supply
Biosafety and Biotechnology Aspects related to Biodiversity	Establish <i>in-vitro</i> conservation facilities for conservation of cultivated plant genetic resources within the relevant gene banks	Medium	Existence of Agricultural research centers, universities scientists and researchers	Insufficient funding to cover the high initial cost, and the infrastructural vulnerabilities	Developing an efficient <i>in-vitro</i> regeneration protocols
	Conducting studies and research on the possibility of using biotechnology to conserve wildlife and other genetic resources	Medium	Existence of research centres, protected areas and universities	Insufficiency of resources and equipment	Establishing of functional biotechnology laboratories Ensuring availability of sufficient capacities
Health Aspects related to Biodiversity	Approve national policy and strategy and updated law of wildlife, with consideration of the role of species in the production of medicines and reduction of human-wildlife conflict	High	Existence of full drafted national policy, strategy and updated law of wildlife	Absence of a full-time active separate national legislative body	Convincing the temporary legislative authority to give high priority for the issue among its agenda

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop an action plan by the concerned authorities to reduce human-wildlife conflict at a national level	High	Existence of full drafted national policy and strategy and updated law of wildlife Numerous action plans and strategies developed at regional, global and country levels to address human-wildlife conflict	Inadequate funding Insufficient monitoring and evaluation	Understanding and managing human-wildlife conflict Involving all relevant sectors and stakeholders, including the communities, in the process
National Target 5 Ensure that the use, harvesting and trade of wild species in Sudan is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities.					
Wildlife Biodiversity	UpdateL wildlife law, including regulations to control harvesting and trade of wild species and setting strong punishments for both illegal trade and hunting	Medium	Availability of International funding and support from conservation partners such as CITES, UNEP and WWF Existence of a legal framework Existence of experts	Absence of political will Insufficiency of financial resources	Ensuring strong legislative and policy integration Addressing the lack of reliable wildlife data and monitoring systems Ensuring stakeholders support Ensuring sufficient coordination among the concerned

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop and operationalize a national e CITES permitting and enforcement system integrated with Sudan's export platforms	High	National commitment to digital transformation Institutional willingness Global technical Support: Existence of human capacity	Insufficient funding System downtime or technical failures	Ensuring cybersecurity and data integrity Removing interoperability barriers Sustaining concerns Ensuring wide coverage even in remote areas Covering regulatory gaps Ensuring coherent institutional coordination Building necessary capacities
Marine Biodiversity	Conduct comprehensive fish stock assessment study	High	Availability of Research centres, and recent pilot studies on fish stock assessment conducted by Norwegian IMR	Insufficient funding Uncertainty in stock structure	Considering impacts of fishing practices during assessment Ensuring effectively implementing management strategies
	Review and develop regulations that encourage sustainable fishing, and to avoid over-fishing	High	Availability of Research centres Expected supports from regional and international organizations	Insufficient funding Lack of political support	Balancing between conservation and socio-economic needs Combating unreported, and unregulated fishing

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop a plan for implementation of Ecosystem Approach Fishery Management	High	Existence of research centres Recent project on Ecosystem Approach Fishery Management conducted by UNIDO	Insufficient funding Data gaps and scientific uncertainty Weakness of stakeholders' engagement	Ensuring good governance and strong institutional set-up Developing clear vision and roadmap
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Develop community protocols on ABS to respect and protect customary sustainable use by indigenous peoples and local communities of their genetic resources, including wild species	High	Existence of guidelines on developing Biocultural Community Protocols (BCP), as well as experiences from different countries, including a national local one	Unavailability of financial resources	Understanding the actual customary sustainable uses of the indigenous peoples and local communities (IPLCs) Engaging local communities in developing community protocols
	Develop communication, education and public awareness materials about the value of customary sustainable use by IPLCs of wild species	Medium	Existence of various awareness materials at international and national levels	General lack of understanding of traditional knowledge and its links to biodiversity conservation	Reaching diverse audiences Overcoming local languages barriers
<i>Health Aspects related to Biodiversity</i>	Develop regulations to avoid the unsustainable and illegal use of wildlife species, and to ensure provision of wildlife	High	Availability of a current wildlife law and a new drafted one	Limited resources	Enhancing public awareness about the negative impacts of

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	functions such as medicinal products		Availability of global assessment on sustainable use of wildlife species		unsustainable and illegal use of wildlife species
	Build institutional capacities to apply prevention measures for reducing the risk of pathogen spillover through provision of hygiene equipment	High	Coordination between sectors in Sudan (mainly Health and Animal Resources sectors) had early been established Joint External Evaluation (JEE) for countries was conducted 2016. Surveillance system for priority zoonotic disease is in place	Infections caused by resistance pathogen	Dealing with the open state borders and overlapping animal groups between counters –
National Target 6 Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species (IAS) on biodiversity and ecosystem services in Sudan by identifying and prioritizing their pathways, controlling or eradicating the priority species, and putting in place measures to manage pathways to prevent their introduction and establishment, and reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent by 2030					
<i>Cultivated Plant Agrobiodiversity</i>	Conduct awareness raising activities among different stakeholders on the issue of IAS and their impacts on	Medium	Availability of media means and expertise	Negligence and lack of interest	Designing the right awareness materials for the right target groups

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	cultivated plant agrobiodiversity				
	Conduct a study on IAS and their impacts on agrobiodiversity, and evaluate their economic, social and environmental impacts	Medium	Availability of expertise	Limited funding	Lack of appropriate infrastructure
	Empower the current plant quarantine authority by strengthening quarantine capacities and measures such as borders control facilities	High	Existence of quarantine authority	In-sufficient funding Under-estimation by some of the role of quarantine authority	Identifying the type and specifications of the capacities needed
	Produce an inventory of invasive alien species	High	Existence of expertise	Limited funding	Ensuring collaboration among different disciplines
	Developing participatory projects/programs targeting priority IAS species for elimination and eradication	High	The distribution of the IAS is still limited to certain areas The negative impact of the IAS is clear Expertise are available Some IAS are valuable at certain stages and attract foreign investors such as mesquite	Lack of collaboration and coordination with concerned authorities Limitation of fund	Convincing local communities to effectively participate in such activities

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
Forest Biodiversity	Conduct activities to eradicate invasive alien species that are already been found having adverse effects on biodiversity	Medium	Existence Invasive species eradication resolution for <i>Prosopis juliflora</i> Existence of monitoring units Possibility doing this within the forests silvicultural practices	Weak political will to enforce the eradication policy or resolution Insufficient funding	Strengthening legal or institutional frameworks for rapid response Accelerating the control measures against the rapid biological reproduction of the IAS
	Develop effective systems and tools for monitoring and evaluation of invasive alien species	Medium	Availability of systems and tools	Insecurity conditions and war	Establishing appropriate information system for sharing the information on the invasive alien species Increasing technical capacity and data availability to ensure the development of the systems
	Provide training and capacity building to local communities in a process for combating invasive alien species	Medium	Availability of training units and extension staff for capacity building	Weakness of local networks for training platforms Insecure finance	Enhancing community interest in the training to attain Long-term behavioral change
Wildlife Biodiversity	Conduct a study on invasive alien species affecting wildlife ecosystems in protected areas	High	Possibility of involvement of universities students and NGOs	Insufficient financial and technical resources	Ensuring ranking this action at a high priority level

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
				Insufficient baseline data	Enhancing the public awareness and perception during implementation Overcoming inconsistency in policies in different states
	Establish an invasive species control and monitoring unit in Dinder National Park	Medium	Invasive species already identified	Insufficient financial resources	Making available necessary logistics and infrastructure Developing necessary technical and human capacities
	Develop materials and conduct activities to promote awareness on halting invasive alien species introduction through public media and social media	Medium	Availability of information on invasive species	Low funding allocation. Absence of clear policy on IAS	Using the appropriate media for the appropriate messages Overcoming language and cultural barriers
<i>Marine Biodiversity</i>	Establishment of a laboratory unit for analysing the ballast water to detect and identify invasive alien species	Medium	Existence of research centres Existence of National Action Plan on Ballast Water	Insufficient funding Shortage in specialized equipment and trained personnel	Identifying microscopic and morphologically similar species Ensuring quality control and standardization Developing early warning systems

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Create effective regular monitoring program/system for investigation of invasive alien species in the ballast water discharging in Bashair (1 and 2) terminals for exported oil	High	Existence of research centres Existence of National Action Plan on Ballast Water	Insufficient funding Weakness in coordination between the related institutions Lack of long term commitment from related institutions	Ensuring accessibility to monitoring area Handling and analysing the large volume of data collected from various sources Ensuring provision of necessary research facilities Ensuring regular equipment maintenance
	Develop awareness materials and implement a public awareness programme on the invasive species for decision makers and other stakeholders.	Medium	Existence of HCENR and the staff of the research centres and others institutions	Insufficient funding Weakness of coordination Weakness of Public engagement	Ensuring effective stakeholder engagement Overcoming difficulties in changing behaviour Designing well awareness materials
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct assessment study to identify and manage pathways of the introduction of alien invasive species in the inland waters.	High	Availability of a global comprehensive assessment of Invasive Alien Species (IAS) and their control Existence of experts	Insufficient resources	Developing scientific information and database on IAS in inland waters Understanding the impact of IAS on local inland waters biodiversity

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Apply biological and cultural control mechanisms to eradicate invasive alien species that are already been found having adverse effects on biodiversity of inland water ecosystems	High	The increasing willingness and desire among stakeholders to cooperate on management, research and building awareness on the impacts of invasive alien species	Insufficient funding to cover the significant control costs	Raising public awareness on cultural control Preventing unintended ecological consequences from introducing new organisms, and the possibility of the control agents themselves becoming invasive Strengthening collaboration among relevant government institutions and stakeholder engagement Developing appropriate legislation, and management strategy for biological and cultural control mechanisms for invasive alien species
	Conduct assessment study to identify and manage pathways of the introduction of alien invasive species in the inland waters	High	Availability of a global comprehensive assessment of Invasive Alien Species (IAS) and their control.	Insufficient resources	Developing scientific information and database on IAS in inland waters Understanding the impact of IAS on local inland waters biodiversity

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			Existence of experts		
	Conduct activities to upgrade capacities on invasive alien species in wetlands	High	Existence of control programme for invasive species Possibility of access to funding from international organizations Existence of the academic and research expertise	Constraints of policy or legal framework to support implementation Low awareness on, and prioritization of the wetlands' conservation Insecurity or remoteness of wetland locations may hinder the activities	Obtaining necessary baseline data and information on wetlands and invasive species
<i>Insect and Microorganism Biodiversity</i>	Capacity building and training to use biological methods to control the invasive alien species in the country	High	Availability of experts and researchers in this field	Insufficiency of funding	Convincing the community about the danger of invasive alien species
	Develop and implement effective response procedures for the prevention of new potential invasive species	High	Existence of some quarantine stations distributed over the country Availability of experts and researchers in this field	Limited fund	Ensuring stable of power supply and molecular tools to identify invasive species

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
Health Aspects related to Biodiversity	Conduct assessment study to identify and manage pathways of the introduction of invasive alien species (IAS) to reduce the introduction of IAS that are hazardous to human, animal, and plant health and environment	High	Existence of a global comprehensive assessment of IAS and their control	Limited resources and capacities, including financial constraints and human resources	Identifying and understanding different pathways of IAS. Enhancing public awareness and engagement Filling gaps in knowledge for some species, particularly in aquatic ecosystems
National Target 7 By 2030, pollution, including from excess nutrients, pesticides and plastic, has been brought to levels that are not harmful to biodiversity and ecosystem functions and services, by reducing to half excess nutrients lost to environment, and risks from pesticides and other chemicals, through more efficient nutrient cycling and use, and integrated pest management, and working towards eliminating plastic pollution					
Cultivated Plant Agrobiodiversity	Conduct awareness raising activities among farmers about the risks associated with excess use of pesticides on plant diversity through different means including farmers schools	High	Availability of resources and expertise	Resistance to change Underestimation of the topic Poor collaboration and communications	Designing convincing materials Targeting the right concerned groups
	Conduct study on the effect of excess use of pesticides on agrobiodiversity.	Medium	Availability of resources and expertise	Limited funding	Collaboration with concerned bodies Collection of relevant data and information
	Development of project proposals on using integrated pest management to reduce	Medium	IPM expertise are available	Weak coordination and collaboration with concerned disciplines	Encourage Farmers participation

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	the negative impacts of chemical uses on plant agrobiodiversity with direct participation of farmers			Insufficient funding	Developing convincing research proposals addressing the exact problem
	Strengthening the existing agro-chemical committee for inspection and monitoring of the marketing processes of chemical pesticides and fertilizers, and inspecting their methods of spraying and storage	Medium	Existence of such committees within the higher council for pesticides	Lack of transparency	Activate and strengthen the existing committee Close follow up and collaboration Participation of concerned stakeholders
Wildlife Biodiversity	Organize periodical litter cleaning activities, especially plastic collection campaigns, in terrestrial and marine parks to reduce the existing amount of plastic litter	High	Existence of civil societies and NGOs Existence of private sectors such as eco-tourism companies	Environmental Risks Inadequate financial resources	Managing and recycling plastics Ensuring applying security measures for equipment against theft or loss
	Disseminate litter containers in the villages of local communities in and around protected areas.	Low	Existence of eco-tourism companies, civil societies and NGOs	Shortage of fund. Inadequate policies and regulations regarding waste management	Facing geographical and environmental challenges in some protected Areas Changing cultural and communities' attitudes
	Develop materials and conduct awareness campaigns for school pupils and in public markets on the harmful effects of the use of	Medium	Availability of some brochures and guidelines developed by the Sudanese wildlife	Insufficient financial resources Increase in human population	Striking a balance between farmers desire to increase their crop production and revenues and ensuring the protection of environment

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	pesticides and others on the environments of wild animals, and provide prizes in recognition for best performances		society on pesticides uses		Overcoming the illiteracy among most of farmers
Marine Biodiversity	Establishment of marine pollution laboratory	High	Existence of laboratories at IMR and FMSF need to be developed	Insufficient funding Technological gaps	Establishment of necessary infrastructure Ensuring quality control and standardization Effective data management Taking into account the safety and environmental concerns
	Review and improve the national response plan for managing marine oil pollution incidents, oil spills and hazardous materials in Sudan	Medium	Existence of research centres Existence of a national action plan for response for managing marine oil pollution incidents, oil spills and hazardous materials in Sudan	Insufficient funding Insufficient trained personnel Weakness in stakeholders' engagement	Managing the influence of natural factors like weather and coastal geomorphology on spill response Clarifying the compensation and legal framework
	Improve the national action plan for the sustainable	Medium	Existence of a National Action Plan for the sustainable	Insufficient funding	Filling the gaps in baseline data

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	management of marine litter in Sudan		management of marine litter	Weakness in stakeholders' engagement	Ensuring good governance and strong institutional arrangements Provision of adequate Infrastructure
	Develop effective reception facilities system in the Sudanese ports	High	Existing opportunities for attracting investment in reception facilities system	Insufficient funding Social and Political Instability	Ensuring logistical efficiency Ensuring adequate infrastructure with sufficient fuel needs
	Review and apply control regulations to reduce the adverse impacts of gold mining to environmentally acceptable levels	High	Existence of Ministry of Mineral Resources	Lack of information and data Insufficient funding Conflicts and competing priorities	Ensuring good governance and strong institutional arrangements Ensuring stakeholders' engagement Enforcing regulations Building capacity and providing technical assistance Measuring and monitoring impacts
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct activities to raise the awareness of the community in order to enhance their role in enforcement of environmental laws to	High	Existence of environmental legislation related to pollution control	Language barriers which can lead to difficulties in	Encouraging community to adopt environment - friendly practices

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	combat pollution in inland waters		Availability of a well-prepared drafted regulation on management of chemical wastes	communication with communities	Reaching a wide spectrum of communities
	Reduce the adverse impacts of traditional as well as organized gold mining on inland waters to environmentally acceptable levels	High	Approval of Minamata Convention by the Cabinet.	High cost to rehabilitate contaminated sites Land use conflicts	Completing the Minamata Convention ratification process and fulfilling its obligations, including establishing national implementation plan, reporting and mining legislation Raising awareness on widespread and improper use of mercury in artisanal and small-scale gold mining
	Develop guidelines to combat pollution in wetlands	High	Sudan is a party to UN bodies Academic and research institutions International support and partnerships	Financial and technical resources constraints Political and institutional instability	Filling gaps in baseline data
<i>Insect and Microorganism Biodiversity</i>	Develop and endorse a plan for the federal as well as the states' authorities to	High	Existence of some regulations organizing the	Wide distribution of polluted spots all-over the country	Combating intensive use of chemicals particularly pesticides

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	reduce/remove incentives/subsidies, or impose penalties for activities that pollute the natural habitats of terrestrial, inland water and marine flora and fauna		registration, import, commercialisation, store and safe use of pesticides		Combating smuggling of unknown pesticides and fertilizers from neighbouring countries
	Develop a national plan to enhance the use of integrated pest management	High	Experiences from previously implemented IPM programme	Insufficient funding	Ensuring effective and fast implementation of IPM programme to ensure the acceptance by farmers of the concept
	Develop a national plan in collaboration with relative authorities to make a strong restriction or banning of some extremely and highly toxic insecticides use to control insect pests and find out appropriate alternative control patterns less harmful to biodiversity and beneficial organisms	Medium	Existence of regulations for introducing and management of hazardous chemicals	The weakness of penalties when importing such pesticides	Removing ant contradictions with other regulations
<i>Pollution Aspects related to Biodiversity</i>	Applying of an integrated pest management programme concentrating on the green-houses pests through the use of new trends of pest control	High	Existence of experiences from the IPM programme implemented earlier	Shortage of allocated funds	Ensuring fast implementation and delivery of IPM results Ensuring acceptability by farmers

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			in Gezira Scheme and ARC		
	Conduct studies on formulation of identified released indigenous bio-pesticides, and test their efficacy on different agricultural pests	High	Many of entomopathogenic fungi and bacteria isolated and identified	Instability of electricity power supply Shortage of funds	Convincing farmers to use biopesticides to control pests instead of chemical pesticides
	Develop a national plan in collaboration with the National Pesticides Council and HCENR to make a strong restriction or banning of some extremely and highly toxic pesticides used to control Quelea birds invading farms, specifically Fenthion avicide, and to find out appropriate alternative avicide less harmful to biodiversity	Medium	Sudan signed and ratified long time ago Rotterdam Convention Availability of safer avicides in the world	Weak in potency and efficacy of alternative proposed avicides	Overcoming difficulties in conventional application methods for alternative avicides Convincing the decision makers of the environmental benefits of such change
	Removal of chemicals contaminated soil resulting from the abuse of agrochemicals and the chemicals used in gold mining sectors, by importation of specific incinerators or appropriate	High	The specifications of incinerators are available A number of research papers already published on the pesticide	Shortage of fund to purchase incinerator	Covering widely distributed areas with obsolete pesticides and pesticides contaminated soil over the country Making available necessary facilities for

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	modern chemical treatment techniques, and using of bioremediation and/or biodegradation techniques for chemical-contaminated soil		biodegradation and bioremediation		production and release of pesticides degradable microorganisms in mass culture
	Organize awareness activities on agrochemical negative impacts on biodiversity and ecosystems for different stakeholders in the agricultural sector and public health sector, including farmers, distributors, employees and relative occupational fields, to raise the ideal knowledge regarding the use, handling and application of chemicals in general	High	Availability of experts in the field	Shortage of funds	Convincing the beneficiaries with the negative impacts associated with these chemicals to their health and biodiversity
	Avoiding the intensive use of non-selective herbicides that affected and damage all species of weeds and plants by using of environment friendly herbicides such as selective herbicides, laser technique, agronomic practices, mechanical control and microbial control	Medium	Availability of integrated pest management unit in the ARC and a number of departments of plant protection in different universities	Most of the herbicide-applied areas belong to private sectors and difficult to manage them	Realizing by farmers the risks associated with the intensive use of herbicides Encouraging them to accept the new technologies to control weeds

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Rearing mass cultures of predator and parasitoids and release them whenever needed, to avoid application of synthetic chemicals to control pests	Medium	Availability of a number of insect rearing laboratories and entomologists	Instability of electricity and low humidity	Convincing farmers to accept biological control concept
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	Raise the capacity of the biosafety National Competent Authority for monitoring and risk management at different stages prior to, during and post to the testing and release of any GM varieties resistant to pests and/or diseases for agricultural production	High	Existence of national biosafety framework, biosafety law and national biosafety competent authority	Infrastructure gaps, monitoring deficiencies and inspection limitations, insufficient human resources both in quality and quantity	Improving functional system for handling of requests, risk assessment, decision –making and risk management of GMOs
<i>Health Aspects related to Biodiversity</i>	Conduct awareness raising activities on the negatives of excess nutrients, pesticides, hazardous waste, chemicals, and plastic on human and animal health and environment	High	Existence of environmental legislation related to pollution control Well prepared drafted regulation on management of chemical wastes Existence of experts	Conflicting interests Lack of individual responsibility	Enhancing public understanding and awareness Involving local communities in the development and implementation of awareness activities Overcoming difficulties of changing human behaviour and attitudes Reaching out concerned stakeholders

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop medical waste disposal plans including provision of necessary equipment to avoid inappropriate use, and to ensure disposal of medical waste	High	Existence of environmental health administration in the Ministry of Health, s concerned with the implementation and control of disposal and follow up of insecticide used to control medical entomology Existence of a national standards of safety management of medicinal and animal waste	Insufficient funding Inadequate infrastructure	Considering proper training and awareness on topics such as sorting waste according to its seriousness Considering providing appropriate incinerators for medical waste disposal
National Target 8 Minimize the impact of climate change and ocean acidification on biodiversity in Sudan, including the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems, and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, so as to maintain their integrity and functioning, and enhance the contribution of biodiversity to carbon stocks, through conservation and restoration					
<i>Cultivated Plant Agrobiodiversity</i>	Development of one national harmonized program addressing the issues of climate change impacts on biodiversity conservation, management and use	High	Existence of a number of agriculture-related national bodies directly concerned with climate change Existence of national body and	Poor communication and coordination Lack of political will	The program team formulation Involving different agricultural sectors

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			expertise on matters related to climate change Existence of the NAP		
	Conduct research and breeding programs addressing adaptation to climate change using PGRFA, such as breeding for resistance to biotic and abiotic stresses	High	Expertise is available ARC research stations with agricultural faculties are covering considerable parts of the country Plant materials are available	Insufficient funding	Developing effective and sustainable breeding activities Identifying genetic material and genes as targets for the breeding program
<i>Range Plant and Animal Agrobiodiversity</i>	Establish meteorological stations for monitoring climate and weather conditions at different rangeland sites in order to get prepared with any necessary plans and actions	Low	Existence of international and national authorities of meteorology	Inadequacy of experts The insecurity situations	Protecting the stations facilities Provision on necessary physical and human capacities Ensuring coordination between related institutions
<i>Forest Biodiversity</i>	Conduct activities to promote the use of climate-resilient tree species and drought-tolerant crops in regions	Medium	Availability of adapted species and best practices	Projected climate shifts may outpace species' resilience	Ensuring seed/seedling supply chain and local adaptation

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	affected by climate change in reforestation and agricultural initiatives		Sources of climate funds such as Adaptation fund		
	Develop and implement activities on climate-smart land management practices, such as agroforestry, soil conservation, and water management techniques in regions prone to soil erosion and water scarcity	High	Richness of experiences in agroforestry, and soil conservation and water management techniques	Absence of national land use plan, that regulate the interventions. Changing of higher policies affecting competing land-use priorities	Ensuring strong enforcement of land-use and water management regulations Establishing strong land use monitoring systems
	Establish early warning systems and community-based adaptation measures to address climate-related disasters, such as droughts and wildfires in high-risk areas for climate-related disasters	High	Possibility of multi-agency involvement Existence of meteorology stations	Destruction in meteorological infrastructure in the war affected areas	Improving pccess to meteorological infrastructure in some rural areas Ensuring community participation.
	Conduct necessary activities to monitor and evaluate the effectiveness of adaptation measures in enhancing ecosystem resilience and biodiversity conservation.	Medium	Institutional support The adoption of Sudan National Adaptation Plan (NAP) The climate financial support	Weak or destroyed monitoring systems and tools Financial resources constraints Climate variability	Ensuring availability of accurate data Working in a complex of ecosystems Enhancing stakeholders' coordination Filling out methodological gaps

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			allocated to implement this NAP		
<i>Wildlife Biodiversity</i>	Reforestation of degraded areas around protected areas, as well as planting mangrove forests to participate in reducing carbon dioxide effects	High	Existence of local organizations specialized in afforestation	Poor seedling survival Land use conflicts	Resolving problems of competition with agricultural land and crop production Considering the social and cultural factors Combating the illegal activities such as cutting of trees
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct studies on the impact of climate change on wetlands biodiversity	High	Possibility of access to international funding through wetlands research aligned with RAMSAR convention or climate goals Existence of concerned NGOs and UN bodies	The ongoing conflict and insecurity in Sudan Constraints of financial and technical resources	Obtaining necessary baseline data and information about the wetlands' biodiversity Avoiding facing risks from wild animals and flooding in wetlands areas
<i>Climate Change Impacts on Biodiversity</i>	Incorporate related elements of the national adaptation plan for climate change into policies and programmes for biodiversity conservation, in	High	Existence of National Adaptation Plan, as well as other policies such	Instable political and economic situations, and insufficient funding	Strengthening coordination cross sectors to ensure the integration of the said plan into various sectors

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	forestry, rangelands, coastal and marine and inland waters ecosystems		as on forests and rangelands		
	Development of project proposals to buffer climate change impacts on biodiversity based on the national resource mobilization plan for the implementation of the NBSAP	High	Existence national resource mobilization plan for the implementation of the NBSAP. Having qualified experts in the field of writing project proposals on climate change and biodiversity aspects	Weak coordination at federal and state levels	Data and knowledge gaps on climate change impacts on biodiversity
	Undertake a detailed vulnerability assessment of impact of climate change on biodiversity in Sudan	High	Availability of previous studies of relevance	Unstable security and political conditions, and social and economic challenges	Filling out the data gaps
	Conduct studies and develop reports to define how to transfer appropriate technologies that minimize negative impacts of climate change on biodiversity	Low	Having qualified experts and human resources to conduct the studies	Insufficient funding, lack of data, political instability	Filling out data gaps
	Develop and design awareness raising and communication materials on	Medium	Availability of media and educational institutions	Limited access to information and resources.	Ensuring the effectiveness of the messages and awareness materials.

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	impact of climate change on biodiversity			The limited available resources,	Simplifying complex scientific information about the impact of climate change on biodiversity
	Establish information centre to launch awareness raising campaigns and information dissemination activities about biodiversity conservation under stress of climate change	Low	Availability of effective communication channels, trained staff and cooperating relevant authorities	Insufficient financing, competencies and expertise	Providing accurate and accessible information and data
	Design and implement programmes to raise awareness and interest through non-class activities in general and high education institutes on climate change and its impacts on biodiversity	Low	Availability of information, research institutions, and technology	Insufficient funding and resources	Coordinating efforts among various stakeholders, including educational institutions, NGOs, and government agencies
Marine Biodiversity	Conduct the necessary studies to evaluate current state of coral reef and other vulnerable marine ecosystems impacted by climate change	High	Existence of research centres and experts	Insufficient funding Shortage in the research facilities Incomplete understanding of resilience	Covering the large scale of targeted area Filling gaps in the baseline data Overcoming difficulty in data collection and monitoring

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop and implement a Coral Reef Bleaching Response Plan	High	Availability of research centres and experts Existence of Regional Action Plan for the Conservation of Coral Reefs in the Red Sea and Gulf of Aden	Insufficient funding Weakness of stakeholders' engagement	Filling gaps in baseline data Overcoming difficulty of accurately predicting bleaching events Working with the complexity of marine ecosystems
	Apply Integrated Ecosystem Approach Management regime, including climate change adaptation measures, covering all marine responsible bodies	High	Existence of research centres and government institutions Existence of Strategic Ecosystem Management of the Red Sea and Gulf of Aden Project	Insufficient funding Weakness of stakeholders' engagement Inadequate scientific Understanding and data gaps Unclear roles and responsibilities	Filling gaps in baseline data Ensuring interdisciplinary collaboration Making the necessary institutional and policy changes
National Target 9 By 2030, at the latest, national and state governments in Sudan, business and stakeholders at all levels have taken steps to achieve or have implemented plans to ensure sustainable use of wild species, and have kept the impacts of use of natural resources well within safe ecological limits, while protecting and encouraging customary sustainable use by indigenous peoples and local communities					
<i>Cultivated Plant Agrobiodiversity</i>	Conduct germplasm collection missions targeting CWR from all over the	High	Existence of the APGRC with relations with the international	Instability situation in the proposed areas as consequence of war	Appropriate timing Collaboration and coordination with plant

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	country for <i>ex situ</i> conservation.		concerned bodies such as ITPGRFA, and Crop trust		taxonomists and extension specialists
	Explore the potential of CWR through research on identification of valuable traits to be used in breeding programs in order to enhance their utilization.	High	Existence of the APGRC Existence of global interest in collecting and enhancing the use of CWR	Limited funding Inadequacy in infrastructure Insufficiency in skilled experts/ scientists	Collaboration with relative experts and specialist Collaboration with national and international research institutes
	Documentation of information on CWR and associated indigenous knowledge	Medium	Existence of the APGRC General interest on the issue among different national and international bodies	Limited funding Insufficient physical and human capacities	Consideration to access and benefit sharing Building trust with knowledge owners Obtaining prior informed consent
Wildlife Biodiversity	Develop wildlife sustainable use policy	Medium	Existence of wildlife utilization experts and curriculum in the universities Some sectors have similar national strategies for reference	Human population increases Conflict of interests among different institutions	Addressing the problem of weakness of management plans of the protected areas Addressing the illegal hunting and collection of resources Addressing the problems associated with conflict of land uses for other purposes

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
					such as agriculture and mining
	Develop action plan for wildlife resources production and consumption	Medium	The increasing demand for wildlife products internally and from abroad Establishment of farms in different parts of Sudan	Outdated laws that do not regulate sustainable wildlife utilization or consumption Overlapping or unclear mandates among relevant agencies	Addressing the problem of hunting of the wild species under the cover of farms Regulating local community livelihood dependence on resources collection such as fruits, honey, firewood, building, materials hunting, and fishing Addressing the problem of conflict of interest
	Conduct awareness activities on wildlife wise and sustainable use for all stakeholders	High	Existence of civil societies and NGOs	Insufficiency of Funding Poverty	Taking into account the norms, culture and beliefs
Marine Biodiversity	Conduct activities to raise public awareness about Integrated Ecosystem Approach Management in marine and coastal environment	Medium	Existence of HCENR and the staff of the research centres and other institutions	Insufficient funding Public apathy or resistance Communication Barriers Diverse stakeholders	Ensuring stakeholders' engagement Developing well designed awareness materials Explaining the marine ecological concepts

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
					Ensuring positive standing approach from the stakeholders
	Develop and implement activities to combat the illegal trade of shells and coral reef parts and provide alternative livelihoods for local communities and traders	Medium	Existence of research centres and government institutions Availability of alternative livelihood options such as sustainable aquaculture and community-based tourism	Insufficient funding Difficulties in monitoring and assessment of illegal trade of shells Weak governance and enforcement	Working with big community sector depending on this trade Enforcing regulations in remote coastal areas Handling the potential for conflict with established local economies
<i>Insect and Microorganism Biodiversity</i>	Conduct research on the role of indigenous knowledge in supporting and enhancing insect and microorganism biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities	High	Availability of diverse indigenous knowledge	Insufficient funding	Covering the widely distributed indigenous knowledge all-over the country
	Develop risk assessment and management programmes and guidelines for newly introduced insect and microorganism species	High	Existence of previous experiences in this field	Shortage of allocated fund	Covering gaps in the baseline data

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Conduct studies and surveys to providing social, economic and environmental benefits for people, especially those in vulnerable situations and those most dependent on insect biodiversity, including through sustainable biodiversity-based activities, products and services that enhance biodiversity	High	Existence of some relative societies extension units and Previously conducted studies on desert locust for food and feed	Limitedness of allocated funds	Accessing people responding to environmental benefits resulting from biodiversity-based activities
	Conduct insects for food and feed programme by adoption of mass rearing concept for some insect infecting crops such as desert locust, tree locusts and bugs, as alternative source of protein to be consumed as food by human and feed for poultry	Medium	Availability of such insects distributed in the whole country The simplicity of their rearing and producing in mass culture	Most of targeted insects exposed to different types of pesticides and having some remaining residues	Convincing the consumers of the importance of insect protein
<i>Health Aspects related to Biodiversity</i>	Develop regulations on management of the use of, and trade in wildlife, so that it is safe from human health perspective, by removing species that are of high-risk for disease emergence from wildlife trade	High	Availability of a current wildlife law and the a new drafted one	Limited resources.	Involving diverse stakeholders, including government related institutions, researchers, local communities, and the wildlife trade industry with different interests and priorities

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
					Determining which species pose the greatest zoonotic disease risk Raising public awareness on the management of the use of, and trade in wildlife Ensuring long-term sustainability of regulations
	Convene a forum to exchange experiences and views on matters related to use of, and trade on wild species	High	The presence of qualified experts and cadres	Illicit use and trade. Misinformation and Disinformation	Ensuring equitable participation of all stakeholders, including local communities, public institutions, researchers, and industry representatives
National Target 10 Ensure, by 2030, that areas under agriculture, aquaculture, fisheries and forestry in Sudan are managed sustainably, through the sustainable use of biodiversity, and biodiversity-friendly practices, contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services					
<i>Cultivated Plant Agrobiodiversity</i>	Development of agricultural policy that is based on the sustainability of resources	High	Existence of a number of national related bodies	Unavailability of data and information needed for policy development	Promoting stakeholders' participation Ensuring the policy is in consistence with other national policies

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Identification of appropriate farmers' varieties/landraces for multiplication and/or developing new breeding populations to incorporate specific traits into locally adapted materials with farmers' participation	Medium	Existence of a number of breeding programs within ARC and universities Availability of germplasm for distribution for research purposes	Insufficient funding Weak coordination and collaboration	Developing effective participatory breeding activities Identification of suitable varieties to be included in a breeding programs
	Extending formal and sustainable agricultural extension programs into the rain-fed sector	High	The existence of the state ministries and departments of agriculture and extension as well as the ARC research stations all over different zones of the country	Weak response from farmers to extension programs Insufficient funding and resources	Covering the rain fed sector being the largest among other agricultural sectors and is the most traditional one Encouraging farmers to participate Identifying actual farmers needs Developing partnership with stakeholders
	Conduct and strengthen research on the problems of shifting cultivation, crop rotation in the traditional farming systems in order to improve such systems for	High	Expertise is available in such traditional systems	Limitation of funding	Convincing farmers to participate effectively within farmer's field research

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	sustainable use of agricultural biodiversity				
	Establish an early warning system to predict, identify and control potential sources of adverse impacts on agrobiodiversity	High	Being part or having relation with international bodies concerned by agrobiodiversity such as FAO, which operates the WIEW system	Limited funding Limited institutional capacities Weakness of political will	Engaging different stakeholders, including governmental and non-governmental organizations, private sectors and local communities Collecting the data and information needed. Using new and advanced technologies such as, GIS AI and IoT
<i>Range Plant and Animal Agrobiodiversity</i>	Conduct programmes for transplanting evergreen range species from areas, where they are well established, to deserted areas	Low	The support of investors and animal raisers for transplanting evergreen plant and high nutrition values plants	Rarity of rainfall Limited use of water harvesting practices	Coping with the mobility of the grazing system in rangelands
<i>Forest Biodiversity</i>	Rehabilitation and establishment of forest plantations in degraded traditional rain-fed areas	High	FNC operational reach Annual Afforestation and eforestation programmes	Changing higher land use policies Competing land demands for agriculture and settlements	Enhancing institutional and technical capacities. Improving access information for addressing land degradation before plantation establishment

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
				Inadequacy of financial resources	
	Initiate 400 community engagement programmes and train a substantial percentage of community members on sustainable practices	Medium	Community interests Availability of success stories	Community fatigue due to overlapping projects	Ensuring equitable participation across gender and age groups
	Implement agroforestry demonstration plots to showcase sustainable land use practices combining tree planting with agriculture	Medium	Existence of experiences demonstrating the value of sustainable practices	Weak enforcement of legislations for adopting agroforestry system	Convincing farmers to participate in this process
Marine Biodiversity	Apply suitable fishing gears innovation to reduce impacts of fisheries on marine biodiversity	High	Existence of research centres and other related government institutions Availability of different options to use	Insufficient funding Weakness of stakeholders' engagement Weakness in governance and enforcement	Implementing regulations on mesh sizes Ensuring social acceptability Combating overexploitation for fish resource
	Formation of bodies to involve the local communities in conservation activities of mangrove forests and encourage them apply sustainable use	Medium	Availability of local NGOs	Insufficient funding Potential conflicts with existing resource use Lack of community trust	Removing the jurisdictions overlapping Ensuring coordination Balancing conservation and livelihoods
	Conduct assessment study to identify the factors that	High	Existence of qualified fishery	Instability and fragile situation in many	Establishing collaboration between the federal and

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Inland Waters and Wetlands Biodiversity</i>	hinder application of regulations, which encourage sustainable fishing, and avoid over-fishing to reach a point where fishing has no adverse effects on the ecosystem, and poses no threats on endangered species through awareness raising and the application of biodiversity friendly practices (fishing gears)		officers and researchers	states, may make it difficult to conduct such study	state fisheries administrations Providing mobility means and appliances.
	Design an effective ecological monitoring system	High	Existence of guidelines and frameworks for designing effective ecological monitoring systems	Scarcity of funds	Provision of necessary training and monitoring devices
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	Establishment of incentive programmes for expansion in commercialization of new genetically modified crops of high economic value and low, manageable negative impacts on the environment	High	Availability of genetic resources, and existence of scientists and researchers	Insufficiency of funding to cover the high cost of Infrastructure, and capacity gaps	Establishing an efficient genetic transformation system
	Development and increase in the production of biotechnological products, such as <i>in-vitro</i> mass	Medium	Existence of research centers, and universities,	Insufficiency of funding to cover the high cost of	Developing high-frequency shoots regeneration protocols.

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	propagation of some cultivated crops and forest trees, including threatened genotypes, in order to enhance productivity and increase areas under agricultural production or conservation on a sustainable basis		as well as scientists and researchers, with relevant capacities	Infrastructure, and capacity gaps	
Health Aspects related to Biodiversity	Develop national dietary guidelines to promote diverse and sustainable use of foods, local crops and livestock, and fisheries	High	Existence of guidelines and other efforts to integrate sustainability into national dietary guidelines	Population Growth posing risks on the effectiveness of such guidelines, as well as biodiversity and climate	Incorporating the knowledge and expertise of diverse professionals, in developing of these guidelines Including issues on knowledge and awareness about the nutritional values of different foods, and environmental impacts of different food choices
	Promote for introducing organic and eco-farming for promotion of sustainability in agriculture, with necessary certification for this system	High	Existence of some relevant guidelines and standards at global level Existence of a national committee on the issue, which has approved	Limited access to financial and technical support Inadequate infrastructure	Training and developing farmers' knowledge on organic farming practices and certification process Finding reliable and affordable sources of different appropriate

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			guidelines for introducing and promoting organic agriculture in Sudan Existence of different initiatives		inputs, including varieties, fertilizers and pesticide.
National Target 11 Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature					
Wildlife Biodiversity	Conduct research on wetlands functions and services	Medium	Existences of wildlife institutes such as universities, wildlife research center and wildlife force Ramsar convention can attract support from donors	Funding limitation Human Activity and land use changes Low public awareness of the importance of wetlands.	Enhancing collaboration and knowledge sharing Transferring necessary technologies Overcoming logistical constraints
	Collect pasture-plant seeds from protected areas and spread them outside these areas for livestock	High	Ecological and biological potentials Institutional and technical potentials Socioeconomic potential	Overharvesting leading to biodiversity loss Risks of deterioration in seed viability and lack of adaptability Invasive species risks	Overcoming socioeconomic and community barriers Overcoming policy and legal barriers

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
				Land tenure and access conflicts	
	Implement Ecosystem-Based Wildlife Conservation Plans in key protected and buffer zones	High	Availability of institutional and scientific foundations	Social displacement and mistrust Absence of political will Insufficiency of funding	Addressing the issue of human–wildlife conflict and livelihoods Filling out the data and knowledge gaps
Marine Biodiversity	Organize activities to raise public awareness on Integrated Coastal Zone Management (ICZM) in marine and coastal environment	Medium	Existence of HCENR and the staff of the research centres and other institutions Previous successful experience in establishing ICZM	Insufficient funding Lack of necessary political support	Overcoming difficulties in engaging diverse stakeholders Removing any potential conflicts between different interests Handling the complexity of coastal issues
	Establish a unit of Integrated Coastal Zone Management (ICZM)	High	Existence of HCENR and the staff of the research centres and other institutions Previous successful experience in establishing ICZM	Insufficient funding Limited public awareness and poor of understanding of ICZM Cultural and behavioural Barriers	Overcoming difficulties in engaging diverse stakeholders Removing any potential conflicts between different interests Handling the complexity of coastal issues

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
Health aspects related to Biodiversity	Conduct campaigns to raise awareness on the value of ecosystem functions and services to health and wellbeing across different community groups	High	A number of campaigns and initiatives focused on raising awareness about the value of ecosystem functions and services to human health and well-being, targeting different community groups were held globally and at country levels	Resource limitations, including funding, personnel, and access to communication channels Misallocation of resources	Addressing diverse community perspectives, and potential barriers to behaviour change Simplifying the scientific information for the public Reaching all target groups
	Conduct a study to identify the benefits of biodiversity for the health of people, wildlife, and the environment, including its use intrinsic values	High	There are numerous studies and reports, of a similar nature exploring the benefits of biodiversity for human health and the environment, including its intrinsic value.	Funding and resources Limitations Gaps in ecological data	Effectively communicating scientific findings about biodiversity and health to diverse audiences, including policymakers and the public Assigning monetary or non-monetary value to the intrinsic worth of biodiversity
National Target 12 Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas in Sudan sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban					

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services					
<i>Wildlife Biodiversity</i>	Develop plans and implement activities to protect and promote the use the naturally existing wild habitats, such as forests, within and around urban areas	Medium	High potential for eco tourism Existence of natural habitats within and around the urban areas such as Sunut forest bird sanctuary in Khartoum	Conflict of interest among the stakeholders Illegal activities without protection Tendency among decision makers towards using lands for constructions	Addressing low public awareness on wildlife habitat Addressing the tendency towards increasing of residential expansion at the expense of green spaces in large cities
<i>Inland Waters and Wetlands Biodiversity</i>	Develop proposals to integrate wetlands in the urban planning of some specific cities	High	Presence of wetlands near major cities International support Potentials Possible academic and research contributions	Land use conflicts and land use interests Encroachment on wetlands Inadequate funding.	Removing constraints to urban plans updating Enhancing coordination between stakeholders. Filling technical and data gaps
<i>Pollution Aspects related to Biodiversity</i>	Conduct awareness activities to demonstrate the danger of automobile exhaust emissions as a dominant source of ambient air pollution, particularly in densely populated urban environments	High	Availability of relative experts	Shortage of funds	Convincing the targeted bodies about the danger associated with automobile exhaust emissions

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Conduct capacity building activities on applying Sudanese and international standard emission limits and testing methods	Medium	Availability of international standard emission limits	Shortage of allocated fund for such activities	Focusing on weakness of regulations in penalties on such matters
	Bann or impose high restriction on the use of methyl bromide as fumigator to control store pests in storages or goods used for export purposes and find alternative method safer for environment and biodiversity	Medium	Sudan is a party to o the Convention, which organise and restrict the use of methyl bromide	Inexecution of regulation that restrict the use of methyl bromide	Making available fumigation alternative methods
<i>Health Aspects related to Biodiversity</i>	Advocate with concerned authorities to consider establishment of, and expansion in green and blue spaces in the post conflict/war rehabilitation plans for cities, in order to enhance human health and wellbeing through green and blue spaces	High	Existence of one health platform as an effective mean of coordination between the ministry of health and other relevant agencies	Insecurity	Convincing concerned authorities to expand on green and blue spaces rather than on constructions
National Target 13 Take effective legal, policy, administrative and capacity building measures at all levels in Sudan, to fully implement the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, and other international instruments of relevance, in order to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources originating from Sudan, and from digital sequence information on such genetic resources, as well as traditional knowledge associated with these genetic resources, and facilitating appropriate access to such genetic resources, in accordance with applicable international access and benefit sharing instruments					

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Cultivated Plant Agrobiodiversity</i>	Building capacity, human and institutional, for regulating access to plant genetic resources and digital sequence information, sharing of benefit arising from their utilization with necessary consideration to farmers' and local community rights in consistence with the international instruments of relevance such as the CBD and the ITPGRFA	High	Existences of a proposed PGR national legislation	Lack of political will	Final approval of the current proposed law on PGR Establish institutions responsible for regulating access to PGR Developing the skills and knowledge of individuals involved Aligning national regulations and practices with international agreements such as ITPGRFA
	The official endorsement of the existing proposed national PGR legislation by the legislative authority	High	Existence of the already proposed national PGR legislation	Lack of political will, and the political instability Limited awareness and understanding	Convincing / encouraging concerned authorities to rank endorsement of the proposed legislation high on their agenda and accelerate the process
	Approval of the already proposed national legislation for protection of plant varieties and breeder's rights with necessary harmonization with the national and international instruments on the PGRFA.	High	Existence of a proposed draft for national legislation for protection of new plant varieties and breeders right Increased awareness about the IPR issues	Limited awareness and understanding Poor stakeholder engagements Lack of political will	Convincing policy makers to push the process and give it priority Encouraging stakeholders to address the issues through their

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			among some of the c concerned individuals and groups		representative bodies and institutes Raising awareness among concerned stakeholders and decision makers
	Conduct awareness raising activities on access to plant genetic resources and sharing of benefits arising from utilization among concerned stakeholders	Medium	Availability of means and experts	Limited funding Poor stakeholders' engagements	Developing effective communication strategy
<i>Wildlife Biodiversity</i>	Develop strategic plan for protection of wild fauna and flora genetic diversity of the Sudan	Medium	Rich experience in wildlife management complemented by the Higher Council for Environment and Natural Resources and Wildlife Forces roles in developing strategic plans	Armed conflict and its negative effect on the wildlife data Inadequate legal and policy frameworks Land use pressures and habitat degradation	Identifying which indigenous fauna and flora need to be protected Enhancing community engagement in biodiversity planning and protection efforts
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Expedite the endorsement and adoption of Access and Benefit Sharing legal framework to have a fully functional ABS system, as this legal framework is in the last stage of the endorsement	High	Existence of a fully drafted legislation document that already passed by the sub-technical bodies and the council of the ministers	Absence at present of a full-time active separate national legislative body in the country	Convincing the temporary legislative authority to give high priority for this issue among its agenda

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	and adoption process by the legislative authority				
	Put in place the necessary institutional structures and administrative systems for ABS, including establishment of Competent National Authority (CNA), designation of checkpoints, in accordance with the ABS legal framework and Nagoya Protocol, and implement legislative measures including development of Prior Inform Consent (PIC) and Mutually Agreed Terms (MAT) for facilitating appropriate access to genetic resources, digital sequence information on genetic resources, and traditional knowledge associated with genetic resources	High	– Existence of a fully drafted national proposed law on ABS – Existence of other countries' experiences	Delay in adopting the national law on access and benefit-sharing	Adopting and entry into force of the national ABS Law
	Publish the information on legislative and administrative measures and institutional arrangements through the Access and Benefit-sharing Clearing-House Mechanism (ABS-CHM)	High	Existence of ABS - CHM designed to enhance transparency, legal certainty and encourage all parties to the Protocol to	Delay in adopting the national law on access and benefit-sharing	Building human and physical capacities for effective participation in the process

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			make this information available		
National Target 14 Ensure by 2030, that biodiversity and its values have been integrated into national, state and local development and poverty reduction strategies, planning and developmental processes, strategic environmental assessments, and environmental impact assessments, and are being incorporated into national accounting, as appropriate, and reporting systems					
<i>Cultivated Plant Agrobiodiversity</i>	Development and adoption of a national policy and strategic action plan for the conservation and sustainable use of cultivated plant agrobiodiversity as part of the national policies and strategies for economic and social development.	High	Existence of a recently developed global plan of action on PGRFA which can be used as a guiding instrument in this regard	Weak political will Poor stakeholder engagement	Promoting stakeholders' participation Raising awareness among policy and decision makers Ensure comprehensive and inclusive content in consistence with national and international instruments
	Train civil servants on transforming agrobiodiversity components into items of monetary value	Medium	Existence of HCENR and Ministry of Finance	Limited understanding of civil servants on agrobiodiversity Insufficient economic valuation skills	Developing effective training programs on the issue
	Organization of non-class activities to encourage universities to incorporate agrobiodiversity and its economic valuation in their curricula	Medium	Existence of Ministry of Higher Education and a number of universities	Some universities may not see the value in incorporating agrobiodiversity and it	Developing effective partnership with universities and faculties

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			interested on the subject	is economic valuation into their curricular	
<i>Range Plant and Animal Agrobiodiversity</i>	Development of strategic action plan for conservation and sustainable use of range and animal agro-biodiversity as a tool for integrating the issue in the national development strategies and plans	High	Existence of national institutions concerned with rangelands and livestock	The ongoing war	Strengthening the coordination between relevant institutions
<i>Forest Biodiversity</i>	Develop awareness materials and conduct activities to raise the awareness and interest at high policy levels in order to integrate the forest biodiversity and its values into different national strategies, policies and plans at both national and local levels	Medium	Availability of capacity building platforms training units	Resistance from some power actors and sectors prioritizing medium and short-term economic gains	Creating high interest or political will to participate in the process Improving the cross-sectoral communication platforms
	Organize activities for integration of forest biodiversity conservation agenda into the Forests National Corporation (FNC) development plans, and the systematic monitoring of the forest biodiversity conservation using the	High	The already alignment with FNC goals, policies, strategies and the annual action plans	Bureaucratic inertia Limited capacities hindering or delaying the implementation of activities Insecure Finance	Strengthening systematic monitoring Harmonizing biodiversity indicators across programmes

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	appropriate standards across all FNC operational areas				
	Develop legal framework(s) for ecosystem service valuation and integrate them into national and sectoral accounts	High	International frameworks and models available (e.g., SESA, IPBES)	Conflicts with economic planning priorities	Ensuring availability of sufficient capacity to apply valuation techniques and integrate results into policies
<i>Wildlife Biodiversity</i>	Conduct awareness and interest raising activities about the values of the wildlife biodiversity for the decision makers as well as local communities in order to encourage including them in strategies and plans, including for poverty reduction	Medium	Existence of specialized Environmental Awareness Department in the Wildlife Conservation Forces, in addition to possibility of utilizing social media for awareness	Limited financial resources and allocated budgets Weak institutional capacity	Overcoming cultural and social barriers Improving access to local media or internet connectivity in rural areas
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct economic valuation of conservation and sustainable use of inland water ecosystems and biodiversity in order to incorporate it into national development plans, poverty reduction strategy, environmental impact assessments (EIA) and national accounting	High	Existence of previous experience in conducting a similar study Existence of guidelines and established methodologies	Unavailability of comprehensive data Political resistance to prioritizing environmental conservation over immediate economic gains	Developing an understanding on the importance and economic values of biodiversity focusing on inland waters biodiversity Resolving the complexity of valuing the diverse goods and services of biodiversity in inland waters and integrate them

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
					into economic strategies and plans
	Conduct non-class activities to raise awareness and interest of the concerned bodies in the educational institutes in order to encourage them to incorporate biodiversity, including inland waters biodiversity, economic accounting, in their curricula.	High	Existence of awareness and education objectives within the environmental legislation	Absence of clear management plan for inland waters biodiversity	Recommending on how to incorporate biodiversity issues, including inland waters biodiversity, in curricula
	Train civil servants in transforming biodiversity components, including inland waters biodiversity, into items of monetary value	High	Existence of a study on economic valuation of biodiversity.	Insufficient appreciation for non-market goods and services among the targeted authorities/bodies	Overcoming difficulties in assigning monetary values to non-market goods and services Building institutional and human capacities to assigning monetary value to non-market goods and services
	Develop awareness materials and conduct activities to raise the awareness and create interest on the role of wetlands in the environment at all levels of stakeholders	High	Availability of concerned civil societies and NGOs Existence of information about	Financial and technical resources constraints	Identifying stakeholders and ensuring their engagement Developing the right message for the right stakeholders

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			the importance and values of wetlands		
<i>Pollution aspects related to Biodiversity</i>	Review and update the national legislations on hazardous pesticides, chemicals and other wastes in order to implement the existing international relative conventions	Medium	Some regulation and legislations are available in relative authorities	The unstable situation in Sudan to approve updated regulations	Addressing the problem of lack of an official follow-up body
	Set specific policies and legislations regarding the use of plastic bags to reduce associated risks, considering positive incentives for those in compliance with the set regulations	High	Existence of some policies and legislations to reduce the using of plastic bags	Conflicts resulting from multitude of the responsible bodies and authorities	Taking into consideration the weakness and gaps in the following up and execution of existing policies and legislations
	Set specific policies to develop waste recycling technologies to reduce associated risk of plastic and hazardous materials	Medium	Abundance of raw material to be recycled Easiness of introduction of such technology	Most of the plastic waste are not segregated from the other solid waste	Convincing the private sectors with the economic values of recycling approach
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	Review and update policies, plans and laws to the extent they are consistent with the biosafety law, and to develop necessary bylaws and regulations	High	Existence of national biosafety framework and national biosafety law	Inability to cope with the rapid technological evolution, and scientific uncertainty	Updating of the current status of policies, plans and laws coping with the rapid technological evolution

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
National Target 15 Take legal, administrative or policy measures to encourage and enable business in Sudan, and in particular to ensure that large and transnational companies and financial institutions: d. Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains and portfolios; e. Provide information needed to consumers to promote sustainable consumption patterns; f. Report on compliance with access and benefit-sharing regulations and measures, as applicable; in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production					
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Enforce the ABS legal framework to encourage compliance with access and benefit-sharing legal framework and regulations	High	The existence of the national proposal of ABS law	Delay in the adoption of ABS national law	Establishment of necessary implementing bodies
<i>Pollution Aspects related to Biodiversity</i>	Conduct awareness activities on the risks and effects associated with the chemicals use in gold mining sectors, particularly artisanal mining sectors, and the impacts of using of these chemicals on biodiversity	High	A number of authorities are considering the impacts of gold artisanal mining and having awareness programmes	Objections from some stakeholders to raise the awareness of workers and labours in the artisanal mining sectors	Convincing all workers in mining sectors with the awareness recommendations
	Develop gold mining legislations, and encourage decision makers to ratify Minamata Convention to stop using mercury in gold mining processing	High	Minamata Convention under process for final ratification	Objections raised by some stakeholders against final approval of the convention	Focusing on expenses and waste of time to irradiate and manage the huge amount of gold mining wastes

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Ratify and implement of the Minamata Convention to limit the use of mercury in artisanal gold mining activities and to find environment friendly methods in gold mining extraction	High	Abundance of gold mining extraction alternative methods Initial approval of the convention from Ministers Council	Objection from interesting stakeholders	Accepting the gold extraction alternative methods
	Develop and implement of Strategic Approach to International Chemicals Management (SAICM) strategy to reduce and manage the production and importing of chemical based on their needs and priority in the country	Medium	Availability of baseline data for the year of 2010	Difficulties facing relevant authority to get adequate budgeted	Obtaining more recent updated data and records
National Target 16 Ensure that by 2030, the national and state governments, business and stakeholders at all levels in Sudan have taken steps to achieve or have implemented plans for sustainable consumption, and people are encouraged in the meantime to make sustainable consumption choices, and to reduce waste, including by improving education and raising awareness on alternatives, in order to keep the impacts of use of natural resources well within safe ecological limits					
Range Plant and Animal Agrobiodiversity	Conduct studies on rangelands capacities	High	The government support to update the information for strategic planning. UN agencies support to collect, update	Inadequacy of fund Inadequacy of professional experts on data and information management	Strengthening coordination for information sharing

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			and share information		
<i>Forest Biodiversity</i>	Implement a national certification and labelling scheme for sustainably sourced forest products, coupled with a public awareness campaign to educate consumers about the environmental impacts of their consumption choices and promote certified products	Medium	Availability of market for certified products	Unclear legal frameworks for national certification and labelling scheme	Ensuring strong enforcement Enhancing capacity for certification standards Increasing the consumer trust and market incentives
<i>Inland Waters and Wetlands Biodiversity</i>	Develop plan for sustainable consumption of inland water resources	High	Existence of qualified personnel and experts in developing plans	Absence of management plan for inland waters biodiversity	Enhancing the understanding of the sustainable consumption concept
National Target 17 Establish, strengthen capacity for, and implement in Sudan biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity, and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention					
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	Conduct studies and consultations to assess the present biosafety status in Sudan according to the requirements and guidelines of Cartagena Protocol and the national legislation in order to identify gaps, constraints	High	Existence of national biosafety framework and national biosafety law, as well as biosafety experts	Data gaps and accessibility	Establishing national biosafety database(s)

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	and problems and develop a future national plan of action				
	Develop and build capacity in biosafety containment, confined use and field trials	High	Existence of research laboratories and demonstration farms	Resource constraints and skill gaps	Developing standard operating procedures (SOPs) for laboratories, greenhouses and field sites
	Develop biosafety standard operating procedures (SOPs)	High	Existence of national biosafety framework, national biosafety law and biosafety experts	Limited funding	Developing SOPs for introduction and utilization of GMOs and their products
	Conduct activities at high policy levels to raise the awareness and interest in order to gain and strengthen political support for the biosafety issues	Medium	Existence of national focal point, national competent authority, national biosafety committee and biosafety clearing house	Resource scarcity	Engaging high level policymakers in biosafety activities through workshops, publications and trainings
	Development of capacity for the system of handling biosafety notifications and the subsequent actions, including risk assessment (RA) and decision-making processes	High	Existence of national focal point, national competent authority, national biosafety committee and biosafety clearing house	Fiscal risks	Preparing guidelines, methodologies and manuals on risk assessment and risk management
	Establishment and operationalization of a system for public information, education and participation on biosafety matters	High	Existence of national competent authority, national biosafety committee	Financial constraints	Establishing an effective participation mechanism at all levels, including the public, government and private sector

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			and biosafety clearing house		
	Provide necessary support to organize and enhance participation and coordination at regional level on issues related to biosafety	Medium	Existence of regional competent authorities, regional biosafety committees and biosafety clearing house	Divergent national standards and enforcement gaps	Promoting collaboration and coordination between countries for addressing biosafety issues
	Improve GMO detection and accreditation laboratories	High	Existence of national competent authority, national biosafety law and biosafety experts	Inadequate funding	Establishing ISO and accredited laboratory for detection of GMOs
	Establishment of biosafety institutional committees	Medium	Existence of national competent authority, national biosafety committee, national biosafety law, institutions and stakeholders	Resource constraints	Convincing institutions' top management officials to formulate such committees within their institutions
	Conduct necessary study and consultation on the Nagoya – Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety to decide on the accession of Sudan to this protocol	High	Existence of national competent authority, national biosafety law and biosafety experts	Baseline data gaps on the issue	Establishing critical national framework for addressing environmental damage from living modified organisms (LMOs)

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Health Aspects related to Biodiversity</i>	Formation of institutional biosafety committees in health institutions and relevant sectors of one health platform to support multisectoral coordination mechanism, where potential benefits and risks from biotechnology applications could be assessed from health and environmental perspectives	High	Established one health platform, which promote multisectoral coordination	Limited resources Conflicts of interest of different entities	Ensuring adequate expertise and resources Enhancing inter-sectoral communication and collaboration Ensuring members with diverse expertise and capacity Coping with complexities of emerging biotechnologies like synthetic biology and gene editing
National Target 18 Ensure that, by 2030 at the latest, incentives, including subsidies, harmful to biodiversity are identified, eliminated, phased out or reformed, starting with the most harmful, in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socioeconomic conditions					
<i>Range Plant and Animal Agrobiodiversity</i>	Conduct studies on the impact of negative and positive incentives for range and animal agrobiodiversity	High	The government support to update the information for strategic planning UN agencies support for the information collection, updating and sharing	Inadequacy of fund Inadequacy in professional experts on data and information management	Strengthening coordination between the concerned in data sharing

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
Forest Biodiversity	Conduct comprehensive review and assessment of all current forest-related incentives and subsidies to identify those negatively impact forest biodiversity	Medium	Government willingness for reform	Political backlash from vested interests	Ensuring transparency and accountability
	Develop and start implementing a comprehensive national scheme for providing incentives and benefits to communities involved in sustainable management of forest resources, such as granting financial incentives, provision of necessary resources and tools, and infrastructure improvements.	High	Already developed Benefit sharing mechanism such as the shelter-belts fund	Changing higher policies. Insecure finance flows for these incentives.	Strengthening systems for monitoring and evaluating the impact of incentive programmes Resolving accessibility constraints
	Develop and start implementing a national scheme for providing subsidies to encourage the development and use of alternative energy sources to firewood and charcoal such as solar energy, cooking gas, hydro-energy and electricity	High	Renewable energy projects	Changing national renewable energy policy Unstable conditions due to war	Improving infrastructure for renewable energy access and delivery. Removing affordability barriers for rural households Improving technical capacities to use the alternative energy sources

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Production and distribution of free or subsidized seedlings to encourage rural communities to establish community forests, including using indigenous tree species	High	Local afforestation momentum Existence of community forests and nurseries	Poor survival rates due to drought and lack of care Difficulty in accessibility and the destroyed infrastructure due to war	Improving capacity constraints in nursery anagement and follow-up support
<i>Wildlife Biodiversity</i>	Conduct study to identify negative and positive incentives affecting wildlife biodiversity	Low	High degree of cooperation between Wildlife Forces, universities and wildlife Research Centre	Limited capabilities Inadequate funding for scientific studies and research	Identifying the exact positive and negative impacts of incentives and subsidies on wildlife biodiversity
	Initiate establishment of a trust fund to encourage local communities and private sector to raise wild animals with economic returns as well as to plant productive trees to increase their income	Medium	Existence of significant coordination between wildlife forces, local communities, and the private sector to conserve wildlife	Weak financial and governance structures Low priority given to reducing harmful effect on biological diversity	Ensuring adequate community engagement and awareness
<i>Marine Biodiversity</i>	Conduct the necessary studies to identify the incentives, including subsidies, harmful to marine biodiversity	Medium	Existence of research centres and other related government institutions	Insufficient funding Political resistance and stakeholder opposition	Covering the large scale of targeted area Filling gaps in the baseline data

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			Availability of related studies over the world		Identifying and quantifying incentives Prioritizing the elimination of the most harmful subsidies, such as those supporting overfishing and destructive fishing practice
	Develop and apply effective policies for making a balance between the government subsidies for fishing in order to avoid overfishing that lead to decline in fish stocks	Medium	Availability of related government institutions Availability of related policies 1 all over the world	Insufficient funding Unstable political situation Some fisheries subsidies linked to international trade agreements	Ensuring enforcement of policies and regulations Accurately assessing the impact of subsidies Combating illegal fishing
National Target 19 Substantially increase and mobilize financial resources for effectively implementing the National Biodiversity Strategy and Action Plan of Sudan from all sources, such as from domestic, international, public and private resources, including by significantly increasing domestic resource mobilization, facilitated by the preparation and implementation of a national biodiversity finance plan or similar instruments according to national needs, priorities and circumstances, while enhancing the effectiveness, efficiency and transparency of resource provision and use					
<i>Cultivated Agrobiodiversity</i>	Development of project proposals to tap possible financial contributions of regional and international organizations in the implementation of different	High	Existence of different funding avenues for PGRFA at international levels	Misuse or ineffective use of tapped money in non-targeted activities	Writing convincing project proposals Involvement of different disciplines concerned with cultivated plant agrobiodiversity

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	actions related to cultivated plant agrobiodiversity				
	Conduct activities to encourage farmers and indigenous people for contributing to provide and managing financial resources for community plant agrobiodiversity conservation activities, including through formation of community-based bodies	High	Similar experiences in other countries	The idea might seem unappealing to local communities	Select and develop intensive awareness activities with emphasis on certain crops Initiation and development of community-based bodies to represent farmers and indigenous local communities in order to address their needs and manage their resources
<i>Range Plant and Animal Agrobiodiversity</i>	Develop project proposals for implementation of actions on conservation and sustainable use of range plant and animal agrobiodiversity	High	The top priority given by the government to rehabilitate the destroyed rangeland due to the ongoing war Funding opportunities by a number of funding agencies for good proposals	The insecurity situations Inadequacy of professional experts	Strengthening skills in preparing good proposals
<i>Forest Biodiversity</i>	Develop project proposals and establish partnerships with international donors and	High	Strong donor interest	Competition with other national	Improving capacity to meet donor proposal standards

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	agencies to secure funding for biodiversity projects			priorities for limited funds	
	Develop and implement project proposal using public-private partnerships to fund and implement specific conservation activities	Medium	Private sector collaboration in terms of social responsibility	Unclear legal frameworks for partnership contracts	Balancing commercial returns with conservation goals
	Launch awareness campaigns to promote private and corporate donations for biodiversity conservation	Medium	Corporate social responsibility trends	Unclear legal frameworks for partnership contracts	Effectively using the willingness and interest of private sectors
<i>Inland Waters and Wetlands Biodiversity</i>	Mobilize the necessary financial resources for effectively implementing the actions related to conservation and sustainable use of inland waters biodiversity including wetlands biodiversity	High	Availability of funding from the international organizations dealing with the wetlands' conservation such as RAMSAR Private sector and corporate social responsibility opportunities	Consideration of inland waters, biodiversity including wetlands, by decision makers as un-productive lands Political and economic instability	Obtaining political will Ensuring good financial governance Overcoming strategic financial planning constraints
<i>Insect and Microorganism Biodiversity</i>	Develop projects proposals to implement actions on conservation and sustainable use of insects and microorganisms	High	Availability of scientists with adequate experiences and skill	Shortage of funds	writing sound projects aligned with donors formats

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			in writing scientific proposals		
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Develop Project proposals to support the implementation of the Nagoya Protocol and the national legislation	Medium	Existence of UN agencies who assist in developing project proposals	Non-adoption of the national ABS legislation	Good writing of proposals
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	Develop project proposals to implement the biosafety and biotechnology related actions	High	Existence of national competent authority, national biosafety law, Cartagena protocol on biosafety and biosafety and biotechnology experts	Funding deficit	Developing robust risk assessment and risk management framework
National Target 20 Improvement of the knowledge and science base on the biodiversity in Sudan, and information sharing mechanisms, through capacity building and development, access to and transfer of technology, access to innovations, technical and scientific cooperation, joint technology development and joint scientific research programs for the conservation and sustainable use of biodiversity					
<i>Cultivated Plant Agrobiodiversity</i>	Rehabilitation of the documentation system of the APGRC by reestablishing local database on genetic resources holdings and make it accessible through local networking, and globally through the PGR data portal "Genesys"	High	The already participation of APGRC in the Genesys with considerable shared data through it The existence of the Crop Trust to help in this regard	Insufficient funding Insufficiency in full-time staff Continuation of instability situation	Finding out and assembling lost genebank data from different sources

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Conduct training activities to enhance technical capacities on knowledge and information sharing with regional and international agrobiodiversity related institutions	Medium	Existence of the APGRC with existing experiences and external links on related issues	Limited funding Weak organization	Establishing and maintaining relationship with regional and international institutions to support training activities and knowledge sharing
	Documentation of indigenous knowledge, practices and technologies that are associated with the PGRFA, and make this information accessible after obtaining owners' prior informed consent	Medium	Availability of guidelines for documentation and supportive materials	Limited funding	Obtaining prior informed consent Misinterpreting or misusing traditional knowledge, practices and technology Language and communication barriers Intellectual property rights concerns
<i>Range Plant and Animal Agrobiodiversity</i>	Conduct programmes for building capacity for the staff and range office units	High	High interest of governmental staff to improve their capacities Training opportunities given by different international, regional and national agencies	Instability of internet during virtual trainings sessions Difficulty to conduct face to face session or training due to restricted movement to and in some states	Preparing good training manuals

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Forest Biodiversity</i>	Organize activities to establish partnerships with academic institutions, research organizations, and government agencies to support collaborative research and data sharing	High	Existing partnerships and success stories Availability of strong research base	Changing policies and institutions mandates Discontinuity of funding	Ensuring effective networking among biodiversity professionals and scientists, and sustainable collaboration between the institutions
	Physical and human capacity building for conservation and sustainable use of forest genetic resources.	High	Availability of training units and extension personnel	Inadequate government funding for the biodiversity sector. Difficulty of accessibility in conflict-affected or remote areas	Creating sufficient interest to participate in the capacity building activities Retaining trained staff
<i>Wildlife Biodiversity</i>	Introduce and implement Spatial Monitoring and Reporting Tool (SMART) management system in all national parks in Sudan	High	Availability of technology offered by Sudanese companies	Limited Financial resources Network failures and internet low coverage	Enhancing change acceptance Addressing the need to train staff to deal with modern technology
	Establish geographical information systems (GIS) in, and provide drones, GPS devices and telecommunication devices for all national parks	High	Existence of experts in GIS, GPS Good cooperation with universities	Shortage of necessary capabilities and funding Problems of malfunctioning, damage or outdating of drones and	Ensuring strong internet network Carrying out periodic equipment maintenance

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
				communication equipment	
	Participate in specialized training courses outside the country for officers and non-commissioned officers of the Wildlife Conservation Forces	High	Availability of advanced training opportunities	Trained personnel may leave for better opportunities Insufficiency of funding	Identifying the right training activities for the right personnel
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct capacity-building activities on management and sustainable use of wetland biodiversity	High	RAMSAR convention on wetlands can provide training and capacity building activities Possibility of obtaining funding from international and local donors Universities, NGOs and private sector can co-develop training programs Existence of experts	Financial and technical constrains	Ensuring obtaining necessary knowledge and skills in monitoring Focusing on restoration and sustainable use practices
	Conduct research, monitoring and inventorying activities on wetlands	High	Presence of ecologically important wetlands Existence of academic and	Political and institutional instability Insufficient and fragmented data	Establishing necessary technological infrastructure

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
			research institutions Existence of skilled personnel and traditional knowledge Potential of engagement in international agreements	Funding constraints	
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Train and raise awareness of relevant stakeholders, including the business sector and the research community, to effectively participate in the implementation of the Protocol and other legally binding instruments of relevance	High	Willingness of the majority of the stakeholders to participate in the implementation of Nagoya Protocol Existence of awareness materials from various sources, primarily the Convention on Biological Diversity (CBD)	Insufficient financial resources	Implementing measures for continued awareness, capacity building and training Facilitating understanding of the complex nature of access and benefit-sharing issues
	Build capacities of indigenous peoples and local communities (IPLC) on ABS issues to support the implementation of the	High	A number of training workshops for IPLCs were held at the international and	Insufficient financial resources to cover the wide spectrum of IPLCs in the country	Finding out appropriate resource persons on the topic, who can effectively communicate with IPLCs

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	provisions of the Protocol related to indigenous peoples and local communities, including granting or refusing to grant prior informed consent (PIC), developing minimum requirements for mutually agreed terms (MAT) for benefit-sharing arising from the utilization of traditional knowledge associated with genetic resources		other countries' levels		
	Train stakeholders, including local communities, to negotiate mutually agreed terms (MAT)	High	Existence of a national experience	Instability in the human resources within the institutions that benefit from the capacity development activities Insufficient number of national trainers	Develop a training program that includes identifying trainers at the national level
	Train and build capacity of relevant stakeholders to monitor the utilization of genetic resources, including the establishment of checkpoints	High	Existence of national resource persons and capacities, although limited, on monitoring issues	Difficulties in accurately tracking the utilization of genetic resources and associated traditional knowledge	Upgrading the understanding of the scope and importance of the genetic resources and their uses

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Pollution Aspects related to Biodiversity</i>	Organize a regular international scientific visits, meetings and knowledge exchange programmes for toxicological specialists and other researchers in the field to transfer recent technology related to risks associated with hazardous wastes	High	Availability of experts in the field	Shortage of funds to cover these activities	Identifying the right persons for the right activities
	Conduct training programmes on recycling of chemicals and hazardous waste removal treatments targeting chemicals and pesticides specialists	High	Availability of relative experts	Shortage of funds to cover relative activities	Identifying the right persons for the right activities
National Target 21 Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity in Sudan, and to strengthen communication, awareness raising, education, monitoring, research and knowledge management and, also in this context, the traditional knowledge, innovations and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, and should only be accessed with their free, prior and informed consent in accordance with national legislation					
<i>Cultivated Plant Agrobiodiversity</i>	Establishment and operationalization of a web site for APGRC on plant agrobiodiversity related data and information	High	Existence of the APGRC Existence of IT unit of the ARC	Lack of funding	Provision of physical capacities Maintenance and regular update —

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Organize and conduct regular awareness campaigns to disseminate information, innovations, practices and any relevant plant agrobiodiversity information to different stakeholders	Medium	Existence of the APGRC with considerable size of PGRFA associated data and information Availability of previous experiences in this field	Limited funding Low level of stakeholder engagement Weak organization and management	Identifying and reaching target audience Develop effective messages and materials Evaluating campaigns impact and effectiveness
<i>Range Plant and Animal Agrobiodiversity</i>	Carry out data collection and establish database units and information platforms for range and animal agrobiodiversity.	High	The support of government for data collection and documentation HCNER positive role in this regard	Inadequacy of fund	Preparing data in standard formats Ensuring provision of adequate data management experts
<i>Forest Biodiversity</i>	Digitize herbarium and forest genetic resources collections to support research and planning	Medium	Strong scientific institutions and growing demand for data	Technical gaps in digitization infrastructure	Ensuring data standardization, quality assurance, and integration with global databases
	Document indigenous knowledge and practices relevant to the conservation and sustainable use of forest biodiversity	Medium	Rich cultural heritage base	Loss of traditional knowledge due to displacement or conflicts	Securing free, prior and informed consent in line with FPIC principles
<i>Wildlife Biodiversity</i>	Establish web-based platform for wildlife conservation data-base and information	High	Availability of wildlife biodiversity information	Increasing risk of hackers and cyber insecurity all over the world	Filling gap of knowledge on information technology

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
					Ensuring efficient utilization and management
	Establish electronic library	Medium	Availability of internet and information	Weakness of technical resources	Collecting materials such as research, books, photos and videos about wildlife
	Develop and distribute awareness materials such as brochures, magazines and maps to raise public awareness	Low	Availability of wildlife information	Limited of Financial resources	Effective displaying of awareness materials among different local languages and different tribal communities
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct a national status assessment of natural inland waters resources, including aquatic biota of the Nile basin and non-Nilotic inland water ecosystems	High	Existence of regional and global ecosystems assessments Existence of researchers and experts	Limitedness of financial resources as the cost of the assessment is high	Identifying and addressing drivers of loss and degradation of inland waters resources –
	Publish data and information on inland waters biodiversity, including wetlands, in the website of HCENR and the Clearing House Mechanism of biodiversity	High	Experts who feed the data on the website are available	Shortage or scarcity of data on inland waters biodiversity	Providing facilitated access to such data Ensuring sustainability of data updating on such a mechanism
	Conduct awareness-raising activities on the importance of inland waters biodiversity	High	Existence of environmental	Difficulty in reaching the different sectors and groups	Designing the right awareness messages for the right targeted groups

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	conservation for decision makers, practitioners and the public, including local communities		legislation related to awareness raising		
	Conduct awareness-raising activities on monitoring, research and knowledge management for inland waters biodiversity	High	Existence of knowledgeable persons on the related subjects	Insufficient funds	Designing the right awareness messages for the right targeted groups Identifying the elements of inland waters biodiversity monitoring system
	Rehabilitate databases and documentation systems of relevance, as post-war activities, to facilitate access to relevant and accurate information on inland waters biodiversity	High	Past experience	Loss of data due to war	Finding out the relevant data from possible sources Incorporating inland waters biodiversity in the system
	Organize and run a consultation process to decide on how to establish centre for research and information on wetland biodiversity	High	Existence of universities and experts, who can conduct scientific research	Funding constraints	Obtaining necessary Baseline data and information
	Conduct a comprehensive baseline study for all inland waters in Sudan and revise and upgrade the taxonomy of their biota and document	High	Huge studies conducted already Availability of scientists and researchers	Armed conflict in targeted areas Limited sources of fund	Obtaining comprehensive data on the biodiversity and ecological status of inland waters ecosystem to start with

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	their known and potential uses			Limited qualified taxonomic experts	
<i>Insect and Microorganism Biodiversity</i>	Training of technicians to recognize and deal with different types of insects and microorganisms	High	Existence of training centres in the country	Shortage of funds	Fairly covering all potential trainees over the country
	Develop awareness materials and conduct awareness raising activities using different fora and media to disseminate information about the insect and microorganism biodiversity among targeted groups	High	Some awareness materials are already available	Limitedness of funds	Attracting targeted people to new developed materials
	Develop plan to encourage media organizations and extension workers to participate in dissemination of information about the impact of harmful insect and microorganism species	High	Existence of extension units Local community knowledge on harmful insects and microorganisms	Insufficient secured fund	Reaching out all targeted bodies
	Organize non-class activities to encourage education institutions to incorporate issues of insect and microorganism biodiversity in their educational curricula	High	Existence of non-class activities in some educational institutions	Insufficiency of allocated money for such activities	Convincing the different audiences with the issue

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	Develop a plan for involvement of all stakeholders in insects and microorganisms' biodiversity management programs	Medium	Availability of some insects and microorganisms' biodiversity management programme in some institutes	Wide stakeholders' distribution of all-over the country Insufficient funding	Convincing the stakeholders about the importance of insects and microorganisms biodiversity programs
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Aggregate and publish data and information on benefit sharing in the Benefit Sharing Clearing House Mechanism (ABS -CHM)	High	Existing ABS-CHM is designed to enhance transparency, legal certainty, and encourage all Parties to the Protocol to make this information available	Potential for confidential data to be mistakenly published	Verifying the validity of the information. Identifying sources of information, and ensuring their supportive collaboration
	Document and preserve traditional knowledge (TK), innovations, and practices of indigenous peoples and local communities associated to genetic resources to ensure that these knowledges only be accessed with their free, prior and informed consent in accordance with the national legislation	High	The existing guidelines for documentation of TK information at national and international levels	Confidentiality issues Potential for piracy on traditional knowledge	Enhancing public understanding of traditional knowledge and its links to biodiversity Building capacities on the collection of data and information on TK
	Establish a protection system to protect traditional	High	Existence of guidelines and other	Financial resources constraints	Identifying and establishing legal

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	knowledge associated with the genetic resources in order to be accessed with the free, prior informed consent of indigenous peoples and local communities in accordance with the national legislation		documents on the protection of TK	Insufficient recognition of IPLC rights in national policies and legislations Potential for biopiracy	measures to protect traditional knowledge Recognizing the IPLCs' rights in national policies and legislations Preventing unauthorized use Defining who holds rights to TK
	Develop awareness materials and conduct awareness activities on the Nagoya Protocol, and relevant instruments and legislations for educational sectors		Increasing trend in the public awareness on the importance of protecting indigenous genetic resources	– Lack of interest among content makers on the issue – Lack of Financial Resources	Creating interest among content makers on the issue
<i>Pollution Aspects related to Biodiversity</i>	Establish a documentation system containing pollution data, information and knowledge.	High	Availability of some data with some relative institutes but need to be verified	Unreliability of the available data	Updating of initial deposited data
	Establish an information website as one platform for pollution affairs authorities	High	Availability of IT experts Fund to cover expenses is secured	Possibility of ineffective coordination among the wide multitude of the responsible bodies	Providing access permits for the right bodies and persons
<i>Biosafety and Biotechnology</i>	Establish the Sudan biosafety electronic platform, and	High	Existence of national competent authority, national	Budgetary limitations	Establishing integrated digital systems for managing information on

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
<i>Aspects related to Biodiversity</i>	launch the Sudan biosafety clearing house		biosafety law, Cartagena protocol on biosafety and biosafety and biotechnology experts.		genetically modified organisms.
National Target 22 Ensure the full and effective participation of indigenous and local communities in Sudan, at all relevant levels, and their access to justice and information related to biodiversity, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as women and girls, children and youth, and persons with disabilities, and ensure the full protection of environmental human rights defenders					
<i>Inland Waters and Wetlands Biodiversity</i>	Ensure that the indigenous peoples and local communities are represented, considering gender perspective, by at least 10% in bodies of decision-making processes, and access to justice and information related to biodiversity, respecting their cultures and rights over lands, territories, resources, and traditional knowledge	High	Development of gender plan is under process Biodiversity policy and updated NBSAP are developed with due consideration to the engagement of IPLCs in all relevant activities, while respecting the gender issue	National laws and regulations not adequately recognizing the rights of indigenous peoples and local communities. Weak political commitment to the issue	Reaching sufficient understanding of the IPLCs roles in biodiversity conservation among the concerned
	Build capacities and raise awareness to enhance representation and participation of indigenous peoples and local communities in decision-	High	Existence of environmental legislation related to awareness raising	National laws and regulations not adequately recognize the rights of indigenous peoples and local communities	Ensuring availability of necessary understanding, skills and knowledge on the roles of the IPLCs and their participation on biodiversity related issues

Component/Related Aspect	Proposed Action(s)	Priority	Opportunity(ies)	Risk(s)	Challenge(s)
	making on issues related to inland waters biodiversity				
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Arrange to ensure that at least 10% of the indigenous peoples and local communities, taking into consideration gender issue, are represented in bodies involved in the decision-making processes, and access to justice and information related to biodiversity	High	Development of gender plan is under process Biodiversity policy will be developed incorporating this 10% representation of the indigenous peoples and local communities, taking into consideration gender issue within it Updated NBSAP considers actively engaging indigenous peoples and local communities in biodiversity decision-making processes, including access to information and justice	Lack of political commitment to prioritize the inclusion of indigenous peoples and local communities in decision-making processes Weak legal frameworks, as national laws and regulations may not adequately recognize the rights of indigenous peoples and local communities	Ensuring the necessary skills and knowledge among IPLCs to participate effectively in biodiversity decision-making Obtaining necessary appreciation among the policy makers and public institutions to effectively engage IPLC in decision-making processes

Appendix 3

Financial Resources Needs for Implementation of the different National Goals and Targets of the NBSAP (2025-2030)

Goal A: Protect and Restore (Reduce Threats to Biodiversity and Enhance its Conservation)

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Cultivated Plant Agrobiodiversity</i>	4	8	2630000
	6	2	150000
	7	3	90000
	9	1	200000
	Total	14	3070000
<i>Range Plant and Animal Agrobiodiversity</i>	1	3	800000
	2	2	575000
	4	1	200000
	8	1	500000
	Total	7	2075000
<i>Forest Biodiversity</i>	1	2	1800000
	4	4	20035000
	6	3	7840000
	8	4	12420000
	Total	13	42095000
<i>Wildlife Biodiversity</i>	1	3	8500000
	3	5	35100000
	4	7	15400000
	5	2	10300000
	6	3	9500000
	7	3	1300000
	8	1	3000000
	Total	24	83100000
<i>Marine Biodiversity</i>	1	3	900000
	2	2	900000
	3	2	500000
	4	2	1400000
	6	2	700000
	7	5	1400000
	8	3	1150000
	9	1	600000
	Total	20	7550000
<i>Inland Waters and Wetlands Biodiversity</i>	1	1	250000
	2	3	570000

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
	3	3	6200000
	4	3	1650000
	6	2	1050000
	7	3	700000
	8	1	500000
	21	2	700000
	Total	18	11620000
<i>Insect and Microorganism Biodiversity</i>	4	3	3700000
	7	2	600000
	Total	5	4300000
<i>Pollution Aspects related to Biodiversity</i>	7	6	113900000
	12	2	520000
	Total	8	114420000
<i>Climate Change Impacts on Biodiversity</i>	20	2	1300000
	21	3	2100000
	Total	5	3400000
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	4	2	1250000
	7	1	150000
	14	1	270000
	17	1	50000
	Total	5	1720000
<i>Health Aspects of relevance to Biodiversity</i>	2	1	200000
	4	2	105000
	6	1	100000
	7	2	10200000
	Total	6	10605000
Total Estimated Budget for Implementing Actions under Goal A (US\$)			283,955,000

Goal B: Prosper with Nature (Enhance Sustainable Use of Biodiversity)

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Cultivated Plant Agrobiodiversity</i>	8	1	500000
	9	1	50000
	10	3	1100000
	20	1	150000
	Total	6	1800000
	10	1	500000

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Range Plant and Animal Agrobiodiversity</i>	Total	1	500000
<i>Forest Biodiversity</i>	10	3	3400000
	Total	3	3400000
<i>Wildlife Biodiversity</i>	9	3	800000
	11	2	1000000
	Total	5	1800000
<i>Marine Biodiversity</i>	5	3	1650000
	10	2	300000
	Total	5	1950000
<i>Inland Waters and Wetlands Biodiversity</i>	10	3	1050000
	12	1	50000
	Total	1	1100000
<i>Insect and Microorganism Biodiversity</i>	9	3	1200000
	Total	3	1200000
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	5	1	200000
	Total	1	200000
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	10	2	520000
	17	1	3000000
	Total	3	3520000
<i>Health Aspects of Relevance to Biodiversity</i>	5	2	420000
	9	2	250000
	10	2	350000
	11	2	1500000
	12	1	500000
	Total	9	3020000
Total Estimated Budget for Implementing Actions under Goal B (US\$)			18,490,000

Goal C: Share Benefits Fairly (Access and Benefit Sharing)

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Cultivated Plant Agrobiodiversity</i>	9	1	50000
	13	3	220000
	20	1	150000
	Total	5	420000

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	5	1	3000000
	13	3	130000
	21	3	6600000
	Total	7	9730000
Total Estimated Budget for Implementing Actions under Goal C (US\$)			10,150,000

Goal D: Invest and Collaborate (Ensure Adequate Means of Implementation)

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Cultivated Plant Agrobiodiversity</i>	4	1	1000000
	6	3	260000
	7	1	10000
	8	1	20000
	10	2	150000
	13	1	50000
	14	3	130000
	19	2	50000
	20	2	300000
	21	2	120000
	Total	18	2090000
<i>Range Plant and Animal Agrobiodiversity</i>	1	1	100000
	14	1	200000
	16	1	300000
	18	1	100000
	19	1	150000
	20	1	300000
	21	1	300000
	Total	7	1450000
<i>Forest Biodiversity</i>	14	3	290000
	16	1	900000
	18	4	15300000
	19	3	3600000
	20	2	900000
	21	2	7950000
	Total	15	28940000
<i>Wildlife Biodiversity</i>	1	1	2000000
	3	1	1000000
	4	1	250000
	6	1	20000000

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
	7	1	5000000
	14	1	100000
	18	1	500000
	13	2	2200000
	20	3	4000000
	21	3	600000
	Total	15	35650000
<i>Marine Biodiversity</i>	2	1	200000
	3	1	1500000
	4	2	1600000
	6	1	150000
	9	1	250000
	11	2	950000
	18	2	450000
	Total	10	5100000
<i>Inland Waters and Wetlands Biodiversity</i>	6	1	500000
	14	4	1050000
	16	1	250000
	19	1	350000
	20	2	1300000
	21	5	1950000
	22	2	300000
	Total	16	5700000
<i>Insect and Microorganism Biodiversity</i>	4	2	400000
	6	1	50000
	7	1	100000
	19	1	50000
	20	3	900000
	21	5	950000
	Total	13	2450000
<i>Pollution Aspects related to Biodiversity</i>	7	1	800000
	12	1	100000
	14	3	1600000
	15	4	1370000
	20	2	800000
	21	2	1100000
	Total	13	5770000
<i>Climate Change Impacts on Biodiversity</i>	8	1	60000
	19	1	100000
	Total	2	160000

Components and related aspects involved	National Target	Total number of actions	Total estimated budget (\$)
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	19	1	150000
	20	4	4300000
	21	1	500000
	Total	6	4950000
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	17	8	4370000
	19	1	50000
	21	1	150000
	Total	10	4570000
<i>Health Aspects of Relevance to Biodiversity</i>	17	1	100000
	Total	1	100000
Total Estimated Budget for Implementing Actions under Goal D (US\$)			96,930,000
Grand Total of Estimated Budget (US\$)			409,525,000

Appendix 4

Matrix of Capacity Building and Development Needs and Implementation Plan for Biodiversity in Sudan (2025-2030)

A: Awareness and Training

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
National Target 1: Plan and Manage all Areas to Reduce Ecosystems Degradation By at Least 25% and Reduce Biodiversity Loss						
<i>Range Plant and Animal Agrobiodiversity</i>						
Awareness on importance of preventing losses in rangelands	individual	Technical	Local communities	Range and Pasture General Directorate	2027	200000
<i>Wildlife Biodiversity</i>						
Training courses outside the country on effective wildlife management	Individual	Technical	Protected areas managers and rangers Wildlife law enforcement officers	Wildlife Conservation Forces (WCF)	2025-2029	2000000
National Target 2: Restore at least 10% of all Degraded Ecosystems						
<i>Marine Biodiversity</i>						
Training on coral reef restoration, and restoration of	Organizational	Technical	Staff of institutions related to marine environment	Higher Council for Environment and Natural	2025 - 2027	200000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
mangrove and seagrass				Resources (HCENR)		
National Target 3: Conserve at least 15% of Land, Waters and Seas in Protected Areas						
<i>Wildlife Biodiversity</i>						
Awareness on engagement of local communities around wildlife reserves and areas	Organizational	Technical	Local communities Wildlife and environmental officers Personnel at locality levels	WCF	2025-2027	1000000
<i>Marine Biodiversity</i>						
Awareness on effective engagement of local communities in conservation activities of marine protected areas	Individual	Functional	local communities existing around marine protected areas	HCENR	2025 - 2027	1500000
National Target 4: Halt Species Extinction and Protect Genetic Diversity						
<i>Cultivated Plant Agrobiodiversity</i>						

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
Human, physical, financial, legal and institutional capacities for Conservation and sustainable use of PGRFA	Across different levels	Technical/Functional	Technical and non-technical staff	Agricultural Plant Genetic Resources Conservation and Research Centre (APGRC)	2025–2030	1000000
Training on plant identification, population biology, ethno-botany, use of geographical information systems (GIS), and molecular tools	Individual	Technical	Technical staff	APGRC	2025-2030	500000
<i>Forest Biodiversity</i>						
Training on forest biodiversity conservation	Individual	Technical	Local communities	Forests National Corporation (FNC)	2025 – 2030.	1000000
<i>Wildlife Biodiversity</i>						
Awareness on supporting	Individual	Functional	Policy makers	WCF	2026-2027	250000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
wildlife conservation issues			Legislators Private sectors NGOs Media professionals Staff of academic and research institutions			
National Target 5: Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species						
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>						
Awareness raising on the value of customary sustainable use by indigenous peoples and local communities of wild species	Individual	Technical capacity	Indigenous peoples and local communities	HCENR	2026 - 2028	200000
National Target 6: Reduce the Introduction of Invasive Alien Species by at Least 20% and Minimize Their Impacts						
<i>Cultivated Plant Agrobiodiversity</i>						

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
Awareness raising on IAS and their impacts on cultivated plant agrobiodiversity	Individual	Technical	Agrobiodiversity workers Farmers	Ministry of Agriculture	2025-2030	100000
<i>Forest Biodiversity</i>						
Training on combating and managing invasive alien species	Individual	Technical	Local communities	FNC	2025-2030	140000
<i>Wildlife Biodiversity</i>						
Awareness on halting invasive alien species introductions	Individual	Technical	Communication officers and content creators Wildlife and environmental outreach staff Nomadic herders NGOs and community-	WCF	2025-2027	5000000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
			based organizations			
<i>Marine Biodiversity</i>						
Awareness on the invasive alien species	Enabling environment	Functional	Decision makers and other stakeholders related to marine environment	HCENR	2025-2030	150000
National Target 7: Reduce Pollution to Levels That Are Not Harmful to Biodiversity						
<i>Cultivated Plant Agrobiodiversity</i>						
Awareness raising on the risks associated with excess use of pesticides on plant diversity	Individual	Technical	Agrobiodiversity workers Farmers	Ministry of Agriculture	2025-2030	30000
<i>Wildlife Biodiversity</i>						
Awareness on the harmful effects of the use of pesticides and others on the environments of wild animals	Individual	Technical	School pupils The public	WCF	2025-2027	500000
<i>Inland Waters and Wetlands Biodiversity</i>						

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
Awareness to enhance the communities' role in enforcement of environmental laws to combat pollution in inland waters	Individual / enabling environment	Functional	Local communities Local governments	HCENR	2025-2030	100000
Awareness on adverse impacts of traditional as well as organized gold mining on inland waters and wetlands	Individual/ enabling environment	Functional	Local communities Local governments	HCENR	2025-2030	500000
<i>Health Aspects related to Biodiversity</i>						
Awareness on negative impacts of excess nutrients, pesticides, hazardous waste,	Individual	Technical	Children and the elderly Policymakers Farmers Consumers	Ministry of Health	2025 – 2027	200000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
chemicals and plastic			Waste management workers			
National Target 8: Minimize the Impacts of Climate Change on Biodiversity and Build Resilience						
<i>Forest Biodiversity</i>						
Training and awareness raising on the use of climate-resilient tree species and drought-tolerant crops	Individual	Technical	Local communities	FNC	2025-2028	8000000
National Target 9: Manage Wild Species Sustainably to Benefit People						
<i>Wildlife Biodiversity</i>						
Awareness on wildlife wise and sustainable use	Individual	Technical	Local communities and indigenous peoples Wildlife conservation forces staff Policy makers Tourism companies' staff	WCF	2025-2027	300000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
			Media professionals NGOs and CBOs			
<i>Marine Biodiversity</i>						
Awareness on Integrated Ecosystem Approach Management in marine and coastal environment	Organizational	Functional	Decision makers and other stakeholders	HCENR	2025 - 2027	250000
National Target 10: Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry						
<i>Forest Biodiversity</i>						
Training and demonstration on forest sustainable practices	Individual	Technical	Local communities	FNC	2025-2030	200000
Training and demonstration on sustainable land use practices	Organizational	Technical	FNC staff	FNC	2025 – 2030	1200000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
National Target 11: Restore, Maintain, and Enhance Nature's Contributions to People						
<i>Marine Biodiversity</i>						
Awareness on Integrated Coastal Zone Management (ICZM)	Organizational	Functional	Stakeholders related to marine environment	HCENR	2025 - 2027	350000
<i>Health Aspects related to Biodiversity</i>						
Awareness on the value of ecosystem functions and services to health and wellbeing	Individual	Technical	Community groups	HCENR	2025 – 2027	1000000
National Target 13: Enhance the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge						
<i>Cultivated Plant Agrobiodiversity</i>						
Training on and institutional capacities for regulating access to PGRFA and digital sequence information,	Organizational	Functional	Technical staff	APGRC	2025-2030	100000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
sharing of benefit arising from their utilization in consistence with international instruments of such as the CBD and the ITPGRFA						
Awareness raising on access to PGRFA and sharing of benefits arising from utilization	Individual	Technical	Agrobiodiversity workers Farmers Local communities	APGRC	2025-2030	100000
National Target 14: Integrate Biodiversity in Decision Making at Every Level						
<i>Cultivated Plant Agrobiodiversity</i>						
Specialized training on transforming agrobiodiversity components into items of	Individual	Technical	Agrobiodiversity workers Technical staff in financing sectors	HCENR	2025-2030	30000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
monetary values						
<i>Forest Biodiversity</i>						
Awareness raising at high policy levels for integration of forest biodiversity and its values into different national strategies, policies and plans	Enabling Environment	Functional	National policy makers	FNC	2025 – 2028	200000
<i>Wildlife Biodiversity</i>						
Awareness on the values of the wildlife biodiversity in order to encourage including them in strategies and plans, including for poverty reduction	Individual	Functional	National decision makers, at state and local governments Local communities NGOs and CBOs	WCF	2025-2028	500000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
<i>Inlands Waters and Wetlands Biodiversity</i>						
Awareness on incorporation of biodiversity, including inland waters biodiversity, economic accounting in the curricula	Organizational	Technical	Teachers Curriculum developers Schools and universities administrators	HCENR	2025-2030	500000
Training on transforming biodiversity components, including inland waters biodiversity, into items of monetary value	Individual	Technical	Economists and statisticians Environmental officers Planners in ministry of finance Staff of protected areas Water resources managers	HCENR	2026-2028	300000
Awareness on the role of	Enabling environment	Functional	Local communities	HCENR	2025-2030	50000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
wetlands in the environment			Media professionals NGOs and community-based organizations Private sector Policy makers			
National Target 17: Strengthen Biosafety and Distribute the Benefits of Biotechnology						
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>						
Awareness and interest raising at high policy level on biosafety issues	Enabling environment	Functional	High policy and government officials	HCENR	2024-2029	100000
Participation and coordination at regional level on issues related to biosafety	Individual	Technical/Functional	Government and private sector officials	HCENR	2024 - 2030	650000
National Target 19: Mobilize Financial Resources for Biodiversity from All Sources						
<i>Cultivated Plant Agrobiodiversity</i>						

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
Awareness raising on contributing to, and managing financial resources for community plant agrobiodiversity conservation	Organizational	Functional	Farmers Local communities	HCENR	2025-2030	30000
<i>Forest Biodiversity</i>						
Awareness raising on private and corporate donations for biodiversity conservation	Individual	Technical	Local communities	FNC	2025–2030	400000
National Target 20: Strengthen Capacity Building, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity						
<i>Cultivated Plant Agrobiodiversity</i>						
Training on enhancing sharing of knowledge and information at regional and	Individual	Technical	Technical staff	HCENR	2025-2030	100000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
international levels						
<i>Range Plant and Animal Agrobiodiversity</i>						
Human capacity building on using remote sensing in the assessment of rangelands	individual	Technical	Governmental staff	Range and Pasture General Directorate	2028	300000
<i>Forest Biodiversity</i>						
Human capacity building on conservation and sustainable use of forest genetic resources	Individual	Technical	Staff of governmental institutions	Ministry responsible for Forestry	2025 – 2030	400000
<i>Wildlife Biodiversity</i>						
Training outside the country on conservation and sustainable use of wildlife biodiversity	Individual	Technical	Wildlife officers and non-commissioned officers	WCF	2025-2030	1500000
<i>Inland Waters and Wetlands Biodiversity</i>						
Management and sustainable	Individual	Technical	Wetlands managers and	HCENR	2025-2030	300000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
use of wetland biodiversity			protected areas staff Local communities and resources users Researchers and academic institutions Private sector Policy makers and legislators			
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>						
Training and awareness on effective participation in the implementation of the Nagoya Protocol and other legally binding instruments of relevance	Individual level	Technical	Relevant stakeholders, including the business sector and the research community	HCENR	2025 – 2027.	400000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
Capacities for the implementation of the provisions of the Protocol related to granting prior informed consent (PIC) and developing minimum requirements for mutually agreed terms (MAT)	Individual	Technical	Indigenous peoples and local communities (IPLC)	HCENR	2026 – 2028	3000000
Training on negotiating mutually agreed terms (MAT)	Individual	Technical	Stakeholders including local communities	HCENR	2025 – 2026	500000
Training and capacities on monitoring the utilization of genetic resources, including the	Individual level	Technical capacity	Relevant stakeholders	HCENR	2025 – 2026	400000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
establishment of checkpoints						
National Target 21: Ensure that Data and Knowledge are Available and Accessible for Biodiversity						
<i>Cultivated Plant Agrobiodiversity</i>						
Awareness raising on information, innovations, practices and any relevant plant agrobiodiversity aspects	Organizational	Technical	Technical staff Farmers	Ministry of Agriculture	2025-2030	100000
<i>Wildlife Biodiversity</i>						
Public awareness on wildlife biodiversity	Individual	Technical	The public	WCF	2025-2028	250000
<i>Inland Waters and Wetlands Biodiversity</i>						
Awareness on importance of inland waters biodiversity conservation	Individual Enabling environment	Functional	Decision makers Practitioners Public and local communities	HCENR	2026-2030	500000
Awareness on monitoring, research and	Individual	Technical	Government officials	HCENR	2025-2030	200000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
knowledge management for inland waters biodiversity			Technical staff			
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>						
Raising awareness on the Nagoya Protocol, and relevant instruments and legislations for educational sectors	Individual	Technical	Staff of educational sectors	HCENR	2026 – 2027	500000
National Target 22: Ensure Participation in Decision Making and Access to Justice and Information Related to Biodiversity for All						
<i>Inland Waters and Wetlands Biodiversity</i>						
Awareness on effective participation of indigenous peoples and local communities in decision-making on issues related to	Individual/Enabling environment	Functional	Indigenous people and local community members	HCENR	2025-2030	150000

Capacity Need	Level	Type	Target group(s)	Main Implementing and Reporting Agency	Time Frame	Estimated Budget (US\$)
inland waters biodiversity						
Total estimated budget						36,930,000

B: Policies, Strategies, Action Plans and Legislations

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
National Target 1: Plan and Manage all Areas to Reduce Biodiversity Loss by At Least 25%						
<i>Forest Biodiversity</i>						
Programme for applying sustainable land management practices	Organizational	Technical	Programme	Forests National Corporation (FNC)	2025-2030	150000
<i>Marine Biodiversity</i>						
Plans to stop the loss in marine habitats by treating the reasons causing this degradation	Enabling environment	Functional	Plans	Institute of Marine Research (IMR)	2027-2030	400000
<i>Inland Waters and Wetlands Biodiversity</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Wetlands biodiversity strategic action plan	Enabling environment	Functional	Action Plan	HCENR	2025 – 2030	250000
National Target 2: Restore at Least 10% of all Degraded Ecosystems						
<i>Marine Biodiversity</i>						
Marine restoration projects on coral reef mangrove and seagrass restoration in degraded areas	Organizational	Technical	Action Plan	IMR	2025 -2030	600000
<i>Health Aspects related to Biodiversity</i>						
Comprehensive restoration plan for different biodiversity components	Enabling environment	Functional	Plan	HCENR	2025 – 2030	200000
National Target 3: Conserve at Least 15% of Land, Waters and Seas						
<i>Marine Biodiversity</i>						
Programmes for effective and equitable management in Dungonab Bay and Mukkawar	Organizational	Functional	Programmes	IMR	2026-2030	300000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Island, and Sangneb Marine National Parks.						
<i>Inland Waters and Wetlands Biodiversity</i>						
Management plans for protected areas that have no management plans	Organizational	Functional	Plan	WCF	2025 - 2027	700000
National Target 4: Halt Species Extinction and Protect Genetic Diversity						
<i>Wildlife Biodiversity</i>						
Action plan for management of wild plant and animal species for medicinal uses, and for reducing human-wildlife conflicts	Organizational	Functional	Action Plan	WCF	2026 - 2030	800000
<i>Health Aspects related to Biodiversity</i>						
Approvement of national policy and strategy and updated law of wildlife on the role of species in the production of	Enabling environment	Functional	Policy / Strategy / Legislation	WCF	2025 – 2025	5000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
medicines and reduction of human-wildlife conflict						
Action plan to reduce human-wildlife conflict	Enabling environment	Functional	Action Plan	WCF	2025 – 2025.	100000
National Target 5: Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species						
<i>Wildlife Biodiversity</i>						
Updating Wildlife Law and regulations to control harvesting and trade of wild species	Enabling environment	Functional	Legislation	WCF	2026	300000
<i>Marine Biodiversity</i>						
Reviewing and developing regulations for sustainable fishing, and avoiding over-fishing	Enabling environment	Functional	Legislation	Marine Fishery Administration (MFA)	2025-2028	150000
Plan for implementation of Ecosystem Approach Fishery Management	Organizational	Functional	Plan	MFA	2025-2030	500000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
<i>Health Aspects related to Biodiversity</i>						
Regulations against unsustainable and illegal use of wildlife species, and for provision of wildlife functions such as medicinal products	Enabling environment	Functional	Legislation	WCF	2025 – 2025	20000
National Target 6: Reduce the Introduction of Invasive Alien Species by 20% and Minimize Their Impact						
<i>Cultivated Plant Agrobiodiversity</i>						
Programmes for elimination and eradication of priority IASs	Organizational	Functional	Programme	Ministry of Agriculture	2025-2030	50000
National Target 7: Reduce Pollution to Levels That Are Not Harmful to Biodiversity						
<i>Marine Biodiversity</i>						
Reviewing the national response plan for managing marine pollution incidents	Organizational	Functional	Plan	Sea Ports Corporation (SPC)	2025-2028	150000
Improving the national action plan for the sustainable	Organizational	Functional	Action Plan	SPC	2025-2028	200000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
management of marine litter						
Reviewing control regulations for reducing the adverse impacts of gold mining to environmentally acceptable levels	Enabling environment	Functional	Legislation	HCENR	2025-2027	100000
<i>Pollution Aspects related to Biodiversity</i>						
National plan for strong restriction or banning of some extremely and highly toxic pesticides used to control Quelea birds	Organizational	Functional	Plan	National Pesticides Council (NPC)	2027-2030	400000
<i>Health Aspects related to Biodiversity</i>						
Medical waste disposal plans	Enabling environment	Functional	Plans	WCF	2025 – 2028	10000000
National Target 8: Minimize the Impacts of Climate Change on Biodiversity and Build Resilience						
<i>Cultivated Plant Agrobiodiversity</i>						
National programme on issues of climate change impacts	Organizational	Functional	Programme	HCENR	2025-2030	20000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
on biodiversity conservation, management and use						
<i>Marine Biodiversity</i>						
Coral reef bleaching response plan	Organizational	Technical	Plan	IMR	2025-2030	350000
National Target 9: Manage Wild Species Sustainably to Benefit People						
<i>Wildlife Biodiversity</i>						
Wildlife sustainable use policy	Enabling environment	Functional	Policy	WCF	2025 - 2026	250000
Action plan for wildlife resources production and consumption	Organizational	Functional	Action Plan	WCF	2026-2027	250000
<i>Health Aspects related to Biodiversity</i>						
Regulations on safe use management and trade of wildlife, ensuring human health	Enabling environment	Functional	Legislation	WCF	2025 – 2026	100000
National Target 10: Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry						
<i>Cultivated Plant Agrobiodiversity</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Agricultural policy based on sustainability of resources.	Enabling environment	Functional	Policy	Ministry of Agriculture	2025-2028	50000
<i>Health Aspects related to Biodiversity</i>						
National dietary guidelines, promoting diverse and sustainable use of foods	Enabling environment	Functional	Policy	Ministry of Agriculture	2025–2026	150000
National Target 12: Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity						
<i>Wildlife Biodiversity</i>						
Plans for protection and promotion of the use of the naturally existing wild habitats within and around urban areas	Organizational	Functional	Plans	WCF	2026-2030	5000000
National Target 13: Enhance the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge						
<i>Cultivated Plant Agrobiodiversity</i>						
Endorsement of the national PGR legislation	Enabling environment	Functional	Legislation	Ministry of Agriculture	2025-2030	20000
Approval of the national	Enabling environment	Functional	Legislation	Ministry of Agriculture	2025-2030	50000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
legislation on protection of new plant varieties and breeder's rights						
Wildlife Biodiversity						
Strategic plan for protection of wild fauna and flora genetic diversity	Organizational	Functional	Plan	WCF	2025-2026	100000
Access and Benefit Sharing Aspects related to Biodiversity						
Endorsement of access and benefit sharing legal framework	Enabling environment	Functional	Legislation	HCENR	2025 - 2026	5000
National Target 14: Integrate Biodiversity in Decision Making at Every Level						
Cultivated Plant Agrobiodiversity						
National policy and strategic action plan for the conservation and sustainable use of cultivated plant agrobiodiversity	Enabling environment	Functional	Policy / Action Plan	APGRC	2025-2027	50000
Range Plant and Animal Agrobiodiversity						
Strategic action plan for conservation and	Enabling Environment	Functional	Action Plan	Ministry of Animal Resources	2028	200000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
sustainable use of range and animal agrobiodiversity						
<i>Forest Biodiversity</i>						
Integration of forest biodiversity conservation agenda into the Forests National Corporation (FNC) development plans, and the systematic monitoring	Organizational	Functional	Plans	FNC	2025 – 2028	40000
<i>Pollution Aspects related to Biodiversity</i>						
Reviewing and updating of the national legislations on hazardous pesticides, chemicals and other wastes in consistence with the existing international conventions	Enabling environment	Functional	Legislation	HCENR	2026 - 2030	800000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Policies and legislations on the use of plastic bags	Enable environment	Functional	Policies / Legislations	Ministry of Industry	2026 - 2030	50000
Policies for waste recycling technologies	Enable environment	Functional	Policies	Ministry of Industry	2026 - 2030	750000
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>						
Reviewing and updating of policies, plans and laws to be consistent with the biosafety law, and developing bylaws and regulations	Enabling environment	Functional	Policies / Legislations	HCENR	2024 - 2030	270000
National Target 15: Business Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts						
<i>Pollution Aspects related to Biodiversity</i>						
Gold mining legislation against using mercury in gold mining processing	Enable environment	Functional	Legislation	HCENR	2026 - 2030	50000
Ratification of Minamata Convention to stop use of mercury in	Enable environment	Functional	Legislation	HCENR	2025 - 2026	20000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
artisanal gold mining						
Strategic Approach to International Chemicals Management (SAICM) strategy	Enable environment	Functional	Strategy	HCENR	2025-2030	500000
National Target 16: Enable Sustainable Consumption Choices to Reduce Waste and Overconsumption						
<i>Inland Waters and Wetlands Biodiversity</i>						
Plan for sustainable consumption of inland water resources	Enabling environment	Functional	Plan	General Directorate of Fisheries	2025 - 2026	250000
National Target 18: Reduce Harmful Incentives and Scale Up Positive Incentives for Biodiversity						
<i>Marine Biodiversity</i>						
Policies for making a balance between the government subsidies for fishing and avoidance of overfishing	Enabling environment	Functional	Policies	MFA	2025-2028	150000
National Target 19: Mobilize Financial Resources for Biodiversity from All Sources						
<i>Forest Biodiversity</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Project proposals and partnerships on forest biodiversity conservation and use	Organizational	Technical	Action Plans	FNC	2025-2030	200000
Total estimated budget						25,050,000

C: Structures, institutions. systems and equipment

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
National Target 1: Plan and Manage all Areas to Reduce Biodiversity Loss by At Least 25%						
<i>Wildlife Biodiversity</i>						
Capacities for wildlife-anti-poaching unit	Organizational	Technical / Hard	Equipment	WCF	2026 - 2027	5000000
National Target 2: Restore at Least 10% of all Degraded Ecosystems						
<i>Range Plant and Animal Biodiversity</i>						
System for managing water bodies in rangelands	Organizational	Functional	System	Ministry of Animal Resources	2028	75000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
to share the water resource and avoid conflicts						
National Target 3: Conserve at Least 15% of Land, Waters and Seas						
<i>Wildlife Biodiversity</i>						
Offices for wildlife management in different localities	Organizational	Technical	Equipment	WCF	2026 - 2030	10000000
<i>Inland Waters and Wetlands Biodiversity</i>						
New protected areas in the fresh water habitats: a. One of the non-Nilotic lakes such as Kundi, b. Wadi Alalagi	Organizational	Functional	Institutions	WCF	2025 -2028	1000000
National Target 4: Halt Species Extinction and Protect Genetic Diversity						
<i>Forest Biodiversity</i>						
Ex situ conservation system for critical threatened forest species	Organizational	Technical	System	FNC	2025 – 2030	5000000
<i>Wildlife Biodiversity</i>						
Captive breeding centre and genebank unit for wildlife	Organizational	Technical	Institutions	WCF	2026 -2027	5000000
<i>Marine Biodiversity</i>						
Capacities for the existing marine	Organizational	Technical	Equipment	IMR	2025 -2030	800000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
environmental monitoring programme applied by IMR						
Marine genetic resources unit and a genebank	Organizational	Technical	Institution	IMR	2025 -2028	1000000
National oceanographic data centre	Organizational	Functional	Institution	IMR	2025 -2030	800000
<i>Insect and Microorganism Biodiversity</i>						
Apiaries for rearing bees, and laboratories for rearing predator insects	Organizational	Technical	Institutions	Ministry of Animal Resources	2025-2028	200000
National microbial culture collection laboratory.	Organizational	Technical	Institution	National Centre for Research	2025-2030	3000000
National Target 5: Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species						
<i>Health Aspects related to Biodiversity</i>						
Institutional capacities to apply prevention measures for reducing the risk of pathogen spillover	Organizational	Technical	Equipment	Ministry of Health	2025 – 2030	400000
National Target 6: Reduce the Introduction of Invasive Alien Species by 20% and Minimize Their Impact						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
<i>Cultivated Plant Agrobiodiversity</i>						
Capacities for the plant quarantine authority	Organizational	Technical	Institution	Ministry of Agriculture	2025-2030	150000
<i>Forest Biodiversity</i>						
Systems and tools for monitoring and evaluation of invasive alien species	Organizational	Functional	System	FNC	2025-2030	700000
<i>Marine Biodiversity</i>						
Laboratory unit for analysing the ballast water to detect and identify invasive alien species	Organizational	Technical	Institution	SPC	2025 -2027	400000
Monitoring system for investigation of invasive alien species in the ballast water discharging in Bashair (1 and 2) terminals for exported oil	Organizational	Technical	System	IMR	2025 -2030	300000
National Target 7: Reduce Pollution to Levels That Are Not Harmful to Biodiversity						
<i>Marine Biodiversity</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Establishment of marine pollution laboratory	Organizational	Technical	Institution	IMR	2025 -2028	800000
Develop effective reception facilities system in the Sudanese ports	Organizational	Functional	System	HCENR	2025 -2027	150000
<i>Pollution Aspects related to Biodiversity</i>						
Incinerators or appropriate modern chemical treatment techniques, and bioremediation and/or biodegradation techniques	Organizational	Technical	Equipment	HCENR	2026-2030	100000000
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>						
Capacity of the biosafety National Competent Authority for monitoring and risk management at different stages	Organizational	Technical	Institutions	HCENR	2025 – 2030	150000
National Target 8: Minimize the Impacts of Climate Change on Biodiversity and Build Resilience						
<i>Range Plant and Animal Agrobiodiversity</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Meteorological stations at different rangeland sites	Organizational	Functional / Technical	Institutions	Ministry of Animal Resources	2029	500000
<i>Forest Biodiversity</i>						
Early warning systems and community-based adaptation measures to address climate-related disasters	Organizational	Technical	System	Higher Council for Civil Defense	2025 – 2030	120000
National Target 10: Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry						
<i>Cultivated Plant Agrobiodiversity</i>						
Early warning system to predict, identify and control potential sources of adverse impacts on agrobiodiversity	Organizational	Technical	System	Ministry of Agriculture	2026-2030	1000000
<i>Marine Biodiversity</i>						
Bodies to involve local communities in conservation and sustainable use of mangrove forests	Organizational	Functional	Institutions	HCENR	2025 -2030	100000
<i>Inland Waters and Wetlands Biodiversity</i>						
Ecological monitoring system	Organizational	Technical	System	HCENR	2025 -2030	500000
<i>Health Aspects related to Biodiversity</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Certification system for organic and eco-farming	Organizational / Enabling Environment	Functional	System	Ministry of Agriculture	2026 – 2030	200000
National Target 11: Restore, Maintain, and Enhance Nature’s Contributions to People						
<i>Marine Biodiversity</i>						
Unit for Integrated Coastal Zone Management (ICZM)	Organizational	Technical	Institution	HCENR	2026 -2030	600000
National Target 13: Ensure the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge						
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>						
Institutional structures and administrative systems for ABS such as Competent National Authority (CNA), and checkpoints s	Organizational	Functional	Institutions	HCENR	2025 - 2026	100000
National Target 16: Enable Sustainable Consumption Choices to Reduce Waste and Overconsumption						
<i>Forest Biodiversity</i>						
National certification and labelling scheme for sustainably sourced forest products	Organizational	Functional	System	FNC	2025 – 2028.	900000
National Target 17:						
<i>Biosafety and Biotechnology related Aspects</i>						

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
System of handling biosafety notifications and the subsequent actions	Organizational	Functional	System	HCENR	2025 – 2030	800000
Capacity for biosafety containment, confined use and field trials	Organizational	Technical	System	HCENR	2025 – 2030	3000000
Biosafety standard operating procedures (SOPs).	Organizational	Technical	System	HCENR	2025 – 2030	50000
System for public information, education and participation on biosafety matters	Organizational	Functional	System	HCENR	2025 - 2030	750000
GMO detection and accreditation laboratories	Organizational	Technical	Institutions	HCENR	2025 - 2030	1500000
Biosafety institutional committees	Organizational	Functional	Institutions/Structure	HCENR	2025 - 2030	250000
<i>Health Aspects related to Biodiversity</i>						
Institutional biosafety committees in health institutions and	Organizational	Functional	Institution/Structure	HCENR	2025 – 2026	100000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
relevant sectors of one health platform						
National Target 18: Reduce Harmful Incentives and Scale Up Positive Incentives for Biodiversity						
<i>Forest Biodiversity</i>						
National scheme for providing incentives and benefits to communities involved in sustainable management of forest resources	Organizational	Functional	System	FNC	2025 – 2030	8000000
National scheme for providing subsidies to encourage the development and use of alternative energy sources	Organizational	Functional	System	Ministry of Energy	2025 – 2030	1600000
National Target 20:						
<i>Cultivated Plant Agrobiodiversity</i>						
Rehabilitation of the documentation system of the APGRC	Organizational	Technical	System	APGRC	2025-2027	200000
<i>Forest Biodiversity</i>						
Partnerships to support	Enabling environment	Functional	Structure		2025 – 2030.	500000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
collaborative research and data sharing						
<i>Wildlife Biodiversity</i>						
Spatial Monitoring and Reporting Tool (SMART) management system in national parks	Organizational	Technical	System	WCF	2026 - 2027	2000000
Geographical information systems (GIS) with drones, GPS devices and telecommunication devices for national parks	Organizational	Technical	System / Equipment	WCF	2027-2028	500000
<i>Insect and Microorganism Biodiversity</i>						
Capacities for the existing insect taxonomy unit at the ARC	Organization	Functional	Equipment	ARC	2025-2030	250000
National Target 21						
<i>Cultivated Plant Agrobiodiversity</i>						
Web site for APGRC on plant agrobiodiversity related data and information	Organizational	Technical	System	APGRC	2025-2030	20000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
<i>Range Plant and Animal Agrobiodiversity</i>						
Database units and information platforms for range and animal agrobiodiversity	Organizational	Technical	System	Ministry of Animal Resources	2027	300000
<i>Forest Biodiversity</i>						
Documentation system for indigenous knowledge and practices relevant to forest biodiversity	Organizational	Technical	System	FNC	2025 – 2030.	7500000
<i>Wildlife Biodiversity</i>						
Web-based platform for wildlife conservation data-base and information.	Organizational	Technical/	System	WCF	2026	100000
<i>Inland Waters and Wetland Biodiversity</i>						
Rehabilitation of databases and documentation systems of relevance to inland waters and wetlands biodiversity	Organizational	Functional	Systems	HCENR	2025 -2026	300000

Capacity Need	Level	Type	Sub-Category	Main Implementing and Reporting Agency	Timeframe	Estimated Budget (US\$)
Consultation process to decide on establishing a centre for research and information on wetland biodiversity	Organizational	Functional	Institutions	HCENR	2025 - 2030	300000
<i>Pollution Aspects related to Biodiversity</i>						
Documentation system for pollution data, information and knowledge.	Organizational	Technical	System	HCENR	2026 - 2030	1000000
Website as one platform for pollution affairs authorities	Organizational	Technical	System	HCENR	2026 - 2030	100000
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>						
Sudan biosafety electronic platform, and Sudan biosafety clearing house	Organizational	Functional	System	HCENR	2025 - 2030	150000
Total estimated budget						168,215,000
Grand Total of Estimated Budget for Capacity Building and Development Actions (US\$)						230,195.000

Appendix 5

Matrix of Proposals to Ensure Implementation of National Target (23) on Gender Equality Across Relevant NBSAP Actions

National Target 23: Ensure gender equality in the implementation of the NBSAP in Sudan through a gender responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
National Target 1: Plan and Manage all Areas to Reduce Ecosystems Degradation By at Least 25% and Reduce Biodiversity Loss					
<i>Range Plant and Animal Agrobiodiversity</i>	Develop awareness materials and conduct awareness activities on importance of preventing losses in rangelands	Conservation	Ensure that women constitute 50% of the local community among different stakeholders.	Ensure that gender experts are included in the development of awareness materials.	Ensure that women are included as experts by 30% in the development of awareness materials
National Target 2: Restore at least 10% of all Degraded Ecosystems					
<i>Marine Biodiversity</i>	Implementation of training activities for all stakeholders on coral reef restoration, and restoration of mangrove and seagrass	Conservation	Arrange to ensure that women are at least 40% of participants the training activities	Ensure balancing education and experience levels among candidate trainees by facilitating/conducting gender-disaggregated data collection	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
National Target 3: Conserve at least 15% of Land, Waters and Seas					
<i>Wildlife Biodiversity</i>	Develop and produce awareness materials and organize awareness raising activities to raise awareness and engagement of local communities around wildlife reserves and areas with high importance in the conservation of wildlife	Conservation	Ensure that women are 50% of the participants from local communities in the targeted areas	Ensure that gender experts are included in the development of awareness materials.	Ensure that women are included as experts by 30% in the development of awareness materials
<i>Marine Biodiversity</i>	Raising public awareness for local communities existing around the protected area in Dungonab Bay and Mukkawar Island Marine National Park to effectively engage them in conservation activities	Conservation	Ensure that 50% of the participating local communities are women.	Ensure the use of standard and local terminologies while using more simple wording and terminologies, as well as using visuals, audios, and performative and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
National Target 4: Halt Species Extinction and Protect Genetic Diversity					
<i>Forest Biodiversity</i>	Provide training and capacity-building for community members involved in conservation activities	Conservation	Ensure that women are at least 40% of participants in the training and capacity building activities	Ensure balancing education and experience levels among candidate trainees by facilitating/conducting gender-disaggregated data collection	
<i>Wildlife Biodiversity</i>	Conduct activities to raise awareness of stakeholders and decision makers towards supporting wildlife conservation issues	Conservation	Ensure 50% of targeted groups are women	Ensure the use of standard, well-known, and terminologies with sufficient explanation by using simple wording and using of visuals, audios, and interactive approaches	
National Target 5: Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species					
<i>Wildlife Biodiversity</i>	Develop communication, education and public awareness materials on the value and contributions of	Sustainable use	Ensure 50% of the indigenous groups and local communities who receive the messages are women	Ensure that gender experts are included in the development of public and education materials	Ensure that at least 30% of the participants in the development of the education and public

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	customary sustainable use by indigenous peoples and local communities of wild species				awareness materials are women
National Target 6: Reduce the Introduction of Invasive Alien Species by at Least 20% and Minimize Their Impact					
<i>Forest Biodiversity</i>	Provide training and capacity building to local communities in a process for combating invasive alien species	Conservation	Ensure that women are at least 40% of the participants in training and capacity building	Ensure balancing education and experience levels among trainees by facilitating gender-disaggregated data collection	
	Develop awareness materials and implement a public awareness programme on the invasive species for decision makers and other stakeholders	Conservation	Ensure that 50% of the targeted groups are women	Ensure that gender experts are included in the development of awareness materials	Ensure that at least 30% of the participants in the development of the materials are women
	Conduct awareness raising activities among different	Conservation	Ensure that women are at least 50% of the participants	Ensure the use of standard, well-known, and local	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	stakeholders on the issue of IAS and their impacts on cultivated plant agrobiodiversity			terminologies and wording, and use of visuals, audios, and interactive approaches	
	Develop materials and conduct activities to promote awareness on halting invasive alien species introduction through public media and social media	Conservation		Ensure that gender experts are included in the development of awareness materials	Ensure that at least 30% of the participants in the development of the materials are women
National Target 7: Reduce Pollution to Levels That Are Not Harmful to Biodiversity					
<i>Cultivated Plant Agrobiodiversity</i>	Conduct awareness raising activities among farmers about the risks associated with excess use of pesticides on plant diversity through different means including farmers schools	Conservation	Ensure that women are at least 50% of the participants	Ensure the use of standard, well-known, and local terminologies and simple wording, and use visuals, audios, and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
<i>Wildlife Biodiversity</i>	Develop materials and conduct awareness campaigns for school pupils and in public markets on the harmful effects of the use of pesticides and others on the environments of wild animals, and provide prizes in recognition for best performances	Conservation	Ensure 50% of school pupils are girls	Ensure that gender experts are included in the development of awareness materials	Ensure that at least 30% of the participants in the development of the materials are women
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct activities to raise the awareness of the community to enhance their role in enforcement of environmental laws to combat pollution in inland waters and wetlands	Conservation	Ensure that 50% of the community groups are women	Ensure the use of standard, well-known, and local terminologies and simple wording, as well as use of visuals, audios, and interactive approaches	
<i>Pollution Aspects related to Biodiversity</i>	Organize awareness activities on agrochemical negative impacts on	Conservation	Ensure 50% of the targeted stakeholders are women	Ensure the use of standard, well-known, and local terminologies and	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	biodiversity and ecosystems for different stakeholders in the agricultural sector and public health sector, including farmers, distributors, employees and relative occupational fields, to raise the ideal knowledge regarding the use, handling and application of chemicals in general			simple wording and using visuals, audios, and interactive approaches	
	Conduct awareness raising activities on the negatives of excess nutrients, pesticides, hazardous waste, chemicals, and plastic on human, animal health and environment	Conservation	Ensure 50% of the targeted groups in local communities are women.	Ensure the use of standard, well-known, and local terminologies and simple wording as well as using visuals, audios, and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
National Target 9: Manage Wild Species Sustainably to Benefit People					
<i>Wildlife Biodiversity</i>	Conduct awareness activities on wildlife wise and sustainable use for all stakeholders	Sustainable use	Ensure 50% of the participating stakeholders are from women	Ensure the use of standard, well-known, local terminologies and simple wording, and use of visuals, audios, and interactive approaches	
<i>Marine Biodiversity</i>	Conduct activities to raise public awareness about Integrated Ecosystem Approach Management in marine and coastal environment	Conservation	Ensure 50% of the targeted groups in all states and social strata are women	Ensure that gender experts are included in developing Integrated Ecosystem Approach Management awareness materials	Ensure that 30% of the participants of local communities are women
National Target 10: Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and forestry					
<i>Marine Biodiversity</i>	Conduct assessment study to identify the factors that hinder application of regulations, which encourage sustainable fishing, and avoid over-	Sustainable use	Target 20% women	Ensure the use of standard, well-known, and local terminologies and simple wording with using visuals, audios, and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	fishing to reach a point where fishing has no adverse effects on the ecosystem, and poses no threats on endangered species through awareness raising and the application of biodiversity friendly practices (fishing gears)				
<i>Marine Biodiversity</i>	Organize activities to raise public awareness on Integrated Coastal Zone Management (ICZM) in marine and coastal environment.	Conservation	Ensure 50% of the targeted groups in the communities are women	Ensure that gender experts are included in developing Integrated Coastal Zone Management awareness materials	Ensure that 30% of the participants of local communities are women
<i>Health Aspects of relevance to Biodiversity</i>	Conduct campaigns to raise awareness of the value of ecosystem functions	Conservation	Ensure that 50% of the different community groups are women	Ensure the use of standard, well-known, and local terminologies and	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	and services to health and wellbeing across different community groups			simplified wording, as well as using visuals, audios, and interactive approaches	
	National Target 12: Enhance Green Spaces and Urban Planning for Human Well-Being and Biodiversity				
<i>Pollution Aspects related to Biodiversity</i>	Conduct awareness activities to demonstrate the danger of automobile exhaust emissions as a dominant source of ambient air pollution, particularly in densely populated urban environments	Conservation	Ensure 50% of the targeted groups who receive the messages are women	Ensure the use of standard, well-known, and local terminologies and simplified wording, as well as using visuals, audios, and interactive approaches	
	National Target 13: Enhance the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge				
<i>Cultivated Plant Agrobiodiversity</i>	Conduct awareness raising activities on access to plant genetic resources and sharing of benefits arising from utilization among	Access and Benefit Sharing (ABS)	Ensure that women comprise at least among concerned stakeholders	Ensure the use of standard, well-known, and local terminologies and simplified wording, as well as use of visuals, audios, and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	concerned stakeholders				
National Target 14: Integrate Biodiversity in Decision Making at Every Level					
<i>Wildlife Biodiversity</i>	Conduct awareness and interest raising activities about the values of the wildlife biodiversity for the decision makers as well as local communities in order to encourage including them in strategies and plans, including for poverty reduction	Sustainable use	Ensure 50% of local communities' participants are women	Ensure the use of standard, well-known, and local terminologies and simplified wording, as well as use of visuals, audios, and interactive approaches	
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct non-class activities to raise awareness and interest of the concerned bodies in the educational institutes in order to encourage them to incorporate	Conservation and sustainable use	Ensure that 50% of the participants of the targeted bodies are women	Ensure the use of standard, well-known terminologies and most direct wording, and use of visuals, audios, and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	biodiversity, including inland waters and wetlands biodiversity economic accounting, in their curricula.				
	Develop awareness materials and conduct activities to raise the awareness and create interest on the role of wetlands in the environment at all levels of stakeholders	Conservation and sustainable use	Ensure 50% of the number of stakeholders are women	Ensure the use of standard, well-known, and local terminologies and simplified wording, as well as visuals, audios, and interactive approaches	
National Target 15: Business Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts					
<i>Pollution Aspects related to Biodiversity</i>	Conduct awareness activities on the risks and effects associated with the chemicals use in gold mining sectors, particularly artisanal mining sectors, and the	Conservation	Ensure 50% of the targeted groups are women	Ensure the use of standard, well-known, and local terminologies and simplified wording with visuals, audios, and interactive approaches	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	impacts of using of these chemicals on biodiversity				
National Target 16: Enable Sustainable Consumption Choices to Reduce Waste and Overconsumption					
<i>Forest Biodiversity</i>	Implement a national certification and labelling scheme for sustainably sourced forest products, coupled with a public awareness campaign to educate consumers about the environmental impacts of their consumption choices, and promote certified products	Sustainable use	Ensure that women are 50% of the targeted consumers	Ensure the use of standard, well-known, and local terminologies and simplified wording with use of visuals, audios, and interactive approaches	
National Target 20: Strengthen Capacity Building and Development, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity					
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Train and raise awareness of relevant stakeholders, including the business sector and	ABS	Ensure 50% of the relevant stakeholders are women	Ensure the use of standard, well-known, and local terminologies and simplified wording	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	the research community, to effectively participate in the implementation of the Nagoya Protocol and other legally binding instruments of relevance.			with use of visuals, audios, and interactive approaches	
National Target 21: Strengthen Capacity Building, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity					
<i>Cultivated Plant Agrobiodiversity</i>	Organize and conduct regular awareness campaigns to disseminate information, innovations, practices and any relevant plant agrobiodiversity information to different stakeholders	Sustainable use	Ensure that women comprise 50% among different stakeholders	Ensure the use of standard, well-known, and local terminologies and simplified wording with use of visuals, audios, and interactive approaches	
	Development of project proposals on using integrated pest	Conservation	Ensure women participate equally, reflecting their balanced proportion	Ensure balancing education and experience levels among the	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	management to reduce the negative impacts of chemical uses on plant agrobiodiversity with direct participation of farmers		among the participating farmers. .	participants by facilitating gender-disaggregated data collection	
	Identification of appropriate farmers' varieties/landraces for multiplication and/or developing new breeding populations to incorporate specific traits into locally adapted materials with farmers participation	Sustainable use	Ensure women participate equally reflecting their balanced proportion among the participating farmers .	Ensure balancing education and experience levels among the participants by facilitating gender-disaggregated data collection	
<i>Forest Biodiversity</i>	Develop and distribute awareness materials such as brochures, magazines	Conservation	Ensure that 50% of the targeted groups receiving materials are women	Ensure the use of standard, well-known, and local terminologies and simplified wording	

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	and maps to raise public awareness			with use of visuals, audios, and interactive approaches	
<i>Inland Waters and Wetlands Biodiversity</i>	Conduct awareness-raising activities on the importance of inland water biodiversity conservation for decision makers, practitioners and the public including local communities	Conservation	Ensure that 50% of the participants from local communities are women	Ensure the use of standard, well-known, and local terminologies and simplified wording with use of visuals, audios, and interactive approaches	
	Conduct awareness-raising activities on monitoring, research and knowledge management for inland waters and wetlands biodiversity	Conservation and sustainable use		Ensure that gender experts are included in the development of monitoring, research and knowledge management awareness materials	Ensure that 20% are women among those developing the awareness materials
<i>Insect and Microorganism Biodiversity</i>	Develop awareness materials and conduct awareness raising activities using different fora	Conservation	Arrange to ensure that 50% of the public who receive the messages are women	Ensure that gender experts are included in the development of awareness materials	Ensure that 20% are women among those developing the awareness materials

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	and media to disseminate information about the insect and microorganism biodiversity among targeted groups				
<i>Wetlands Biodiversity</i>	Develop awareness materials and conduct -awareness activities on the Nagoya Protocol, and relevant instruments and legislations for educational sectors.	ABS	Ensure that 50% of the targeted students and pupils are women	Ensure that gender experts are included in the development of awareness materials	Ensure that at least 30% of the participants in the development of the awareness materials are women
<i>Climate Change Impacts on Biodiversity</i>	Develop and design awareness raising and communication materials on impact of climate change on biodiversity	Conservation	Ensure 50% of the targeted groups are women	Ensure that gender experts are included in the development of awareness materials	Ensure that at least 30% of the participants in the designation and communication materials are women
<i>Climate Change Impacts on Biodiversity</i>	Design and implement programmes to raise awareness and	Conservation	Ensure that 50% of the students and pupils who receive	Ensure that gender experts are included in the development of	Ensure that at least 30% of the participants in the

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	interest through non-class activities in general and high education institutes on climate change and its impacts on biodiversity		the messages are women and girls.	the awareness materials	development of the materials are women
National Target 22: Ensure Participation in Decision Making and Access to Justice and Information Related to Biodiversity for All					
<i>Inland Waters and Wetlands Biodiversity</i>	Ensure that the indigenous peoples and local communities are represented, considering gender perspective, by at least 10% in bodies of decision-making processes, and access to justice and information related to biodiversity, respecting their cultures and rights over lands, territories, resources,	Conservation, sustainable use and ABS	-	Ensure that gender experts are included in all these processes.	Ensure that women are represented by at least 30% of the indigenous peoples and local communities that represented in bodies of decision-making processes, and access to justice and information related to biodiversity

Biodiversity Component or Related Aspect	Action where gender aspect should be taken into account	CBD Objective	Measures to ensure gender equality in opportunities	Measures to ensure gender equality in capacities?	Measures to ensure gender full, equitable, meaningful and informed participation and leadership
	and traditional knowledge				
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Arrange to ensure that at least 10% of the indigenous peoples and local communities, taking into consideration gender issue, are represented in bodies involved in the decision-making processes, and access to justice and information related to biodiversity	Conservation, sustainable use and ABS	-	Ensure that gender experts are included in all these processes.	Ensure that women are represented by at least 30% of the indigenous peoples and local communities that represented in bodies of decision-making processes, and access to justice and information related to biodiversity
<i>Biosafety and Biotechnology Aspects related to Biodiversity</i>	Establishment and operationalization of a system for public information, education and participation on biosafety matters	Conservation	Ensure 50% of the targeted groups of the public information are women	Ensure that gender experts are included in establishing the system.	Ensure that at least 30% of the participants in the establishment of the system are women

Appendix 6

Matrix on Highlighting and Enhancing the Roles of IPLCs in the Implementation of the Sudan's NBSAP Across Relevant Actions (see CBD objectives and the Programme of Work on Article 8J...etc)

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
National Target 3: Conserve at least 15% of Land, Waters and Seas					
<i>Marine Biodiversity</i>	Raising public awareness for local communities existing around the protected area in Dugnab Bay and Mukkawar Island Marine National Park to effectively engage them in conservation activities	Awareness raising and training Effective participation	Conservation	1. Conservation and Restoration 1.4 Engage and collaborate with indigenous peoples and local communities to improve the outcomes of management actions addressing the direct drivers of biodiversity loss	Consider raising awareness on alternative livelihood options
<i>Wildlife Biodiversity</i>	Develop and produce awareness materials and organize awareness-raising activities to raise awareness and	Effective participation Awareness raising and training	Conservation	1. Conservation and Restoration 1.4 Engage and collaborate with indigenous peoples and local	Employing individuals from the local population within the workforce to guard protected natural areas

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
	engagement of local communities around wildlife reserves and areas of high importance in the conservation of wildlife			communities to improve the outcomes of management actions addressing the direct drivers of biodiversity loss	
National Target 4: Halt Species Extinction and Protect Genetic Diversity					
<i>Cultivated Plant Agrobiodiversity</i>	Initiation of activities for <i>in-situ</i> and on-farm conservation of plant genetic resources for food and agriculture (PGRFA) in close collaboration with local farmers and communities, through the establishment of community gene banks	Ensuring effective participation	Conservation	1. Conservation and Restoration 1.4 Engage and collaborate with indigenous peoples and local communities to improve the outcomes of management actions addressing the direct drivers of biodiversity loss.	This action should be accompanied with awareness raising activities during implementation!
	Develop communication, education and public awareness materials	Awareness raising and training	Sustainable use	2. Sustainable use of biological diversity	Ensuring effective participation of representative persons from the

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
	on the value and contributions of customary sustainable use by indigenous peoples and local communities of wild species			2.2 Promote and strengthen community-based initiatives developed by indigenous peoples and local communities, including in collaboration with other actors, that support and contribute to the sustainable use of biological diversity and to the respect for and protection of the customary sustainable use of biological diversity	IPLCs in the development of the materials
National Target 5: Ensure Sustainable, Safe and Legal Harvesting and Trade of Wild Species					
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Develop community protocols on ABS to respect and protect customary sustainable use by	ABS	Sustainable use ABS	3. Sharing of benefits	Be accompanied with awareness on the ABS national framework

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
	indigenous peoples and local communities of their genetic resources, including wild species				
National Target 7: Reduce Pollution to Levels That Are Not Harmful to Biodiversity					
<i>Wildlife Biodiversity</i>	Disseminate litter containers in the villages of local communities in and around protected areas.	Effective participation	Conservation	1. Conservation and restoration 1.4 Engage and collaborate with indigenous peoples and local communities to improve the outcomes of management actions addressing the direct drivers of biodiversity loss	
National Target 9: Manage Wild Species Sustainably to Benefit People					

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
<i>Cultivated Plant Agrobiodiversity</i>	Documentation of information on CWR and associated indigenous knowledge.	Knowledge documentation	ABS	3. Sharing of benefits To promote the fair and equitable sharing of benefits arising from the utilization of genetic resources, traditional knowledge associated with genetic resources	Be accompanied with awareness raising activities on ABS
<i>Wildlife Biodiversity</i>	Conduct awareness activities on wildlife-wise and sustainable use for all stakeholders	Awareness raising and training	Sustainable use	2. Sustainable use 2.2 Promote and strengthen community-based initiatives developed by indigenous peoples and local communities, including in collaboration with other actors, that support and contribute to the sustainable use of biological diversity and to the respect for	Ensure balanced participation of IPLCS in these activities

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
				and protection of the customary sustainable use of biological diversity	
<i>Insect and Microorganism Biodiversity</i>	Conduct research on the role of indigenous knowledge in supporting and enhancing insect and microorganism biodiversity, and protecting and encouraging customary sustainable use by indigenous peoples and local communities	Effective participation Knowledge documentation	Sustainable use	4. Knowledge and culture 4.1 Support efforts by indigenous peoples and local communities to strengthen the intergenerational transmission, use and revitalization, and enhancement of their languages and traditional knowledge, including in formal and informal education settings and in cultural and education centres, in particular with respect to the roles	

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
				and needs of women, girls and youth	
National Target 18: Reduce Harmful Incentives and Scale Up Positive Incentives for Biodiversity					
<i>Cultivated Plant Agrobiodiversity</i>	Documentation of indigenous knowledge, practices and technologies that are associated with the PGRFA, and make this information accessible after obtaining owners' prior informed consent.	Documentation of IK	ABS	Element 3. Sharing of benefits from the utilization of genetic resources and digital sequence information on genetic resources, as well as traditional knowledge associated with genetic resources To promote the fair and equitable sharing of benefits arising from the utilization of genetic resources, traditional knowledge associated with genetic resources	Be accompanied with awareness raising for the IPLCs on the importance of the TK and the related ABS issues

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
<i>Wildlife Biodiversity</i>	Initiate the establishment of a trust fund to encourage local communities and private sector to raise wild animals with economic returns as well as to plant productive trees to increase their income	Effective participation	Sustainable use	2. Sustainable use 2.2 Promote and strengthen community-based initiatives developed by indigenous peoples and local communities, including in collaboration with other actors, that support and contribute to the sustainable use of biological diversity and to the respect for and protection of the customary sustainable use of biological diversity. 2.4 Support the livelihoods of indigenous peoples and local communities through	Consider implementing agroforestry demonstration plots to showcase for indigenous people and local community sustainable land use practices combining tree planting with agriculture using extra funding

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
				activities that promote the customary sustainable use of biodiversity	
National Target 19: Mobilize Financial Resources for Biodiversity from All Sources					
<i>Cultivated Plant Agrobiodiversity</i>	Conduct activities to encourage farmers and indigenous people to contribute to providing and managing financial resources for community plant agrobiodiversity conservation activities, including through the formation of community-based bodies	Effective participation	Conservation	1.Conservation and Restoration 1.4 Engage and collaborate with indigenous peoples and local communities to improve the outcomes of management actions addressing the direct drivers of biodiversity loss	Encouraging formation of permanent committees for local communities and indigenous peoples in various localities to deal with activities aiming at reducing biodiversity loss through vital methods and local innovations
<i>Access and Benefit Sharing Aspects related to Biodiversity</i>	Develop and implement activities to combat the illegal trade of shells and	Effective participation	Conservation	1.Conservation and Restoration 1.4 Engage and collaborate with	

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
	coral reef parts and provide alternative livelihoods for local communities and traders			indigenous peoples and local communities to improve the outcomes of management actions addressing the direct drivers of biodiversity loss	
National Target 22: Ensure Participation in Decision Making and Access to Justice and Information Related to Biodiversity for All					
<i>Inland Waters and Wetlands Biodiversity</i>	Build capacities and raise awareness to enhance representation and participation of indigenous peoples and local communities in decision-making on issues related to inland waters and wetlands biodiversity.	Awareness raising and training Effective participation	Conservation Sustainable use ABS	5. Full and effective participation of IPLCs 6.2 Ensure the full and effective participation of indigenous peoples and local communities in the development, revision and implementation of national biodiversity	

Biodiversity Component or Related Aspect	Action	Area of Intervention	CBD Objective	Task Element of the Prog. of Work on Article 8J...etc	Further Proposals
				strategies and action plans and national reports, and strengthen partnerships and collaboration with indigenous peoples and local communities, recognizing their collective actions and contributions for the implementation of the Convention.	

Appendix 7

Matrix of the Monitoring System for NBSAP (2025-2030)

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
National Target 1: By 2030, the rate of loss of all natural habitats in Sudan is brought down by at least 25 percent, and degradation and fragmentation is significantly reduced through participatory, integrated and biodiversity inclusive spatial planning, and/or effective management processes, while respecting the rights of indigenous peoples and local communities (Natural habitat and natural ecosystem / degradation /loss)									
1. Extent of natural ecosystems 2. % of land & Sea covered by biodiversity having spatial planning for conservation of biodiversity (Zonation.)	Existence of Effective management System	• Local community participation • Conservation of wilderness areas	•% of land area underutilization for food production. •% of biodiversity in marine protected area.	1.fences established 2.awareness activities 3. Trend in increase forest cover Results of studies 4. plans Patrolling units Officers trained	Zonation of Sea area having spatial planning 75%	P < 30% (Low)	RS, GIS, Survey, Ground truth	85000	- Ministry of Federal government. - Ministry of physical planning at states levels. - Ministry of Agriculture and Forestry - Ministry of animals resources and fisheries - Faculty of Geographical and Environmental Sciences,
						30% ≤ P ≤ 50% (moderate)			
						P > 50% (high)			
					Zonation of Terrestrial area having spatial planning 25	P < 30% (Low)	RS, GIS, Survey, Ground truth	50000	
						30% ≤ P ≤ 50% (moderate))			
						P > 50% (high)			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
									University of Khartoum. - Sudan Surveying Authority - Land use planning authority - Ministry of Defense
National target 2: Ensure that, by 2030, at least 10% of degraded terrestrial, inland water, coastal and marine ecosystems in Sudan that provide essential services, including services related to water, and contribute to health, livelihoods, wellbeing and climate, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable (Degraded terrestrial, inland water, coastal and marine ecosystems provide essential services)									
Area under restoration (Zonation)	Existence of a biodiversity restoration plan	• Extent of natural ecosystems by type • Maintenance and restoration of connectivity of natural ecosystem	• Increase in secondary natural forest cover • Percentage of cropped landscapes with at least 10 per cent natural land	1. Areas covered by broadcasted seeds, and number wells dug 2. marine restoration projects	Restoration of 10% of terrestrial degraded ecosystem	P < 8% (Low)	RS, GIS, Survey, Random ground truth, Report	85000	- Ministry of Animals Resources and Fisheries - Related Faculties and Research Institutions - Faculty of Geographical and Environmental Sciences, University of Khartoum.
						$8\% \leq P \leq 14\%$ (moderate)			
						P > 14% (high)			
					Restoration of 10% of inland water degraded ecosystem	P < 8% (Low)	RS, GIS, Survey, Random ground truth, Report	50000	
						$8\% \leq P \leq 14\%$ (moderate)			
						P > 14% (high)			
	P < 8% (Low)		50000						

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				3. number of training activities 4. Innovative solutions agreed upon 5. Trends in knowledge on inland water ecosystems restoration 6. Identified methodologies for restoration of wetlands 7. Restoration plans	Restoration of 10% of coastal and marine degraded ecosystem	8% ≤ P ≤ 14% (moderate)	RS, GIS, Survey, random ground truth, Report		- Higher Council for Environment and Natural Resources (HCENR). - Native Admiration - Ministry of Agriculture and Forestry - Ministry of Defense - Range and Pasture General Directorate National Tree Seed Centre
						P > 14% (high)			
National target.3: Ensure by 2030, that at least 15 per cent of terrestrial, inland water and coastal and marine areas in Sudan, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably, while ensuring that any sustainable use, where appropriate in such areas, is fully consistent with conservation outcomes, and recognizing and respecting the rights of indigenous peoples and local communities, including over their traditional territories (Conserved terrestrial, inland water, coastal and marine ecosystems)									
Coverage of protected areas		•Status of Key Biodiversity Areas • Local community	1. updating of the data base and maps	1. updating of the data base and maps	Conserved 15% of terrestrial area	P < 6% (Low)	RS, GIS, survey, random ground truth, Report	85000	- Related government agencies
						6% ≤ P ≤ 11% (moderate)			
						P > 11% (high)			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		involvement in policy and management to enhance nature contribution to people	2. awareness materials and activities 3. implemented marine programs 4. Number of new protected areas established	2. awareness materials and activities 3. implemented marine programs 4. Number of new protected areas established	Conserved 15% of inland water	P < 6% (Low)	RS, GIS, survey, random ground truth, Report	50000	- Related ministries at various levels. - Native Administration - Indigenous peoples and local communities. - Faculty of Geographical and Environmental Sciences, University of Khartoum - Ministry of Justice - Sudan Surveying Authority - Wildlife conservation forces
						6% ≤ P ≤ 11% (moderate)			
						P > 11% (high)			
				5. Number of new PA management plans formulated	Conserved 15% of coastal and marine area	P < 6% (Low)	RS, GIS, survey, random ground truth, Report	50000	
						6% ≤ P ≤ 11% (moderate)			
						P > 11% (high)			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
									- Forest national corporation - Ministry of Health - Range and Pasture General Directorate
National Target 4: Ensure by 2030, that urgent management actions are taken to prevent the extinction of known threatened species, as well as to maintain and restore the genetic diversity within and between populations of native, wild and domesticated species, including cultivated plants and domesticated animals, and to improve and sustain their conservation status, particularly of those most in decline, including through in-situ and ex-situ conservation practices, and effectively manage human wildlife interactions to minimize human-wildlife conflict for coexistence (Halt Species Extinction, Protect Genetic Diversity Manage Human-Wildlife Conflicts).									
Threatened species: The proportion of populations		•Cultural ecosystem •Indigenous species •Protected areas Abundance	•Species threat abatement and restoration	1. Number of community genebanks established 2.training and building capacity	% of threatened species affected by human wildlife conflict	Hotspot area (amphibians, Coral reef, conifers, mammals, birds)	RS, GIS, survey, random ground truth, Report	85000	- Ministry of Justice
					% of halting cases that prevent human	P > 70% (high)	Report	30000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
within species with an effective. Population size > 500.		distribution of species •Trends in effective and Sustainable management of human-wildlife conflict and coexistence		3. Number of species and accessions collected, duplicated & repatriated 4. Number of farmers involved and varieties used for restoration 5. Percentage of forests registered as reserved forest 6. Number of forest species conserved ex situ 7. Results of the surveys for species exposed to extinction	wildlife conflict.				- Wildlife Conservation General Administration - Sudanese Environment Conservation Society - Range and Pasture General Directorate
					Numbers of plants genetic resources conserved and protected	Gene of crops that provide 95% of our daily caloric intake (30 crops)	Report, policy and plans, legislation on access & benefit sharing	45000	
					Number of Reforestation resources efficient program	Afforestation in km ² , forest protection in km ² , 5000 km ² : P < 12% (Low) 12% ≤ P ≤ 21% (moderate) P > 21% (high)	Report, policy and plans, survey	55000	
					> 500 species p	Taxonomy, identify 100 groups (vertebrates, invertebrates and plants) for five years.	Report, survey	35000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				8. Number of mega fauna species translocated and released in the nature 9. Areas of buffer zones around protected areas 10. Existence of the breeding centre and the genebank for wildlife 11. Identified endangered indigenous range species 12. Existence of marine genebank 13. Existence of a national oceanographic data centre					

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				14. Endangered fish and mammals' species outside the protected areas 15. Threatened and beneficial insect and microorganism species 16. Number of apiaries and rearing laboratories established 17. Existence of national culture collection 18. Existence of PGR in vitro conservation facilities					

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				19. Existence of national action plan to reduce human-wildlife conflict					
National target 5: Ensure that the use, harvesting and trade of wild species in Sudan is sustainable, safe and legal, preventing overexploitation, minimizing impacts on non-target species and ecosystems, and reducing the risk of pathogen spill-over, applying the ecosystem approach, while respecting and protecting customary sustainable use by indigenous peoples and local communities (Sustainable use, Safe and Legal Harvesting and Trade of Wild Species)									
Sustainable use. Proportion of fish stock	Trend in the improvement of institutional capacities on the matter	•Sustainable use of wild species. •Red List Index for used species	•Proportion of legal and illegal wildlife trade consisting of species threatened with extinction - Conservation measures for protected areas	1. outcomes of fish stock study 2. Regulations reviewed and improved/developed 3. awareness materials developed 4. Existence of law regulations on wildlife	Fish stock sustainability index (FSSI). 79% of sea food (FAO).	Fish stock sustainability index (FSSI). 79% of sea food (FAO).	Regulations, reports, monitoring	25000	- Ministry of Trade and Commerce - Wildlife conservation - Ministry of Livestock , Fisheries and Rangelands
					P > 70% (high), legally and sustainably and compliance of trade with IUCN	P > 70% (high), legally and sustainably and compliance of trade with IUCN	Regulations, reports, monitoring, number of training (on-line and in person) provided to	25000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				5. Operation of Ecosystem Approach Fishery Management 6. Number of community protocols developed	capacity building of the coastal communities to use ecosystem based	capacity building of the coastal communities to use ecosystem based	the coastal communities		
National Target 6: Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species (IAS) on biodiversity and ecosystem services in Sudan by identifying and prioritizing their pathways, controlling or eradicating the priority species, and putting in place measures to manage pathways to prevent their introduction and establishment, and reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 per cent by 2030 (Reduce the Introduction of Invasive Alien Species by 50% and Minimize Their Impact).									
Invasive alien species. Rate of invasive alien species	Trend in preventing new IAS Trend in the existing	• Rate of invasive alien species spread • Invasive alien species degree of impact (vector and quantitative)	• Quarantine laws and regulations. •Rate of reduction or eradication. •Number of invasive alien species introduction events	1. Trend in the plant quarantine at borders and cross points 2. Inventory on IAS 3. % in the area reduction	Established rate of invasive alien species reduction 20% (Taxon, Priority conservation area (for 5 year)	P < 1.6% /year (Low) 1.6 % ≤ P ≤ 2.8% /year(moderate) P > 2.8% year (high))	Survey Documentation	35000	- Forestry Extension Department - Forestry Faculties and Departments at Universities. - Faculties of Environment

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
establishment	of procedures to eradicate IAL	• Number of invasive alien species on national lists/ events	• Temporal occurrence and spatial distribution of non- indigenous species	in areas occupied by IAS 4. Awareness materials 5. Number of IAS pathways identified and managed 6. Monitoring systems and tools on IAS 7. Number of communities and individuals trained on combating IAS 8. Existence of invasive species control and monitor unit in Dinder National Park 9. Existence of laboratory unit for analysing	Determination of invasive alien species pathway.	International cross points Ornamental & other type species determination, policy	Survey, customs documentation	35000	at Universities. - HCENR - Ministry of Agriculture and Forestry. - Ministry of Water resources and Irrigation, - Ministry Rangelands, animal resources and fisheries.
						Quarantine laws and regulation			
						Evaluation and assessment			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				the ballast water 10. Trends in eradication of IAS 11. Number of IAS pathways identified and managed					
National Target 7: By 2030, pollution, including from excess nutrients, pesticides and plastic, has been brought to levels that are not harmful to biodiversity and ecosystem functions and services, by reducing to half excess nutrients lost to environment, and risks from pesticides and other chemicals, through more efficient nutrient cycling and use, and integrated pest management, and working towards eliminating plastic pollution (Reduce Pollution to Levels That Are Not Harmful to Biodiversity)									
index of coastal eutrophication potential Pesticide environment concentration	Trend in reduction of plastic litter. Existence of national Action plan	- Fertilizer use - Proportion of domestic and industrial wastewater flow safely treated - Floating plastic debris density (by micro and macro plastics)	- Existence of simple plant life at sea coastal - Municipal solid waste collected and managed - Plastic debris density	1. No. of Awareness Activities & farmer participation 2. Application of regulations 3. Medical waste disposal plan 4. Number of chemical	Index for reduction of pollution to conserve ecosystem function. Index of pesticide environment concentration Clean marine and fresh water	Environmental quality index (air, water, land, built, and sociodemographic environment)	Measurement, analysis, Gas inventory, Report	60000	- Ministry of Justice - HCENR - Ministry of Petroleum and Mining. - Sudanese Standards and Metrology Organization - Related faculties and

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		• Red List Index		incinerators imported, 5. Trend in reduction of plastic litter 6. Existence of the marine pollution laboratory 7. Existence of effective reception facilities system in the Sudanese ports 8. Trend in the reduction in the impacts of mining on environment 9. Existence of a plan to reduce/remove incentives/subsidies or	Gases contributed to pollution exported from national boundaries				institutes at the - Ministry of Agriculture

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementin g groups	
Headline	Binary	components	Complementary	National	Headline indicators to be measured					
				impose penalties for activities that pollute the natural habitats 10. Existence of the medical waste disposal plans						
National Target 8: Minimize the impact of climate change and ocean acidification on biodiversity in Sudan, including the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems, and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, so as to maintain their integrity and functioning, and enhance the contribution of biodiversity to carbon stocks, through conservation and restoration (Minimize the Impacts of Climate Change on Biodiversity and Build Resilience)										
Minimize the Impacts of Climate Change on Biodiversity and Build Resilience	Trend in areas planted with climate-resilient trees	•Promotion of coastal community, technically and legally. •Sustainable tourism in coastal ecosystem. •Law and regulations for safety and	National greenhouse inventories from land use and land use change • National adaptation plans with climate change	1. The availability of the national programme 2. No. of Meteorological stations established 3. Areas reforested 4. Level of implementatio	National greenhouse gas inventories from land use and land use change	Inventory for carbon dioxide, methane, ozone, nitrous oxide, chlorofluorocarbon s, and water vapor (within permissible levels). Numbers of programs and partnerships	Acts and regulations, report, survey, monitoring and assessment	60000	- Sudan Meteorologic al Authority - Wildlife Conservation forces - Related faculties and institutes - Native administration - HCENR	
	Use of climate-				Program for Coral reefs conservation.					
					Program for Coral reefs conservation.					

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementin g groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
	smart techniques Existence of Early warning system	coastal ecosystem		n of the Coral Reef Bleaching Response Plan 5. Level of application of the Integrated Ecosystem Approach Management regime 6. Trend in areas planted with climate-resilient trees 7. Trend in expansion in use of climate-smart techniques 8. Existence of operational early warning system		Building coral resilience to threats			- Ministry of Energy
						habitat suitability			
					Vulnerable ecosystem maintenance.	Numbers of Reforestation program and wildlife protection	Legislation and public education.	35000	
						Quantity of biofuels used	Survey, report		
						% of population use renewable sources of energy.	Survey, report, positive incentives		
					Resilience building	Species diversity, species richness of the ecosystem	Measurements, remoteness, survey, report	35000	
					Increase sustainable productivity of agriculture and forested ecosystems	Numbers of programs for utilization of modern biotechnology on agriculture and forests.	Survey, report	50000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				9. Levels of incorporation of the NAP in policies and programmes		% of Change in cultural practice			
National Target 9: By 2030, at the latest, national and state governments in Sudan, business and stakeholders at all levels have taken steps to achieve or have implemented plans to ensure sustainable use of wild species, and have kept the impacts of use of natural resources well within safe ecological limits, while protecting and encouraging customary sustainable use by indigenous peoples and local communities (Manage Wild Species Sustainably To Benefit People).									
Percentage of the population in traditional occupations Benefits from the sustainable use of wild species		• Number of people using wild resources for energy, food or culture	•Proportion of fish stocks within biologically sustainable levels •Number of people using wild resources for energy, food or culture	1. Number and type of awareness activities conducted 2. Risk assessments 3. Management plan 4. Existence of the regulations on the subject 5. Trend of progress on documentation of CWR and associated knowledge 6. Wildlife sustainable use policy	Percentage of the population in traditional occupations	% of women working in traditional occupation (P > 25%)	Polices, programs, reports	50000	- Ministry of Justice - Native administration - Ministry of Finance and National Economy. - Wildlife Conservation Forces
						Community based natural resource management			
						% of land use change and land tenure			
					Percentage of official bodies and stakeholders focus on wild species	Existence of plans on sustainable use of wild species	Polices, programs, reports	70000	
Number of official bodies, companies reporting on disclosures of risks, dependencies,									

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
						Labeling and level of compliance			
National Target 10: Ensure, by 2030, that areas under agriculture, aquaculture, fisheries and forestry in Sudan are managed sustainably, through the sustainable use of biodiversity, and biodiversity-friendly practices, contributing to the resilience and long-term efficiency and productivity of these production systems, and to food security, conserving and restoring biodiversity and maintaining nature's contributions to people, including ecosystem functions and services (Enhance Biodiversity and Sustainability in Agriculture, Aquaculture, Fisheries, and Forestry)									
Progress towards sustainable forest management. Proportion of agricultural area under productive and sustainable agriculture		•Sustainable use of wild life species. •Aquatic ecosystems endanger •National legislation enforcement. •Area of forest under sustainable management •Proportion of land that is degraded	•Proportion of land that is degraded over total land area •Proportion of ecological zone conserved by protected areas	1. Presence of the agricultural policy 2. Trends in the expansion of agricultural extension 3. New areas covered with evergreen range species 4. Number and %of communities engaged 5. Trend of use and adoption of organic and eco-farming	Sustainable exploitation of fish and aquatic plant (sea& rivers).	Quantity of fish, shellfish, and seaweeds harvested	Documentation, reports	25000	- Ministry of Livestock ,Fisheries and Rangelands - Related faculties and institutes from different universities - Native administration and local communities
						Status of habitat			
						Status of productive ecosystems			
					Reduction of pressures on main actors of ecosystems	Sea & land use change, invasive alien species, pollution, Urbanism & climate change,	Policies, program, report (related NT: 6, 7 & 8).	25000	

Indicators						Progress measurement		Means of verification	Cost (US\$)	Implementin g groups
Headline	Binary	components	Complementary		National					
		over total land area. •Average income of small-scale food producers, by sex and indigenous status		6. Number of farmers; varieties identified and multiplied 7. Trend in increase in rehabilitated areas with forest plantations 8. Number of agroforestry plots established 9. Number and type of fishing gears applied 10. Trend in the commercialization of new GM crops with low manageable negative impact on environment 11. Trend in the production of biotechnological products enhancing productivity and conservation of biodiversity	Proportion of agricultural area under productive and sustainable	P < 40% (Low) (Low)	Report, Acts and legislations	60000	- Forestry Extension Department - Ministry of Agriculture and Forestry - Wildlife Research Centre - Ministry of Agriculture and Forestry. Wildlife Conservation Force	
						40% ≤ P ≤ 70% (moderate)				
						P > 70% (high)				
					(15% of forest area under long management	P < 6% (Low)	RS, GIS, ground truth, plans, program, report	60000		
						6% ≤ P ≤ 11% (moderate)				
						P > 11% (high)				

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				12. Existence of national dietary guidelines					
National Target 11: Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature (Restore, Maintain and Enhance Nature's Contributions to People)									
Services provided by the ecosystems	Existence of national environmental account	• Sustainable use of aquatic plants that have food, fodder and medicinal value. • Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population • Mortality rate attributed to	• Proportion of local communities participation in water and sanitation management • Proportion of population using safely managed drinking water services • Mortality rate attributed to household and ambient air pollution (SDG indicator 3.9.1)	1. Trend in the increase of pasture lands 2. Number and type of awareness activities organized on ICZM 3. Existence of the ICZM unit	NEA accounts of Social services provided by ecosystem	Numbers of species provided medicine	Report, survey, Policy, Acts	50000	- Ministry of Finance and Economic Planning (Federal) - Ministries in line HCENR
						Species for environmental products			
						Numbers of recreation lots			
					NEA of regulation of air quality, quality and quantity of water, and protection from hazards and extreme events for all people, from ecosystem	Natural capital indicators. Other related targets , SEEA	Report, survey, Policy, Acts	50000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		unsafe water, unsafe sanitation and lack of hygiene (exposure to • Annual mean levels of PM _{2.5} and PM ₁₀ in cities							
National Target 12: Significantly increase the area and quality and connectivity of, access to, and benefits from green and blue spaces in urban and densely populated areas in Sudan sustainably, by mainstreaming the conservation and sustainable use of biodiversity, and ensure biodiversity-inclusive urban planning, enhancing native biodiversity, ecological connectivity and integrity, and improving human health and well-being and connection to nature and contributing to inclusive and sustainable urbanization and the provision of ecosystem functions and services (Enhance Green Spaces and Urban Planning for Human Well-Being Biodiversity)									
Average share of the built-up area of cities that is green/blue space for public use		Recreation and cultural ecosystem services provided		1. Trend in the integration of naturally existing habitats in urban planning 2. Number and type of awareness activities 3. Trend in the adoption of	Average green/blue space for public use for all (10% of the total area) in cities	P < 4% (Low)	RS, GIS, survey, plans	95000	- Ministry of Physical Planning - Land use planning authority - Faculties of Environment and Wildlife Conservation Forces
						4% ≤ P ≤ 7% (moderate)	RS, GIS, survey, plans		
						P > 7% (high)	RS, GIS, survey, plans		

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementin g groups
Headline		Binary	components	Complementary	National				
					green and blue spaces in the urban planning of some citie2				
National Target 13: Take effective legal, policy, administrative and capacity building measures at all levels in Sudan, to fully implement the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization, and other international instruments of relevance, in order to ensure the fair and equitable sharing of benefits that arise from the utilization of genetic resources originating from Sudan, and from digital sequence information on such genetic resources, as well as traditional knowledge associated with these genetic resources, and facilitating appropriate access to such genetic resources, in accordance with applicable international access and benefit sharing instruments (Increase the Sharing of Benefits From Genetic Resources, Digital Sequence Information and Traditional Knowledge)									
Indicators on monetary benefits received Indicators on non-monetary		1. Total number of permits, or their equivalent, granted for access to genetic resources 2. National legislation on equitable sharing of genetic	Total number of permits, or their equivalent, granted for access to genetic resources	1.Presence of regulations and capacities for handing issues of access to PGRFA Entry into force of the national PGR legislation Entry into force of the	Monetary benefit from genetic resources towards conservation and sustainable use of biodiversity	Amount of royalties, Intellectual property rights	legislating on (ABS) and indigenous knowledge reports	25000	Plant Genetic Resources Unit of the Agricultural Research Corporation.
					Nonmonetary benefits from genetic resources	Development of research skills and knowledge	ABS principles in Formal agreements with foreign research	35000	
						Training and education			
						information on genetic resources			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		resources in force		ABS legislation Existence of ABS institutional structures and administrative systems Availability on the ABS-CHM the specified information	Transfer of technology traditional knowledge users-providers relation	institutions, Reports, legislations			
					legislative, administrative or policy frameworks which ensure fair and equitable sharing of benefits,	Existence of authorities on policy framework for ABS	Legislation s and reports	25000	
National Target 14: Ensure by 2030, that biodiversity and its values have been integrated into national, state and local development and poverty reduction strategies, planning and developmental processes, strategic environmental assessments, and environmental impact assessments, and are being incorporated into national accounting, as appropriate, and reporting systems (Integrated biodiversity in decision making at every level)									
	Existence of ESIA at	1. Existence of environmental economic accounting. 2. Values of plant Agro-biodiversity in national	1. Change in water-use efficiency over time 2. % of people depend on environmental product.	1. Presence of the national policy and strategic action plan on plant agrobiodiversity	Existence and implementation of biodiversity value on ESIA	Existing of different values of biodiversity on ESIA	Plans and policies. legislation, report	50000	- HCENR - National Council for strategic planning - Ministry of Finance and

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
	different level	accounting strategies. 3. Biodiversity values are mainstreamed across all sectors and integrated into assessments of environmental impacts	3. Biodiversity value into national and local development	2. Number and type of awareness materials 3. Trend of integration of forest biodiversity into FNC plans 4.. Economic valuation for inland waters biodiversity 5. existence of plans and Regulation updated 6. Number of civil servant trained on Train civil servants in transforming agrobiodiversity					Economic Planning (Federal) - Ministries in line Relevant Faculties and institutes

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				components into items of monetary value 7. Results of the economic valuation for inland waters biodiversity					
National Target 15: Take legal, administrative or policy measures to encourage and enable business in Sudan, and in particular to ensure that large and transnational companies and financial institutions: d. Regularly monitor, assess, and transparently disclose their risks, dependencies and impacts on biodiversity, including with requirements for all large as well as transnational companies and financial institutions along their operations, supply and value chains and portfolios; e. Provide information needed to consumers to promote sustainable consumption patterns; f. Report on compliance with access and benefit-sharing regulations and measures, as applicable; in order to progressively reduce negative impacts on biodiversity, increase positive impacts, reduce biodiversity-related risks to business and financial institutions, and promote actions to ensure sustainable patterns of production (Businesses Assess, Disclose and Reduce Biodiversity-Related Risks and Negative Impacts)									
Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicator to be measured				
Number of companies reporting	.	1. Number of companies publishing sustainability report	1. Species threat abatement and restoration	1. Number of bodies reporting on compliance	Number of companies reporting on disclosures of risks,	P < 40% (Low)	Acts and regulation, Report Labeling	50000	- Ministry of Justice - Relevant private companies
						40% ≤ P ≤ 70% (moderate)			
						P > 70% (high)			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
on disclosure of risks, dependencies. Impacts of business on biodiversity.				with the legal framework 2. Existence of a developed legislation.	dependencies, Labeling and level of compliance		RS, GIS, Ground truth, Acts and regulation, Report Labeling	85000	- Ministry of Finance and Economic Planning (Federal) - HCENR - Information and accounting institutes
					Impacts of business on biodiversity	Signs of degradation			
						destruction of habitat, and deforestation			
						Invasive species			
National Target 16: Ensure that by 2030, the national and state governments, business and stakeholders at all levels in Sudan have taken steps to achieve or have implemented plans for sustainable consumption, and people are encouraged in the meantime to make sustainable consumption choices, and to reduce waste, including by improving education and raising awareness on alternatives, in order to keep the impacts of use of natural resources well within safe ecological limits (Enable Sustainable Consumption Choices To Reduce Waste and Overconsumption).									
		1. National measures, legislation and policies for biodiversity conservation. 2.Public	Extent to which: (i) national citizenship education/education on policy/curricula	1. National certification and labeling scheme 2. Existence of the plan for sustainable	Sustainability in consumption of wild species	vision of sustainable use	Scientific and office reports, surveys, curricula	35000	Ministry of education - Ministry of High Education - All universities.
					Numbers and type of activities in	Labeling			
						% of people aware of importance of biodiversity			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		engagement/involvement in biodiversity protection Food waste index	(ii) education for sustainable development,	consumption	promotion of public awareness on sustainable consumption	Numbers of people received messages on sustainable consumption Numbers of activities on promotion of awareness on value of biodiversity			- Consumers organizations (eco-labeling) - Production institutes, companies and factories. - HCENR - Ministry of Justice
					Index of food waste.	Waste calculations amount Waste prevention, re-use, Recycling, recovery, Disposal	Scientific and office reports, surveys, curricula	35000	- Poverty reduction bodies - All states
National Target 17: Establish, strengthen capacity for, and implement in Sudan biosafety measures as set out in Article 8(g) of the Convention on Biological Diversity, and measures for the handling of biotechnology and distribution of its benefits as set out in Article 19 of the Convention (Strengthen Biosafety and Distribute the Benefits of Biotechnology)									
		1. biosafety legal and administrative measures in place 2. Existence means for detection and identification of products of biotechnology	1. Species threat abatement and restoration. 2. Proportion of local breeds classified as being at risk of extinction.	1. Trend in the capacity improvement of the system for handling the specified aspects 2. Number of institutional	Program for utilization of biotechnology Measures in place to prevent,	Program to improve Agricultural production and protection and wild species Acts align with Article 8(g) of the CBD	Report, program of relevant, regulation	70000	- Ministry of Justice - HCENR - Related institutes and faculties - Ministry of Industry

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		Improve socio-cultural practice. 2. National plan for conservation of genetic resources	3. % of area dominated by invasive alien species.	biosafety committees formed 3. Trend in the actual involvement and participation of the public in biosafety matters 4. Number and type of biosafety SOPs developed 5. Trend in the improvement in the biosafety laboratories	manage and control potential adverse impacts of biotechnology on biodiversity				- Ministry of Agriculture and Forestry - Ministry of Health Agricultural Plant Genetic Resources Conservation Research Centre
National Target 18: Ensure that, by 2030 at the latest, incentives, including subsidies, harmful to biodiversity are identified, eliminated, phased out or reformed, starting with the most harmful, in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socioeconomic conditions (Reduce Harmful Incentives by at Least \$500 Billion per Year, and Scale Up Positive Incentives for Biodiversity).									
	. Trend of use of	1. Value of subsidies and		1. Number and type of	Trend of use of new	Offering incentive	Reports	60000	- Ministry of Justice

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
Positive incentives in place to promote biodiversity conservation and sustainable use. Value of subsidies and other incentives harmful to biodiversity that have been eliminated, phased out or reformed.	new energy sources alternative to firewood and charcoal	other incentives harmful to biodiversity, that are redirected, repurposed or eliminated	1. Existence of biodiversity-relevant taxes 2. biodiversity-relevant charges and fees	incentives and benefits developed and implemented 2. Number of free or subsidized tree seedlings distributed 3. Existence of policies, and number of working boats and fish stock level 4. Trend of use of new energy sources alternative to firewood and charcoal 5. Trust fund operational to encourage local communities and private	energy sources alternative to firewood and charcoal				- HCENR - Ministry of Finance and Economic Planning (Federal)
					Value of subsidies and other incentives harmful to biodiversity that have been eliminated, phased out or reformed	Imposition of penalties			
						Stop incentives			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				sector to breed wildlife species					
National Target 19: Substantially increase and mobilize financial resources for effectively implementing the National Biodiversity Strategy and Action Plan of Sudan from all sources, such as from domestic, international, public and private resources, including by significantly increasing domestic resource mobilization, facilitated by the preparation and implementation of a national biodiversity finance plan or similar instruments according to national needs, priorities and circumstances, while enhancing the effectiveness, efficiency and transparency of resource provision and use (Mobilize financial sources for Biodiversity from all Sources including sources through International Finance)									
1. International public funding 2. Domestic public funding 3. Private Funding (for conservation and sustainable use of natural ecosystem)		1. Amount of financial (\$) and technical assistance committed to safeguarding ecosystems. 2. Amount of finance allocated for capacity building on planning, policy, management and conservation of biodiversity	Other relevant financial resources that can assist in implementation	1. Number of project proposals developed and submitted, and partnerships established 2. Number of project proposals developed in partnership with private sector	Amount of International funding	Increase at least by 10% from reference data	Reports	60000	- Private sectors (banks and companies) - Public sectors - International agencies Ministry of Finance and Economic Planning (Federal
					Amount of domestic funding	Increase at least by 10% from reference data	Reports		
					Amount of private funding	Increase at least by 10% from reference data	Reports		

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
National Target 20: Improvement of the knowledge and science base on the biodiversity in Sudan, and information sharing mechanisms, through capacity building and development, access to and transfer of technology, access to innovations, technical and scientific cooperation, joint technology development and joint scientific research programmes for the conservation and sustainable use of biodiversity (Strengthen Capacity-Building, Technology Transfer, and Scientific and Technical Cooperation for Biodiversity)									
	Existence of program on capacity building and technology transfer related to biodiversity	1.Improved and shared technology of biodiversity 2.Existence of documentation 3.PGR information system Accessibility of traditional knowledge		1. The gene bank documentation system operating 2. Number and type of partnerships established 4. Size of indigenous knowledge documented 5. SMART operational in all parks 6.Percentage of	Capacity building for biodiversity	Numbers of programs in capacity building in (skills, knowledge, abilities, processes and resources of the communities support biodiversity). Online or in person	Reports, workshops, training on line and in person	35000	Ministry of Culture and Information - Different related institutes and organizations - Ministry of Justice - HCENR - Telecom companies - Ministries in lines. - National Council for Strategic
					Technology transfers and technical cooperation for biodiversity	Numbers of programs and partnerships and technology used to monitor and safeguard biodiversity.	Agreement and partnerships documents	35000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				stakeholders received training 7. Number and type of capacity building 8. Results of characterization and evaluation for PGRFA 9. Number of GIS, GPS devices and drones supplied 10. Trend in the improvement on the capacities of the insect taxonomy unit 11. Results of the vulnerability	Modern biodiversity utilization.	Identification of biodiversity of medicinal and socio-cultural values	reports	40000	Planning Related faculties and Institutes.

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
				assessment of impacts of climate change on biodiversity					
National Target 21: Ensure that the best available data, information and knowledge, are accessible to decision makers, practitioners and the public to guide effective and equitable governance, integrated and participatory management of biodiversity in Sudan, and to strengthen communication, awareness raising, education, monitoring, research and knowledge management and, also in this context, the traditional knowledge, innovations and practices of indigenous peoples and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, and should only be accessed with their free, prior and informed consent in accordance with national legislation (Ensure That Knowledge Is Available and Accessible To Guide Biodiversity Action)									
Availability of Data & knowledge on biodiversity at national level		1.Availability and accessibility of data and knowledge 2. National legislation on		1. Web Site operating 2. Number and type of awareness raising and	Indicator on biodiversity information for the monitoring the global biodiversity framework	National legislation on traditional knowledge and innovations Availability and accessibility of	Reports, document ations, Information	70000	- Telecom companies - Ministry of Education - Ministry of High Education

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		traditional knowledge 3.and innovations 3.Growth in number of records and database at national level 4.education for sustainable development, including gender equality and human rights, are mainstreamed at all levels in (a) national education policies, (b) curricula, (c) teacher education and		information dissemination 3. Existence of databases and information platform 5. Availability /accessibility of information and reports on the websites 6. Existence of the biosafety platform and clearing house 7. Level of indigenous knowledge and practices documented 8. Level of rehabilitation achieved in the databases and documentation systems		data and Knowledge Documentation on indigenous knowledge, practices and technologies produced Availability of information system Monitoring Availability of knowledge based system for monitoring biodiversity	System documents. Knowledge-based System documents		- HCENR - Wildlife Research Corporation - All Research Institutes Corporation of National Communication
					Biodiversity monitoring and information	Establish of national information system for documenting, monitoring and sharing the information on biodiversity			

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		(d) student assessments		9. Availability of data and information on ABS on the ABS-CHM					
National Target 22: Ensure the full and effective participation of indigenous and local communities in Sudan, at all relevant levels, and their access to justice and information related to biodiversity, respecting their cultures and their rights over lands, territories, resources, and traditional knowledge, as well as women and girls, children and youth, and persons with disabilities, and ensure the full protection of environmental human rights defenders (Ensure Participation in Decision-Making and Access to Justice and Information Related to Biodiversity for all)									
		Proportion of total adult population with secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure.	Percentage of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to national distributions, by sex, age, persons with	1. Level of representation of local communities in related bodies 2. Trend in awareness towards representation of local communities 3. and participation of local communities	Traditional/indigenous knowledge for conservation of biodiversity	Number of rare and endangered species based identified on traditional knowledge Identification of habitat requirements based on traditional knowledge	Documentation, Added to Curricula at elementary levels Report,	35000	- Native Administration - Ministry of Justice - Telecom companies - Non-governmental Organizations - HCENR Related civil society Local communities
					Effective participation of local communities	P < 40% (Low) 40% ≤ P ≤ 70% (moderate)	Laws, plans, Statistics, report Laws, plans, Statistics, report	35000	

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementin g groups
Headline		Binary	components	Complementary	National				
			disabilities and population groups. Numbers and amount of grants received for access to genetic resources		(Represen tative).	P > 70% (high)	Laws, plans, Statistics, report	35000	
					% secure tenure rights to land	P < 10% (Low)	Laws, plans, Statistics		
						10% ≤ P < 18% (moderate)	Laws, plans, Statistics		
						P > 18% (high	Laws, plans, Statistics		
National Target 23: Ensure gender equality in the implementation of the NBSAP in Sudan through a gender responsive approach where all women and girls have equal opportunity and capacity to contribute to the three objectives of the Convention, including by recognizing their equal rights and access to land and natural resources and their full, equitable, meaningful and informed participation and leadership at all levels of action, engagement, policy and decision-making related to biodiversity(Ensure Gender Equality and a Gender-Responsive Approach for Biodiversity Action)									
Gender equality Existence Gender plan of Action		1. %of seats held by women in (a) national parliaments and (b) local governments 2. Indicator on national implementation of the gender plan of action 3. Proportion of total adult population with	1. % of population who perceive women land right 2. percent of positions in national and local institutions, including (a) the legislatures; (b) the public service; and (c) the judiciary, compared to	Existence of the action plan	Gender plan of action	Exist in execution	5 years plans, policies, reports	25000	- Sudanese Organizations for Research and Development (SORD) - Ministry of Justice - Ahfad University HCENR, Ministries in line, Research
						Not exist	Reports		

Indicators						Progress measurement	Means of verification	Cost (US\$)	Implementing groups
Headline	Binary	components	Complementary	National	Headline indicators to be measured				
		secure tenure rights to land, (a) with legally recognized documentation, and (b) who perceive their rights to land as secure, by sex and type of tenure	national distributions, by sex, age, persons with disabilities and population groups						Institutes, NGOS
Total Estimated Budget (US\$)								2,355,000	

