State of the **Wildlife Economy** in Africa

Case Study: Morocco

ALU SCHOOL OF WILDLIFE CONSERVATION

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DISCLAIMER
Although every attempt was made to collect data from as many sources as possible, both online and from numerous, varied other sources, this report is in no way exhaustive and there are a number of data gaps. For a number of the wildlife economy activities the 'latest' available data was often still 5-10 years old, highlighting a major gap in terms of relevant, recent, robust data to measure the value of the wildlife economy in Africa. The authors have taken care to ensure that the material presented in this report is accurate and correct. However, the authors do not guarantee the accuracy of the data or material contained in this report, and accept no legal liability or responsibility connected to its use or interpretation.

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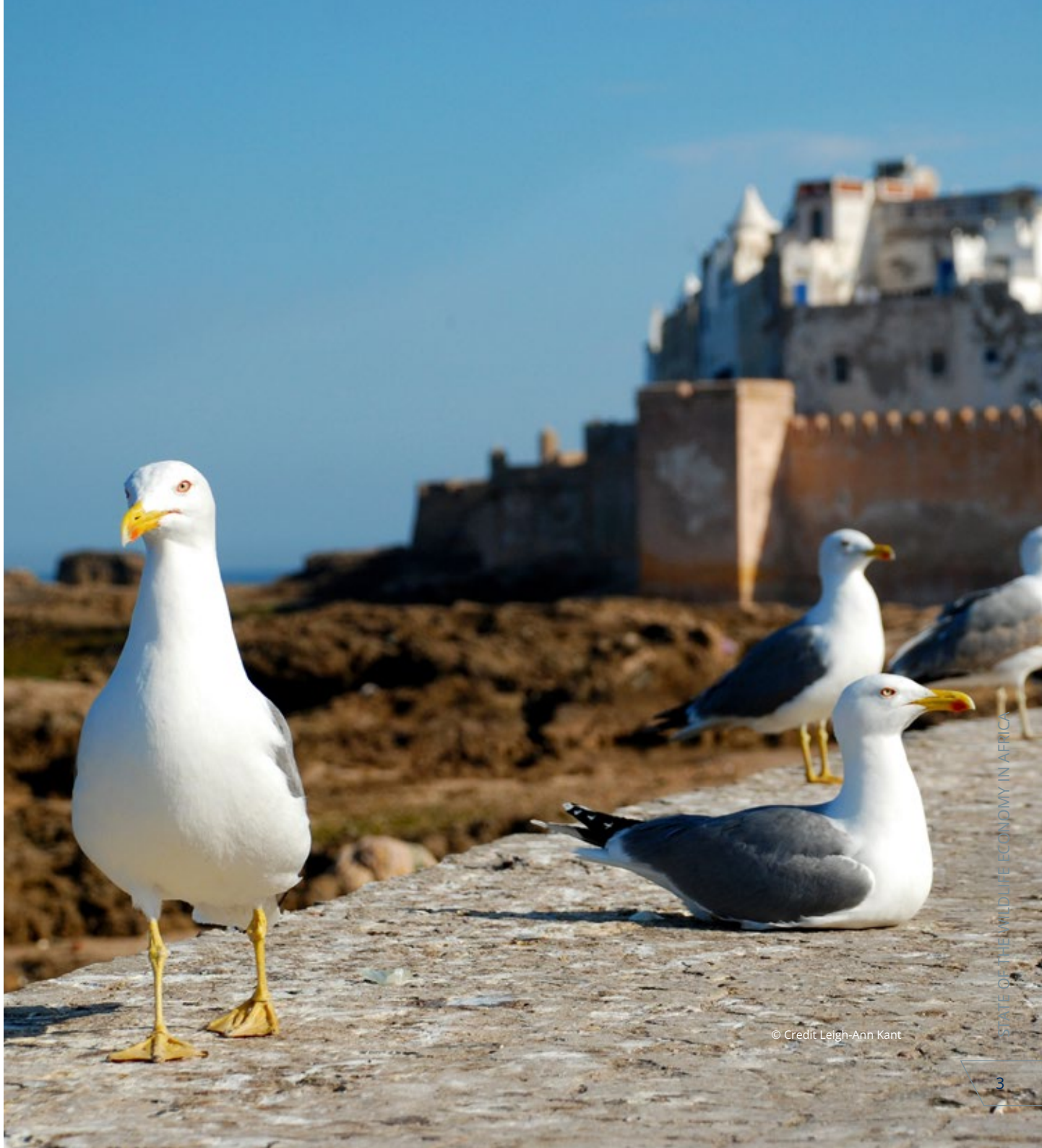
List of acronyms

ABR - Arganeraie Biosphere Reserve
ADA - Agricultural Development Agency
AMEPN - Moroccan Association for Ecotourism and Nature Protection
AESVT - Association of Teachers of Life and Earth Sciences / Association des Enseignants des Sciences de la Vie et de la Terre
AFOLU - Agriculture, Forestry, and Other Land Use
ALU - African Leadership University
ANDA - National Agency for the Development of Aquaculture
ANDZOA - National Agency for the Development of Oasis Zones and the Argan Tree
ANEF - National Agency for Water and Forests
AU - African Union
BAM - Bass Angler Magazine
CAGR - Compound Annual Growth Rate
CBD - Convention on Biological Diversity
CBNRM - Community-Based Natural Resource Management
CDG - Caisee de Depot et de Gestion
CDM - Clean Development Mechanism
CER - Certified Emission Reductions
CHNP - National Center for Hydrobiology and Fish Farming
CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS - Convention on Migratory Species
CNEDD - National Charter for the Environment and Sustainable Development / Charte Nationale de l'Environnement et du Développement Durable
CO_2 - Carbon dioxide
COVID-19 - Coronavirus Disease 2019
CPI - Corruption Perceptions Index
DRE - Regional Environment Directorate
DMF - Department of Maritime Fisheries
ECWP - Emirates Centre for Wildlife Propagation
EIB - European Investment Bank
ESV - Ecosystem Services and Value
ETS - Emission Trading Scheme
EUR - Euro
FAO - Food and Agriculture Organization of the United Nations
FCCM - Fonds Capital Carbone Maroc
FEC - Fonds d'Équipement Communal
FMDT - Moroccan Fund for Tourism Development
GDP - Gross Domestic Product
GHG - Greenhouse Gas
GISD - Global Invasive Species Database
GREPOM - Research Group for the Protection of Birds in Morocco
GRT - Gross Registered Tonnes
HCEFLCD - High Commissioner for Water and Forests and the Fight Against Desertification / Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification
HDI - Human Development Index
IAA - Integrated Agriculture-Aquaculture
IAEA - International Atomic Energy Agency
IAS - Invasive Alien Species
ICZM - Integrated Coastal Zone Management
IFHC - International Fund for Houbara Conservation
IUCN - International Union for Conservation of Nature
IUU - Illegal, Undeclared and Unregulated
LPG - Liquefied Petroleum Gas
MAD - Moroccan Dirham
MAPMDREF - Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests
MASEN - Moroccan Agency for Sustainable Energy
MEMEE - Ministère de l'Énergie, des Mines, de l'Eau et de l'Environnement
MNTO - Moroccan National Tourism Office
MPA - Marine Protected Area
MPI - Multidimensional Poverty Index
MRFR - Market Research Future
MRV - Monitoring, Reporting, and Verification
MWN - Morocco World News
NAMA - Nationally Appropriate Mitigation Action
NDC - Nationally Determined Contribution
NGO - Non-governmental Organisation
NSDS - National Sustainable Development Strategy
NTFP - Non-timber Forest Product
OECD - Organisation for Economic Cooperation and Development
OECM - Other Effective Area-Based Conservation Measures
ONSSA - National Office for the Health Security of Food Products / Office National de Sécurité Sanitaire des Produits Alimentaires
PA - Protected Area
PNSM - National Park of Souss Massa
PMR - Partnership for Market Readiness
REDD+ - Reducing Emissions from Deforestation and forest Degradation (plus, the sustainable management of forests, and the conservation and enhancement of forest carbon stocks)
SIBE - Sites of Biological and Ecological Interest
SLU - Standard Livestock Unit
SMIT - Moroccan Agency for Tourism Development / Société Marocaine d'Ingénierie Touristique
SOWC - School of Wildlife Conservation

TTDI - Travel and Tourism Development Index
UNCCD - United Nations Convention to Combat Desertification
UNDP - United Nations Development Programme
UNECA - United Nations Economic Commission for Africa
UNECE - United Nations Economic Commission for Europe
UNEP-WCMC - United Nations Environment Programme World Conservation Monitoring Centre
UNESCO - United Nations Educational, Scientific and Cultural Organization
UNESCO-MAB - United Nations Educational, Scientific and Cultural Organization - Man and the Biosphere Programme
UNFCCC - United Nations Framework Convention on Climate Change
UNWTO - United Nations World Tourism Organization
USD - United States Dollar
WEF - World Economic Forum
WEII - Wildlife Economy Investment Index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CASE STUDY INTRODUCTION

Overview of the research

Conservation of wildlife is frequently seen as a cost to governments, resulting in little investment in wildlife resources despite the extensive contributions that the wildlife economy can, and does, make in terms of employment and revenues. The African Leadership University's School of Wildlife Conservation received funding to conduct research and produce the inaugural State of the Wildlife Economy in Africa Report, as well as country case studies for all African countries, to illustrate the current and potential value of wildlife to economies in Africa and through this to encourage investment in this important economic asset. The report development process highlighted data gaps that should encourage the collection of robust data related to wildlife economies in order to better understand the vast contribution of wildlife resources to local, national and regional economies.

For the purposes of this research, the wildlife economy is defined as:

> ***"The Wildlife Economy uses wildlife, plants and animals (marine and terrestrial), as an economic asset to create value that aligns with conservation objectives and delivers sustainable growth and economic development"***

Wildlife economies can include a mix of consumptive and non-consumptive uses. The growth and development of the wildlife economy in Africa is influenced by a number of factors, including, amongst others:

- The enabling environment which either facilitates (or not) various stakeholders, including communities and the private sector, to engage in and benefit from the wildlife economy
- This includes policy, legislation and supporting institutions
- The stock of wildlife resources for use in the wildlife economy
- Investment in wildlife resources to 'grow' the asset base on which the wildlife economy depends
- Political will and support
- Infrastructure to support the wildlife economy, such as roads, airports, hotels, etc.

As the first comprehensive regional assessment of the wildlife economy in Africa, the State of the Wildlife Economy in Africa report had the following main objectives:

1. To provide an overview of the status of the wildlife economy in Africa, including country case studies
2. To provide an overview of the regulatory framework governing the wildlife economy, including country case studies
3. To highlight gaps in the data in terms of country data, as well as data specifically relating to different types of wildlife economy activities
4. To analyse and highlight best practices of particular relevance to the region, through the use of case studies
5. To provide facts and figures required by governments and investors to make informed decisions, track progress and provide guidance for implementation in terms of the wildlife economy
6. To raise the profile of the wildlife economy in Africa and to highlight the importance of seeing wildlife as an asset to invest in
7. To promote the learning of lessons between countries and organisations
8. Where possible, to provide key recommendations for policy and practice

The overall aim of the report was to highlight the potential of the wildlife economy and encourage more public and private investments in protected and conserved areas to improve biodiversity outcomes and support economic development.

Success would include turning conservation into a growth industry, attracting young, inspired leaders, increasing private sector investment in wildlife resources and related businesses, involving communities and increasing their benefits and nature/wildlife becoming more abundant. Ultimately, the aim of the ALU SOWC research is to ensure that governments see wildlife as a key strategic asset and, therefore, create an enabling environment for the wildlife economy and the conservation of related wildlife resources.

The first full report focused on five main wildlife economy activities: ecotourism , wildlife ranching, carbon finance and forest products. The activities included in the report had the criteria of having to contribute to both biodiversity conservation and social and/or economic development. For all ALU SOWC wildlife economy reports, the activities are defined as follows:

Ecotourism includes non-consumptive tourism related to nature/wildlife includes trophy , game meat, as well as some aspects of fishing, such as artisanal, small-scale and recreational fishing.

Wildlife ranching includes the breeding of wild/indigenous animals for game meat, products and other uses.

Other consumptive use includes forest products used commercially and for subsistence purposes.

The carbon market includes projects that earn income through REDD+ and other mechanisms that sequester carbon, reduce greenhouse gas emissions and conserve natural systems of carbon.

The full report covered 54 countries in Africa. Data for all 54 countries was, however, not available and a selection of case study countries, with diversity in terms of geographic location, biomes, wildlife economy activities, policy and socio-economic context were selected (selection criteria described below). Throughout the report, text boxes were included covering other countries in order to cover as many countries on the continent as possible and to provide examples of different approaches to the wildlife economy, as well as innovative examples and best practices. Wherever possible, attempts were made to allow for generalisations, and where not possible, caveats or specific enabling factors have been highlighted.

This report is part of the series of national State of the Wildlife Economy reports for Africa to provide an important baseline for the country, as well as to identify challenges and opportunities for growing and unlocking the wildlife economy.

Data collection process

A research project of this magnitude requires a number of different approaches to gathering the data and information required to present analyses and a useful picture of the wildlife economy in Africa. Given various time and budget constraints, and limited access to printed documents, it was decided to largely focus on conducting a literature review, as well as desktop research and, where possible, contacting in-country sources to gather data.

Where possible, future research aims to conduct more primary research and data collection. Currency amounts have been converted to USD for comparison purposes, with the local currency amount still included, using the average annual USD rate for the year of the data. Some graphs and tables have, however, been kept in the local currency because fluctuations in the exchange rates can affect the USD amount in such a way that it does not reflect the true local and national economic impacts as well as the local currency amounts do.

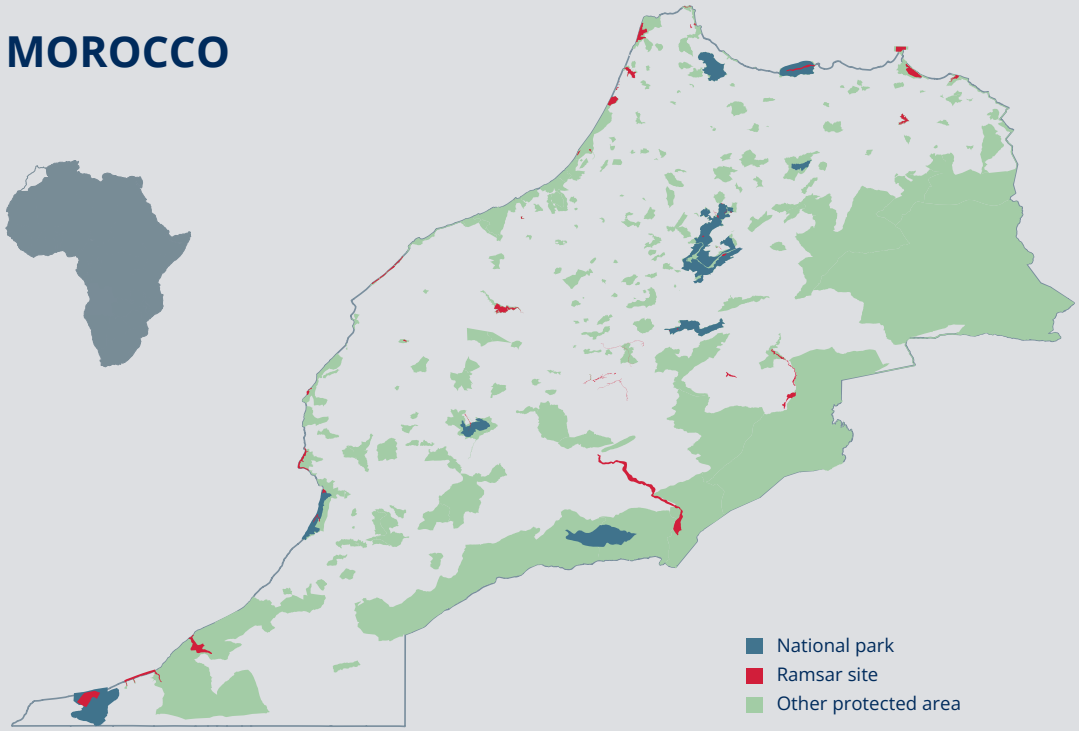
During the research for the full report, it was found that very few countries in Africa have a good understanding of the value of the wildlife economy at a national level. For certain wildlife economy activities there was information and data available at a local, and often only a project level, and often this data was only collected for the duration of the project, or when funding was available. This resulted in data for the continent, as well as per country, largely being inconsistent, incomparable, and often quite old. The overall research project highlights a large gap in data on the value of the wildlife economy and the important need to have consistent, comparable data to ensure that the value of the wildlife economy is truly understood. This information would allow for better policy and investment decision making and would encourage greater investment in the wildlife economy once the true value is understood. Research for the case study countries includes contacting relevant contacts in the specific countries, an extensive literature review and engaging stakeholders to collect as much relevant, up-to-date data as possible. It also, where possible, includes stakeholder workshops and external reviews of the case study by relevant experts.

The complexity of stakeholders involved in the wildlife economy and the fact that a large amount of activity also occurs in the informal sector, also results in a difficulty in collecting and collating data that provides a true reflection of the value of the wildlife economy. The data collection process is in no way exhaustive and is done with the purpose of providing an illustrative overview/baseline report of the wildlife economy. Following on from the full report, the Roadmap for Africa's Wildlife Economy report and numerous country case studies, this case study focuses on the state of the wildlife economy in Morocco.

All country case studies follow the same structure to allow for comparisons and ease of reading.

Please see https://sowc.alueducation.com/research/ for all publications to-date.

MOROCCO



Socio-economic/governance

GDP per capita (USD)
3,993.4

Gini coefficient
39.5

Transparency International Corruption Perceptions Index
Ranked 99th
out of 180 countries

Total population
38.1 million

Mo Ibrahim Governance Index
Scored 62
out of 100

Mo Ibrahim Governance Index
Ranked 8th
out of 54 countries

Protected areas

414,105km² total land area

92 protected areas

2.14 % terrestrial protected area

0.27 % marine protected area

29 Biological Reserves

34 Ramsar Sites, Wetlands of International Importance*

Species numbers

105 mammal species

521 bird species

116 reptile species

738 fish species

* UNEP-WCMC figures differ from official national figures (which state 38 Ramsar sites) but are used here for consistency with other SOWC wildlife economy reports

Sources: Avibase, 2024; Bouazza & Rihane, 2021; FishBase, 2025; Government of Morocco, 2016; IIAG, 2024; Transparency International, 2025; UNEP-WCMC, 2025; World Bank, 2025

Overview of the wildlife economy in Morocco

Forest products

- Forest products contribute approx. 1% of annual GDP and support the livelihoods of approx. 7 million people who depend directly on them.
- Argan oil, one of Morocco's most valuable non-timber forest products, had a projected global market value of USD 676.5 million by 2024, with over 20 million working days linked to its production, mostly by rural women.
- Rosemary (*Rosmarinus officinalis*) alone supports approx. 81,000 workdays each year and contributed to exports valued at MAD 12.3 million (USD 1.2 million) in 2006.
- Aromatic and medicinal plants contribute approx. MAD 300 million (USD 30 million) annually through exports of essential oils, extracts, and dried herbs, supporting approx. 500,000 workdays.

Carbon finance

- The country launched its first carbon fund in 2008, the Fonds Capital Carbone Maroc (FCCM), with an initial fund of MAD 300 million (approx. USD 35 million), co-financed by Caisee de Depot et de Gestion (CDG) (50%), EIB (25%), and Caisse de Depots et Consignations (25%).
- Morocco secured USD 350,000 from the World Bank's Partnership for Market Readiness in 2012 to design a pilot carbon market.

Fisheries

- The fisheries sector contributed approx. 0.99% of GDP in 2020 and directly employed 111,464 people in 2017.
- Morocco exported fish and fisheries products worth USD 2 billion in 2020, against imports of USD 187 million.
- In artisanal and coastal fisheries, landings reached 1.31 million tonnes in 2018, valued at MAD 7.3 billion (approx. USD 752 million), representing 95% of national fish production.
- Aquaculture production rose from 1,050 tonnes in 2015 to 1,922 tonnes in 2021, with only 250 direct jobs recorded in aquaculture in 2017.

Tourism

- Travel and tourism contributed 10.9% in 2022 (USD 14.2 billion), with forecasts of 13.4% of GDP by 2033.
- The sector supported approx. 1.23 million in 2022 (11.2% of total employment).
- Ecotourism generated MAD 2.31 billion (approx. USD 230 million) in 2015, representing 3.9% of total tourist income.
- Souss-Massa National Park alone attracts approx. 300,000 visitors annually, contributing approx. USD 1.3 million to the local economy.

Wildlife trade

- From 2015-2021, Morocco legally exported millions of specimens, mainly to Singapore (5.7 million), Hong Kong (3.6 million), South Korea (1.68 million), the USA (1.05 million), and the Netherlands (384,320).
- A 2013-2014 market survey found 1,586 reptiles of at least nine species for sale across Morocco's wildlife markets, with an estimated value of USD 100,000.

Hunting

- Hunting in Morocco contributes over MAD 1.2 billion annually (approx. USD 125.6 million) to the economy, involving more than 80,000 local hunters and 3,000 tourists.
- In 2018, average spending per hunter was MAD 15,000 (approx. USD 1,570), covering accommodation, transport, and equipment.
- That same year, hunting permits, licences, and taxes generated MAD 43.5 million (approx. USD 4.5 million), reflecting a 4.5% increase from 2017.

Sources: Arnegger, 2010; Badr et al., 2015; Bakour et al., 2021; Bergin et al., 2018; Chebli et al., 2018; CITES, 2024; DMF, 2018; EIB, 2008; Eliason, 2019; FAO, 2023; Laaribya et al., 2017; Montanari, 2023; Moukrim et al., 2019; Nachmany et al., 2015; Nijman & Bergin, 2017; Taleb, 2013; Taleb, 2017; Thopson, 2022; WTTC, 2023

Key messages

- Morocco's wildlife economy is constrained more by ecological limits than institutional ones: while laws, infrastructure, and management are relatively strong, habitat loss, species pressures, and fragmented landscapes restrict growth potential.
- Illegal and unsustainable practices continue to undermine the sector's credibility and profitability, highlighting the need for stronger enforcement, higher penalties, and better monitoring systems.
- Community participation remains weak despite traditional systems of stewardship; empowering rural populations and women's cooperatives is important for both conservation and equitable development.
- High-value forest and plant products such as argan oil, cork, and medicinal plants offer significant opportunities, but realising them requires fair benefit-sharing, certification, and sustainable harvesting practices.
- Morocco's leadership in renewable energy and climate commitments positions it to scale carbon and ecosystem finance, linking conservation with rural job creation and global climate goals.

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Introduction to the natural resources and biodiversity in Morocco

The Kingdom of Morocco (*hereafter* Morocco) is bordered by Algeria to the east, and Western Sahara to the south, and features an extensive coastline along the Atlantic Ocean and Mediterranean Sea. **Morocco is the only African country with a land border with the European Union: the small Spanish enclaves of Ceuta and Melilla, on the northern shores of Morocco's Mediterranean coast** (Cilliers, 2024). Geographically, Morocco encompasses a diverse landscape that includes the Atlas Mountains and the Sahara Desert (MEMEE, 2016; UNECE, 2022). This geographical position gives Morocco many **varied bioclimates**, ranging from humid and sub-humid climates to deserts (Cilliers, 2024).

Morocco has a well-developed network of protected areas that cover over 2.14% (approx. 8,862 km²) of the country's land area, comprising biological reserves, marine protected areas, national parks, natural parks, nature reserves and other internationally essential conservation areas (see Table 1) (UNEP-WCMC, 2025). **Since 2014, Morocco has made progress in extending its network of conservation areas to enhance the protection of species and habitats** (UNECE, 2022). In 2014, the Department of Marine Fisheries created three Marine Protected Areas (MPAs) for sustainable fish resource management (Ibid.). In terms of biospheres, a fourth biosphere reserve was designated in 2016: the Atlas Cedar Biosphere Reserve, which covers 1.37 million hectares across the Ifrane, High Atlas Oriental, and Khenifra National Parks (Ibid.). **Morocco also designated two new Ramsar sites in 2018 and another 12 in 2019** (Ibid.). The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) records 34 Ramsar sites for Morocco, whereas the official Ramsar list includes 38 (Ramsar, 2025; UNEP-WCMC, 2025). The difference comes from four sites **(Baie d'Ad-Dakhla, Côte Aftissate-Boujdour, Oued Assaquia Al Hamra à La'youne, Sebkhat Imlili)** situated in the disputed territory of Western Sahara, which UNEP-WCMC does not include (Ibid.). This report uses the UNEP-WCMC total for consistency across ALU SOWC case studies. Among the wildlife thriving in these protected areas are numerous plant species, such as Atlas cedar (*Cedrus atlantica*), Alpine butterwort (*Pinguicula alpina*), Atlas lily (*Lilium maroccane*) and animal species including Barbary macaques (*Macaca sylvanus*), Barbary ground squirrels *(Atlantoxerus getulus*), the endangered Barbary stag (*Cervus elaphus barbarus*), and the Moroccan monitor lizard (*Varanus deserti*) (Namous et al., 2017; Nassif & Tanji, 2017).

Morocco is estimated to have more than 25,000 animal species, 8,371 plant species, and 7,830 marine species (UNECE, 2022). **Desert ecosystems, although characterised by limited precipitation, are estimated to support 750 different types of flora species** (of which 60 are endemic), 650 invertebrates (primarily endemic), over 250 birds and at least 40 of the most globally threatened mammals (CBD, 2014; Rankou et al., 2013; Wakass et al., 2023). **In addition to fragmented data on species diversity, the conservation of most species in Morocco continues to present challenges** (Msanda et al., 2021; Wakass et al., 2023). Arthropods are the dominant group in wildlife, making up 73% of all species (17,893 species) (CBD, 2014; UNECE, 2022). Molluscs (2,249 species) and vertebrates (1,718 species) make up 9% and 7% of the total national biodiversity, respectively (Ibid.). The Rif, High Atlas, Middle Atlas, and Anti-Atlas Mountains harbour 80% of the country's endemic species (CBD, 2014; UNECE, 2022; Wakass et al., 2023). However, 64% of mountain areas are at an advanced level of deterioration from anthropogenic impacts (Ibid.). Only 7% of the area is classified as having low to medium deterioration (UNECE, 2022). Globally, Morocco ranks **among the countries with the highest levels of fish diversity** (CBD, 2014). Nearly 65 different kinds of fish species, cephalopods, and crustaceans, are targeted in Moroccan fishing, including two species of *Merluccidae*, 15 species of *Sparidae*, five species of cephalopods, 20 species of other groundfish, three species of shrimp, five species of crabs, and four species of sardines and other pelagic (Cherkaoui & Essabbani, 2016; IUCN, 2024).

Table 1: Number of protected areas in Morocco based on designation

Designations	Numbers
National designation	
Biological Reserve	29
Marine Protected Area (MPA)	5
Nature Reserve	1
National Park	11
Natural Park	7
Regional designation	
Specially Protected Areas of Mediterranean Importance	1
International designation	
Ramsar Site, Wetland of International Importance*	34
UNESCO-MAB Biosphere Reserve	4

*UNEP-WCMC figures differ from official national figures (which state 38 Ramsar sites) but are used here for consistency with other ALU SOWC wildlife economy reports
Source: UNEP-WCMC, 2025

Community-Based Natural Resource Management

In Morocco, community-based natural resource management (CBNRM) aims to address environmental sustainability while promoting economic growth within local communities (Lakshman, 2021). **One traditional system demonstrating CBNRM principles is the Agdal system practised by communities in the Moroccan Atlas** (Lakshman, 2021; Mesnildrey, 2021). In Agdals, local institutions govern access rights and the utilisation of natural resources (Mesnildrey, 2021). **These institutions enforce temporary pauses in resource utilisation to conserve or postpone resource usage during critical periods** (Ibid.). **This system highlights the potential for local management approaches, but there remains a need for more robust policies supporting communities' rights and roles in managing local resources** (Mesnildrey, 2021). While specific data on CBNRM programme revenues is limited, the types of projects being implemented under Agdals offer insights into the potential economic benefits (Lakshman, 2021). For instance, Morocco's forestry strategy aims to increase the annual value of ecotourism, in the Agdals systems, from two to five billion Moroccan Dirham (MAD) (approx. USD 200 - 500 million) by 2030 (Lakshman, 2021). The Moroccan government's new forestry strategy focuses on sustainable resource use,

local user engagement, rural development, and biodiversity conservation (Ibid.). The strategy aims to restore 133,000 hectares of forests by 2030 and create 27,500 new forestry jobs (Lakshman, 2021; Mesnildrey, 2021). This projected growth highlights the potential for CBNRM to contribute to economic development in rural areas through ecotourism and other sustainable resource management practices.

Biodiversity finance

Biodiversity and ecosystem services are important for Morocco's economy and development. Ecosystem services are often overused and face declining availability because they are perceived as abundant and freely accessible to the public, leading to unsustainable consumption (Egoh et al., 2007; Mejjad et al., 2023). This is mainly because the economic value of ecosystem services has not been well understood and incorporated explicitly into national economies (Xie et al., 2017). **Although the current ecosystem service values (ESV) in Morocco is unknown, in 2022, Kusi et al., (2023) estimated that it amounted to USD 108.5 billion,** as detailed in Table 2. Croplands emerged as the highest contributor to ESV, accounting for 49.5% in 2015, while natural vegetation also held a significant share, contributing 48.3% to the total ESV for the same year (Kusi et al., 2023). In contrast, other land use categories made minimal contributions to the total ESV, with wetlands registering the lowest percentage at a negligible 0.01% (Ibid.). **Over the period from 1992 to 2015, the value of natural ecosystems in Morocco, including forests, grasslands, wetlands, natural vegetation, and water bodies, increased by USD 3.3 billion, representing a percentage increase of 6.1%** (Ibid.). Conversely, artificial ecosystems, such as croplands and urban areas, also saw an increase in ESV by 3.6%, amounting to USD 1.8 billion (Ibid.). Across the country, other ecosystem services, such as cultural services at the Todgha Oasis, have been estimated to reach EUR 188.70/year (approx. USD 204/year) (Ahrabous et al., 2023), while wood in the Oued Beht watershed generates an annual socio-economic value of MAD 5,981/ha/year (approx. USD 600/ha/year) (Alaoui, 2023).

Threats to biodiversity

Morocco has over 600 endangered species, and most are declining at an irreversible rate, particularly those found close to urban areas and the Central Rif region (IUCN, 2024). **Overutilisation of resources**, such as timber and wildlife, further exacerbates Morocco's declining biodiversity (Aoubouazza et al., 2013). **Erosion from deforestation and unsustainable farming methods** threatens Morocco's ecosystem stability and wildlife habitats (Government of Morocco, 2016). In addition, Morocco's **wildlife resources are also threatened by habitat fragmentation, degradation and loss, pollution, inappropriate water management, and climate change** (Government of Morocco, 2016; Menioui, 2018). The threats of climate and human activities are discussed in Text boxes 1 and 2. Invasive species, introduced through human actions, also pose significant threats by out-competing native species and disturbing the natural balance of ecosystems in the country (Ibid.). These invasive species, shown in Table 3, include Bermuda buttercup (*Oxalis pes-caprae*), Summer cypress (*Kochia scoparia*), Lily of the valley vine (*Salpichroa origanifolia*), amongst others (Government of Morocco, 2016). **However, efforts to combat Invasive Alien Species (IAS) remain sporadic and often reactive, needing a cohesive and strategic approach** (Menioui, 2021). The primary monitoring mechanism remains under the National Office for the Health Security of Food Products (ONSSA), tasked primarily with overseeing the transit of plants, seeds, animals, and biological materials potentially hazardous to the environment or public health at each entry point into the national territory (Ibid.).

Table 2: Total ecosystem service values (ESV) for each land use category in 1992 and 2015

Category	ESV 1992 (billion USD)	ESV 2015 (billion USD)	ESV change (%)
Urban areas	0.75	1.43	91.43
Forest	7.09	7.73	9.08
Natural vegetation	44.64	48.33	8.28
Water bodies	1.09	1.16	7.07
Cropland	48.46	49.53	2.21
Wetland	0.01	0.01	0
Grassland	1.35	0.26	-80.78
TOTAL	**103.39**	**108.46**	**4.91**

Source: Kusi et al., 2023

Table 3: Invasive species in Morocco

Kingdom	Common species name	Scientific name	System
Plantae	Orange wattle	*Acacia saligna*	Terrestrial
	Bear's Breech	*Acanthus mollis*	Terrestrial
	Barbed Goatgrass	*Aegilops triuncialis*	Terrestrial
	Century Plant	*Agave americana*	Terrestrial
	Black Alder	*Alnus glutinosa*	Terrestrial
	European Beachgrass	*Ammophila arenaria*	Terrestrial
	Asparagus	*Asparagus officinalis*	Terrestrial
	Long-stalked Cabbage	*Brassica elongata*	Terrestrial
	Asian Mustard	*Brassica tournefortii*	Terrestrial
	Red Brome	*Bromus rubens*	Terrestrial
	Flowering Rush	*Butomus umbellatus*	Terrestrial
	Scotch Heather	*Calluna vulgaris*	Terrestrial
	Wavy Bittercress	*Cardamine flexuosa*	Terrestrial
	Maltese Star-thistle	*Centaurea melitensis*	Terrestrial
	Artichoke Thistle	*Cynara cardunculus*	Terrestrial
	Nutgrass	*Cyperus rotundus*	Terrestrial
	Portuguese Broom	*Cytisus striatus*	Terrestrial
	Redstem Filaree	*Erodium cicutarium*	Terrestrial
	Hemp Agrimony	*Eupatorium cannabinum*	Terrestrial
	Alder Buckthorn	*Frangula alnus*	Terrestrial
	French Broom	*Genista monspessulana*	Terrestrial
	Red Algae	*Gracilaria vermiculophylla*	Marine
	English Ivy	*Hedera helix*	Terrestrial
	Seaside Heliotrope	*Heliotropium curassavicum*	Terrestrial
	St. John's Wort	*Hypericum perforatum*	Terrestrial
	Red Algae	*Hypnea musciformis*	Marine
	Cogongrass	*Imperata cylindrica*	Terrestrial
	Yellow Iris	*Iris pseudacorus*	Terrestrial
	Perennial Pepperweed	*Lepidium latifolium*	Terrestrial
	White Leadtree	*Leucaena leucocephala*	Terrestrial
	Bird's-foot Trefoil	*Lotus corniculatus*	Terrestrial
	Field Wood-rush	*Luzula campestris*	Terrestrial
	Purple Loosestrife	*Lythrum salicaria*	Terrestrial
	Water Blinks	*Montia fontana*	Terrestrial
	Spiny Naiad	*Najas minor*	Terrestrial
	Tree Tobacco	*Nicotiana glauca*	Terrestrial
	Bermuda Buttercup	*Oxalis pes-caprae*	Terrestrial
	Torpedo Grass	*Panicum repens*	Terrestrial
	Canary Island Date Palm	*Phoenix canariensis*	Terrestrial
	Maritime Pine	*Pinus pinaster*	Terrestrial
	Brodie's Thread Weed	*Polysiphonia brodiei*	Marine
	White Poplar	*Populus alba*	Terrestrial
	Mesquite	*Prosopis*	Terrestrial
	Lesser Celandine	*Ranunculus ficaria*	Terrestrial
	Italian Buckthorn	*Rhamnus alaternus*	Terrestrial
	Common Buckthorn	*Rhamnus cathartica*	Terrestrial
	Castor Bean	*Ricinus communis*	Terrestrial
	Himalayan Blackberry	*Rubus discolor*	Terrestrial
	Curled Dock	*Rumex crispus*	Terrestrial
	Procumbent Pearlwort	*Sagina procumbens*	Terrestrial
	Prickly Russian Thistle	*Salsola tragus*	Terrestrial
	Common Groundsel	*Senecio vulgaris*	Terrestrial
	Dense-flowered Cordgrass	*Spartina densiflora*	Terrestrial
	Athel Tamarisk	*Tamarix aphylla*	Terrestrial
	Lesser Trefoil	*Trifolium dubium*	Terrestrial
	White Clover	*Trifolium repens*	Terrestrial
	Colt's-foot	*Tussilago farfara*	Terrestrial
	Broadleaf Cattail	*Typha latifolia*	Terrestrial
	Thyme-leaved Speedwell	*Veronica serpyllifolia ssp. serpyllifolia*	Terrestrial
Animalia	Giant African Snail	*Achatina fulica*	Terrestrial
	Barbary Sheep	*Ammotragus lervia*	Terrestrial

Table 3: Invasive species in Morocco (continued)

Kingdom	Common species name	Scientific name	System
	Mallard	*Anas platyrhynchos*	Freshwater & terrestrial
	Greylag Goose	*Anser anser*	Freshwater & terrestrial
	Cattle Egret	*Bubulcus ibis*	Terrestrial
	European Green Crab	*Carcinus maenas*	Marine & terrestrial
	Mediterranean Fruit Fly	*Ceratitis capitata*	Terrestrial
	Rock Dove	*Columba livia*	Terrestrial
	House Crow	*Corvus splendens*	Terrestrial
	Pacific Oyster	*Crassostrea gigas*	Marine
	Lesser White-toothed Shrew	*Crocidura suaveolens*	Terrestrial
	Grass Carp	*Ctenopharyngodon idella*	Freshwater
	Common Carp	*Cyprinus carpio*	Freshwater
	Painted Frog	*Discoglossus pictus*	Freshwater & terrestrial
	Northern Pike	*Esox lucius*	Freshwater
	Spinycheek Crayfish	*Faxonius limosus*	Freshwater
	Mosquitofish	*Gambusia affinis*	Freshwater
	Common Genet	*Genetta genetta*	Terrestrial
	Common Garden Snail	*Helix aspersa*	Terrestrial
	Silver Carp	*Hypophthalmichthys molitrix*	Freshwater
	Bighead Carp	*Hypophthalmichthys nobilis*	Freshwater
	Gypsy Moth	*Lymantria dispar*	Terrestrial
	Largemouth Bass	*Micropterus salmoides*	Freshwater
	Mediterranean Mussel	*Mytilus galloprovincialis*	Marine
	Viperine Snake	*Natrix maura*	Freshwater & terrestrial
	Rainbow Trout	*Oncorhynchus mykiss*	Freshwater
	European Flat Oyster	*Ostrea edulis*	Marine
	Ruddy Duck	*Oxyura jamaicensis*	Freshwater & terrestrial
	Longhorn Crazy Ant	*Paratrechina longicornis*	Terrestrial
	European Perch	*Perca fluviatilis*	Freshwater
	Guppy	*Poecilia reticulata*	Freshwater
	Purple Swamphen	*Porphyrio porphyrio*	Freshwater & terrestrial
	Roach	*Rutilus rutilus*	Freshwater
	Mediterranean Fanworm	*Sabella spallanzanii*	Marine
	Brown Trout	*Salmo trutta*	Freshwater
	Brook Trout	*Salvelinus fontinalis*	Freshwater
	Lake Trout	*Salvelinus namaycush*	Freshwater
	Rudd	*Scardinius erythrophthalmus*	Freshwater
	Gilthead Sea Bream	*Sparus aurata*	Marine, freshwater & brackish
	Eurasian Collared Dove	*Streptopelia decaocto*	Terrestrial
	Redbelly Tilapia	*Tilapia zillii*	Freshwater
	Tench	*Tinca tinca*	Freshwater
	Common Pine Shoot Beetle	*Tomicus piniperda*	Terrestrial
	Khapra Beetle	*Trogoderma granarium*	Terrestrial
Virus	West Nile Virus	*Orthoflavivirus nilense*	Terrestrial

Source: GISD, 2024

Text box 1

Climatic and anthropogenic impacts on endemic species in Morocco

Morocco experiences frequent droughts, desertification, and land degradation, yet it is a recognised biodiversity hotspot. This area is home to numerous endemic species facing threats, including the iconic argan tree (*Argania spinosa*).

The argan tree has adapted genetically to survive in arid conditions with highly variable rainfall patterns by reducing its adequate population size (reducing genetic diversity). Despite this resilience, human activities have significantly impacted argan woodlands in southern Morocco over the past 3,000 years. **Since the 18th century, intense human activities such as overgrazing and deforestation have caused a dramatic contraction of the argan tree's range**. This has resulted in a 200 km southward and northward shift from its original distribution. In addition, future climate change scenarios for 2080 predict a further decline of the argan tree's range, with potential losses reaching 20-30% compared to its current distribution. This highlights the urgent need for conservation measures to protect this unique and threatened species. **Conservation efforts should include habitat restoration, sustainable land management practices, and community involvement to ensure the long-term survival of the argan tree, the ecosystems it supports and the positive economic development impacts it has.**

Sources: Alba Sánchez et al., 2015; Zhao et al., 2019

Text box 2

Snake charming and population and range decline of the Egyptian cobra (*Naja haje*)

Morocco has a rich diversity of reptiles, including 27 snake species. A 2010 national assessment indicated that snakes comprise a significant portion of threatened species, with 18.5% classified as such. The Egyptian cobra (*Naja haje*) and the puff adder (*Bitis arietans*), commonly used in snake charming, were listed as vulnerable. In Morocco, snake charming was introduced by the *Aissawas* religious order approx. 500 years ago and has become a prominent aspect of the country's tourism. However, it has also led to the overexploitation of wild snake populations, primarily concentrated in key tourist areas such as Marrakech and southern souks.

Over the past 20 to 25 years, the variety of snake species used in charming has declined. The *Aissawas* now focus on the most visually striking and venomous species, along with larger non-venomous ones. **It is estimated that hunters capture approx. 4,500 snakes annually, with approx. 75% destined for charmers**. Hunting grounds for the Egyptian cobra have shifted from northern to southern areas between 1989-1996 and 2003-2014, suggesting declining populations in the north. The cultural significance of snake charming complicates calls for a ban on the practice. Nonetheless, the ongoing threat to snake populations remains unregulated. Although snakes are protected under Moroccan law (Décret d'application de la loi 29-05, catégorie IV), there are no limits on the number harvested or used in performances. **This unchecked exploitation endangers both snake species and the communities that depend on them.**

Source: Pleguezuelos et al., 2018

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Socio-economic overview

Morocco's population has grown steadily, from 24.4 million in 1990 to an estimated 38.1 million in 2024 (World Bank, 2025). This represents a growth rate of approx. 56% in 34 years. **The country is currently experiencing the third stage of the demographic transition, characterised by declining birth rates due to factors such as economic progress, improved women's education and access to contraception** (Cilliers, 2024). In 2023, the average fertility rate (births per woman) was 2.2, down from 4.1 in 1990 (World Bank, 2025). Projections suggest Morocco will reach replacement-level fertility (2.1 births per woman) around 2028, with a population of approx. 40.11 million (Cilliers, 2024).

Before the COVID-19 pandemic, Morocco's economy grew consistently, and the Gross Domestic Product (GDP) reached USD 128.92 billion in 2019 (World Bank, 2025). The pandemic caused a temporary decline to USD 121.35 billion in 2020, but the economy rebounded to USD 142.02 billion by 2021 (Ibid.). **While GDP per capita showed an approx. 153% increase in 2021 (USD 3,785.9) compared to 2000 (USD 1,499.1), the overall unemployment rate remained at 12.3% (World Bank, 2025), indicating that this economic growth has yet to translate into job creation**. **A particular challenge is youth unemployment**, which rose from 22.9% in 2016 to 31.8 % in 2021 (Cilliers, 2024; El Foutoun, 2023). Although youth-focused entrepreneurship can solve youth unemployment, an inadequate business environment, financial constraints, and excessive taxation remain barriers to entrepreneurship (Habumuremyi & Snyman, 2024). Addressing these issues will be crucial for Morocco's future economic development.

In 2021, UNDP (2023) estimated that 6.4% of the population lived in multidimensional poverty, with an additional 10.9% classified as vulnerable to multidimensional poverty. This was based on a Multidimensional Poverty Index (MPI) score of 0.027 (Ibid.). The MPI is a composite index measuring severe poverty across various developing countries, ranging from 0 to 1, where higher values signify greater poverty levels (Ibid.). Morocco's MPI is higher than that of some neighbouring countries (e.g., Tunisia (0.003), Libya (0.007)), reflecting a relatively higher level of multidimensional poverty (Ibid.). **Income inequality is one of the main issues that reflect the state of poverty in Morocco**. Morocco's average Gini coefficient, an index of a country's income inequality, between 1990 and 2015 was **40.3**, indicating relatively high income inequality compared to most North African peers (OECD, 2018). **The 2023/2024 Human Development Index (HDI) (0.71) showed that Morocco's improvements in human development were relatively higher than most countries based on measures such as income per capita, life expectancy and education** (UNDP, 2024). In 2022, the adult literacy rate in Morocco (ages 15 and above) was 77% (World Bank, 2025). These indicators suggest that while Morocco has made progress in certain areas of human development, challenges related to poverty, unemployment and inequality persist. However, income inequality remains a significant issue, as reflected in Morocco's relatively high Gini coefficient and higher MPI compared to some neighbouring countries. Addressing these disparities will be essential for Morocco to continue improving its human development outcomes and achieving more inclusive growth.

Morocco scored moderately on key governance metrics. Transparency International's Corruption Perceptions Index (CPI) ranked Morocco 99th out of 180 countries globally in 2024 (Transparency International, 2025). The CPI indicates a perceived level of corruption in the public sector, with Morocco's score of 37/100 indicating high levels of corruption (Ibid.). On the other hand, the Ibrahim Index of African Governance (IIAG) showed a more positive perspective. Morocco ranked 8th out of 54 African countries according to the 2023 IIAG ranking (IIAG, 2024). This Index considers broader governance aspects, including security, rule of law, human rights, and economic opportunity. In terms of peace and stability, the Institute for Economics & Peace (IEP) (2025) ranked Morocco 85th out of 163 countries on the Global Peace Index (GPI). The GPI measures peace across three domains: societal safety and security, ongoing conflict, and militarisation. A higher GPI ranking signifies greater peace (IEP, 2022). **These indices also suggest that while Morocco faces challenges with perceived corruption, it demonstrates progress in broader governance areas and enjoys moderate peace and stability**. See Text box 3 for Morocco's performance in the Wildlife Economy Investment Index (WEII) developed by the School of Wildlife Conservation, African Leadership University.

Regulatory framework for the wildlife economy

Morocco is committed to wildlife conservation through a robust national legal framework and active participation in international agreements. The country's legal framework seamlessly integrates civil and Muslim law. **The King has authority through *dahir*, a form of royal decree, enabling legislative decree and the endorsement of laws ratified by the bicameral parliament** (UNECE, 2022). The bicameral parliament, which consists of two chambers (the House of Representatives and the House of Councillors), is responsible for passing laws and contributing to the country's legal framework (Ibid.). This structure ensures a balanced approach to lawmaking and supports the country's conservation efforts. **Morocco has established comprehensive laws and regulations to support sustainable wildlife management practices** (e.g., Water Law, Law on Protected Areas, Law on the Protection of Species of Wild Fauna and Flora). These laws address various environmental concerns, including air and water pollution, waste management, and renewable energy use (Law on Renewable Energy). Additionally, the National Charter for the Environment and Sustainable Development (CNEDD) and the 2011 Moroccan Constitution provide overarching frameworks for environmental protection.

Morocco actively participates in several international agreements, further solidifying its global commitment to conservation. This includes participation in the Ramsar Convention on Wetlands, the Convention on Biological Diversity (CBD), and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Recognising the importance of habitat conservation for wildlife, Morocco is also a signatory to agreements addressing climate change (United Nations Framework Convention on Climate Change (UNFCCC)) and desertification (United Nations Convention to Combat Desertification (UNCCD)). **Morocco aligns its wildlife management strategies with key regional policies in line with its role within the African Union (AU)**. This includes the African Convention on the Conservation of Nature and Natural Resources. There have also been proposals to establish transboundary conservation parks with neighbouring countries such as Algeria and Mauritania (Kamath et al., 2023).

Morocco's dedication to national and international efforts ensures the sustainable management of its wildlife resources and contributes significantly to a broader global conservation framework. Table 4 provides a non-exhaustive list of legislation, policies, and strategies related to Morocco's wildlife economy.

Table 4: Overview of the regulatory framework for the wildlife economy in Morocco

Framework	Overview	Source
Law No. 11-03 Pertaining to the Protection and Improvement of the Environment	This law aims to lay down the basic rules and general principles of national policy in protecting and developing the environment. Among other objectives sought is, in particular, establishing a specific liability regime guaranteeing repair of damage caused to the environment and compensation to victims.	Available at https://www.informea.org/en/law-no-11-03-pertaining-protection-and-improvement-environment [Accessed 3rd March 2024].
Law No. 15-12 on the Prevention and Fight Against Illegal, Unreported and Unregulated Fishing	The law focuses on combating illegal, undeclared, and unregulated (IUU) fishing by establishing fisheries conservation and management measures. It outlines fishing regulations such as authorisations, zones, species, quotas, and catch records. Additionally, it sets rules for foreign fishing vessels regarding unloading/transhipment in Moroccan ports and ensures fishery products sold in Morocco are not from IUU fishing.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC135031 [Accessed 3rd March 2024].
Law No. 22-07 on Protected Areas	This law establishes the fundamental rules and guiding principles of national policy on environmental protection and enhancement, in line with international standards and evolving approaches to safeguarding natural heritage.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC098312 [Accessed 3rd March 2024].
Law No. 28-00 on Waste Management and Disposal	This law aims to protect human health, wildlife, plants, water, air, soil, ecosystems, sites, landscapes, and the environment from the detrimental effects of waste. It aims to achieve this by preventing waste harm, reducing its production, organising its collection, transportation, storage, and treatment in environmentally responsible ways, and ensuring proper disposal.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC069174 [Accessed 3rd March 2024].
Law No. 29-05 on the Protection of Wild Fauna and Flora Species and the Control of Their Trade	This law aims to establish a legal framework dedicated to protecting wild fauna and flora species. It seeks to comply with provisions outlined in international environmental protection conventions, notably the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). For example, the ministerial ord er No. 2707-20 of 9 November 2020 concerning the temporary ban on fishing for blue marlin (*Makaira nigricans*) and white marlin (*Tetrapturus sp*p.) or ord er No. 4195-14 of 25 November 2014 regulating the fishing of certain species of hake, as amended and completed.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC106726 [Accessed 3rd March 2024].
Law No. 36-15 on Water	The law establishes rules for integrated, decentralised, and participatory management of water resources to ensure citizens' right to access water and promote its rational and sustainable use.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC178261 [Accessed 3rd March 2024].
Law No. 39-12 on the Organic Production of Agricultural and Aquatic Products	The law on organic production of agricultural and aquatic products aims to promote the value of such products, including those from wild flora collections. It seeks to enhance sustainable development by increasing the income of producers engaged in organic farming, contributing to environmental conservation and biodiversity conservation.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC134688 [Accessed 3rd March 2024].
Law No. 49-17 on Environmental Assessment	It mandates that draft policies, programs, plans, and sectoral plans undergo a strategic environmental assessment, which evaluates potential positive and negative impacts, proposes measures to mitigate adverse effects, and presents alternative solutions. The law delineates requirements for environmental impact studies and notices, specifying projects subject to each.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC224934 [Accessed 3rd March 2024].

Table 4: Overview of the regulatory framework of the wildlife economy in Morocco (continued)

Framework	Overview	Source
Law No. 80-14 on Tourist Establishments and Other Forms of Tourist Accommodation	This law aims to integrate non-classified tourist accommodations like riads and guesthouses into the national hotel infrastructure, creating a level playing field by requiring compliance with regulations and taxes, while benefiting both formal operators and informal hosts. This reform establishes a unified quality system and brings structure to previously informal tourism operations, ensuring compliance and contributing to increased registered overnight stays.	Available at https://mtaess.gov.ma/fr/textes-juridiques-tourisme/ [Accessed 3rd March 2024].
Law No. 81-12 on the Coastline	This law establishes the fundamental principles and rules of sustainable integrated management of the coastline with a view to its protection, development and conservation.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC170297 [Accessed 3rd March 2024].
Law No. 84-21 on Marine Aquaculture	This law determines the principles and rules for the planning, development, organisation and management of marine aquaculture.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC225949 [Accessed 3rd March 2024].
Law No. 99-12 Establishing the National Charter for the Environment and Sustainable Development (CNEDD)	Provides a legal basis for the principles, rights, duties and obligations contained in the 2011 Constitution about sustainable development. The law enforces that sustainable development is fundamental and must be integrated into all societal activities.	Available at https://www.fao.org/faolex/results/details/en/c/LEX-FAOC134969 [Accessed 3rd March 2024].
National Biodiversity Strategy and Action Plan 2016-2020	It aimed to conserve, restore, and ensure the sustainable use of Morocco's biological diversity while linking it to national development and improving people's well-being.	Available at https://www.cbd.int/doc/world/ma/ma-nbsap-v3-fr.pdf [Accessed 8th October 2025].
National Strategy for the Conservation of Birds of Prey	It provides a coordinated framework to protect, restore, and sustain raptor populations by reducing human pressures, improving habitat management, strengthening research and collaboration, and promoting public awareness and international cooperation.	Available at https://iucn.org/sites/default/files/2025-10/strategie-rapaces-maroc_web.pdf [Accessed 8th October 2025].
National Strategy for the Development of the Aromatic and Medicinal Plants Sector	It aims to develop and sustain the aromatic and medicinal plants sector by improving production, strengthening research and investment, ensuring resource conservation, and enhancing the livelihoods of local communities through sustainable and competitive growth.	Available at https://faolex.fao.org/docs/pdf/mor164078.pdf [Accessed 8th October 2025].
National Sustainable Development Strategy (NSDS)	The Strategy aims to achieve a green and inclusive economy in Morocco. It emphasises the importance of securing fundamental elements to ensure a sustainable development trajectory that benefits present and future generations.	Available at https://www.greenpolicyplatform.org/sites/default/files/downloads/policy-database/ENG-SNDD_RESUME%20EXECUTIF-V24-D%20(1).pdf [Accessed 3rd March 2024].
National Wetlands Strategy 2015-2024	It aimed to enhance wetland heritage values and ecological functions, promote governance and coord ination among policies affecting wetlands, and enhance knowledge sharing about these areas.	Available at https://medwet.org/en/publications/moroc-co-national-wetlands-strategy-2015-2024/ [Accessed 3rd March 2024].
National Integrated Coastal Zone Management Plan	Aims to pilot the Integrated Coastal Zone Management (ICZM) approach on the eastern Mediterranean coast of Morocco. It consists of three components.	Available at https://documents.worldbank.org/en/publication/documents-reports/documentdetail/808171468062107931/morocco-integrated-coastal-zone-management-project [Accessed 3rd March 2024].

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Text box 3

Wildlife Economy Investment Index (WEII) results for Morocco

The Wildlife Economy Investment Index (WEII), developed by the African Leadership University's School of Wildlife Conservation, aims to evaluate the potential of African countries in terms of their wildlife assets and the investment-enabling environments related to the wildlife economy. It is a comprehensive tool that gauges five fundamental pillars: wildlife assets, wildlife management, ease of doing business, public sector capacity, and investment safety.

In the overall WEII rankings, Morocco placed 8th out of 53 countries (São Tomé and Príncipe were not included in the overall WEII score due to a lack of data). The country performed well in both Sub-Indices, 11th in the Investment-enabling Environment Sub-Index and 13th in Wildlife Status Sub-Index. See Figure 1 for an overview of Morocco's scores across the WEII, with green denoting it positioned in the upper third of African countries, yellow in the middle third and red in the lower third.

According to the WEII report for Morocco, the country excels in "Wildlife management" (1st) and leads key sub-categories such as the "Wildlife legal framework" (1st) and "Infrastructure" (1st). It also performs strongly on "Property rights" (4th), "Access to markets" (5th), "Access to finances" (7th), and overall "Ease of doing business" (9th) category. However, Morocco lags in "Wildlife assets" (42nd), reflecting weaker results on "Ecological habitats" (51st), "Protected Areas" (34th), and middling "Species richness" (31st). Within the enabling environment, "Money growth" (43rd), "Social inclusion" (33rd), "Labour market" (27th), and mid-table standings for "Corruption," "Rule of law," and "Security and stability" (each 20th) indicate areas for improvement.

At the indicator level, Morocco ranks first on the continent for numerous measures, including efficiency of the legal framework in challenging regulations, accessibility of public records, strength of auditing and accounting standards, mobile communications, internet usage, intellectual property protection, and low levels of organised crime. It also shares top positions on interest-rate controls/negative real rates, overall banking system health, financial freedom, and effective limitation of civil conflict. On environmental commitments, Morocco stands out for promotion of environmental sustainability, Stockholm Convention reporting, sustainable forest use, coastal protection, and active measures against wildlife trafficking (destination quantity). Conversely, it sits in the lower third for several conservation and business-climate indicators, including wetlands extent and loss, biodiversity protection, Protected Areas (PAs) and Other Effective Area-Based Conservation Measures (OECMs) connectivity, above-ground forest biomass, high average security costs for firms, stringent hiring regulations, heavy tax burden/tariff complexity, and relatively low scores on freedom of religion and expression.

In terms of recommendations from the WEII report, the following were highlighted, a need to:

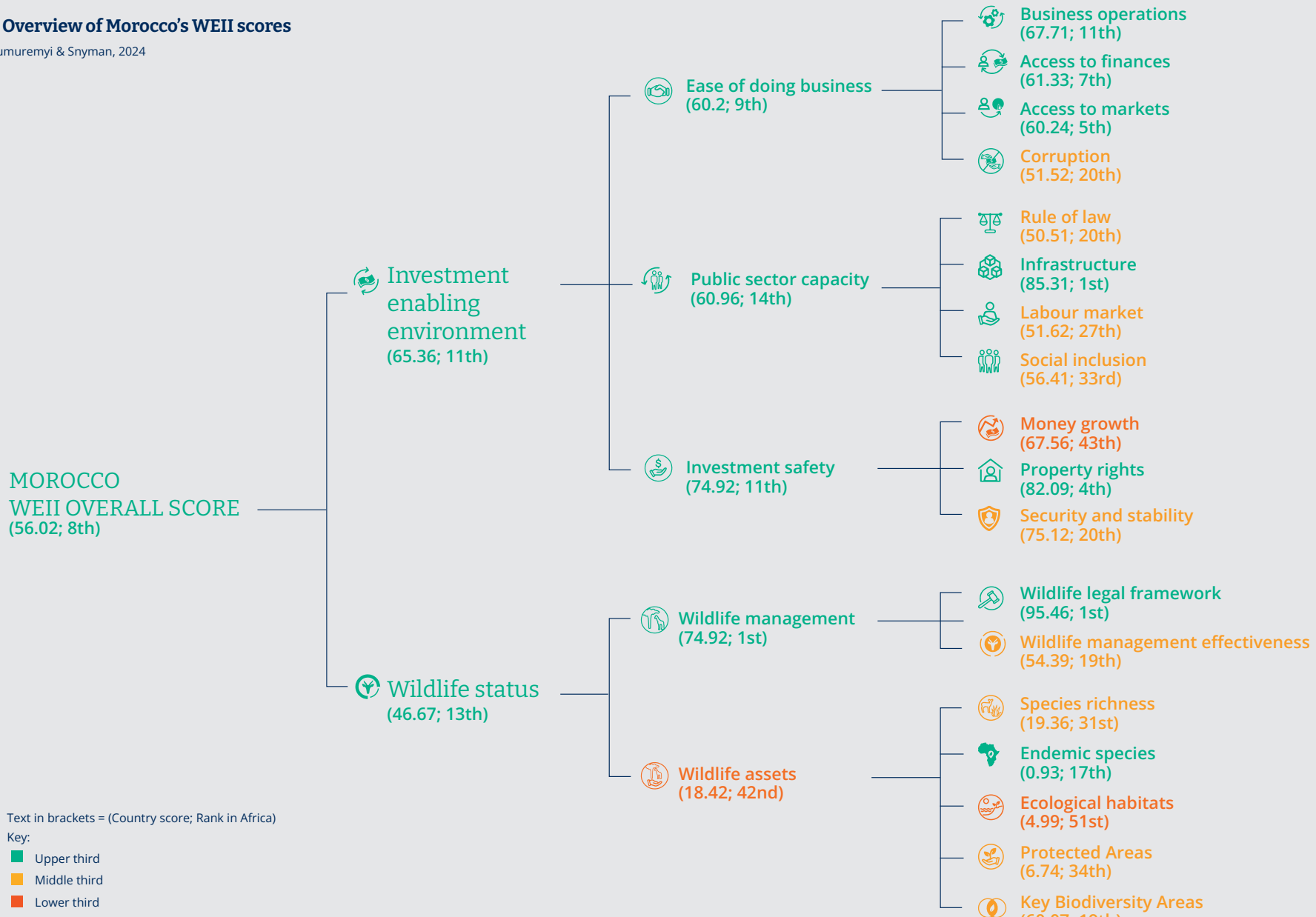
- strengthen ecological assets
- accelerate marine conservation
- improve the business environment
- deepen inclusion and governance
- leverage strengths for growth

For further details on Morocco's performance and the full set of policy and practice recommendations, please consult the Morocco WEII report.

Source: Habumuremyi & Snyman, 2024

Figure 1: Overview of Morocco's WEII scores

Source: Habumuremyi & Snyman, 2024



Text in brackets = (Country score; Rank in Africa)

Key:

- Upper third
- Middle third
- Lower third

Institutions for managing the wildlife economy

The **Department of Sustainable Development within the Ministry of Energy Transition and Sustainable Development** serves as the principal national authority entrusted with the formulation and execution of the country's environmental policy (UNECE, 2022). Through its Regional Environment Directorates (DREs), it coordinates ecological conservation efforts nationwide, as well as regionally (Ibid.). Alongside the Department of Energy and Mines, and under the guidance of a Secretary-General, these bodies form the Ministry of Energy Transition and Sustainable Development (Ibid.).

The Department of Sustainable Development collaborates closely with other government agencies, non-governmental organisations, and local communities to promote the sustainable use of natural resources, manage protected areas, and raise awareness about environmental issues (UNECE, 2022). These include, amongst others, the Ministry of Equipment and Water, the Ministry of Agriculture, Marine Fisheries, Rural Development and Waters and Forests, the Ministry of Tourism, Handicrafts and Social and Solidarity Economy, the Association of Teachers of Life and Earth Sciences of Morocco (AESVT Morocco), the Association Ribat Al Fath, Bahri Association, Mohammed VI Foundation for Environmental Protection, Moroccan Association for Ecotourism and Nature Protection, National Charter for Environment and Sustainable Development. A non-exhaustive list of institutions involved in supporting the work of the Department of Sustainable Development is listed in Table 5.

Table 5: Institutions supporting the wildlife economy in Morocco

Institution	Overview	Source
Agricultural Development Agency (ADA)	Provides action plans and value-added solutions to address agricultural needs at the local and national levels.	Available at https://www.ada.gov.ma/en/ [Accessed 3rd March 2024].
Department of Marine Fisheries	Manages all marine species stocks and the Moroccan seashore, as well as marine protected areas.	Available at https://www.agriculture.gov.ma/en [Accessed 3rd March 2024].
Forestry Research Centre	The centre coordinates forestry research and develops cooperation and partnerships with research, training and funding institutions at the national and international levels.	Available at https://cirf.eauxetforets.gov.ma/ [Accessed 3rd March 2024].
Ministry of Agriculture, Marine Fisheries, Rural Development and Waters and Forests and its Department of Water and Forests	Responsible for the management of all terrestrial protected areas, but also for the management of the entire public forest domain, including some areas that are not protected.	Available at http://www.agriculture.gov.ma/en [Accessed 3rd March 2024].
Ministry of National Territory Planning, Land Planning, Housing and City Policy and its Urban Development Department	Responsible for all territorial spatial planning and strategic management, including regional spatial planning strategy. The Department is aware of the necessity to integrate biodiversity and natural resources issues in spatial planning strategies.	Available at www.muat.gov.ma [Accessed 3rd March 2024].
Moroccan Agency for Sustainable Energy (MASEN)	MASEN initiates and oversees the development of renewable energy projects in Morocco, including solar, wind, and hydroelectric projects.	Available at https://www.masen.ma/en [Accessed 3rd March 2024].
Moroccan Agency for Tourism Development (SMIT)	SMIT aims to implement a development strategy for tourism products in Morocco.	Available at https://smit.gov.ma/ [Accessed 3rd October 2024].
Moroccan National Tourism Office (MNTO)	The role of the Moroccan National Tourism Office is to promote cultural and coastal resources, as well as developing select niche themes which place Morocco among the sought-after tourist destinations.	Available at https://www.visitmorocco.com/en [Accessed 3rd March 2024].

Table 5: Institutions supporting the wildlife economy in Morocco

Institution	Overview	Source
National Agency for the Development of Aquaculture (ANDA)	The core mandate of ANDA in Morocco is to promote and develop the aquaculture sector in the country. This includes implementing policies and strategies to support sustainable aquaculture practices, providing technical assistance and support to aquaculture businesses, conducting research and development initiatives to enhance aquaculture productivity and efficiency, and ensuring compliance with regulatory standards and environmental sustainability in aquaculture activities.	Available at https://www.anda.gov.ma/en [Accessed 3rd March 2024].
National Agency for the Development of Aromatic and Medicinal Plants	The core mandate of the National Agency for the Development of Aromatic and Medicinal Plants in Morocco is to promote and develop the country's aromatic and medicinal plants sector. This involves implementing policies and strategies to support the cultivation, processing, and marketing of aromatic and medicinal plants and providing technical assistance and support to farmers and businesses involved in this sector.	Available at https://anpma.gov.ma/en/home/ [Accessed 3rd September 2025].
National Agency for the Development of Oasis Zones and the Argan Tree (ANDZOA)	The Agency is responsible for revitalising oases and argan areas, including the Arganeraie Biosphere Reserve (ABR), while maintaining their ecological balance.	Available at https://andzoa.ma/ [Accessed 3rd March 2024].
National Commission on Climate Change and Biodiversity	The Commission is composed of representatives of governmental authorities, public institutions and environmental research institutions, as well as three representatives of the most important civil society organisations working on climate change or biological diversity.	Available at https://climate-laws.org/document/decree-ndeg-2-19-721-establishing-the-national-climate-change-and-biodiversity-commission_f4aa [Accessed 3rd March 2024].
National Office for Food Safety (ONSSA)	ONSSA develops and enforces regulations related to food safety and quality standards, ensuring compliance with national and international guidelines.	Available at https://www.onssa.gov.ma [Accessed 3rd March 2024].
Regional Directorate of Water and Forests and the Fight against Desertification	The Directorate plays a crucial role in managing and conserving natural resources, particularly focusing on water and forest ecosystems in the Rif region. Its mission encompasses the sustainable development of forested areas, combating desertification, and promoting biodiversity conservation.	Available at https://medpan.org/en/annuaire-des-organisations/regional-directorate-water-and-forests-and-fight-against-0 [Accessed 3rd October 2024].
International Union for Conservation of Nature (IUCN)	IUCN is focused on nature conservation and the sustainable use of natural resources.	Available at https://iucn.org/ [Accessed 3rd March 2024].
GREPOM/Birdlife Maroc	GREPOM (Research Group for the Protection of Birds in Morocco) is focused on the conservation of wild birds and their habitats in Morocco. It is also based on the concept of sustainable development, including the well-being of human populations in relation to nature.	Available at https://www.birdlife.org/partners/morocco-grepom-birdlife-maroc/ [Accessed 3rd March 2024].
Moroccan Association for Ecotourism and Nature Protection (AMEPN)	AMEPN objectives revolve around the conservation of nature, the enhancement of ecosystems and natural landscapes and the preservation of biodiversity.	Available at https://amepn.ma/ [Accessed 3rd October 2024].
Living Planet Morocco	The organisation works on the protection and restoration of natural resources, biodiversity, wetlands and freshwater ecosystems.	Available at http://www.lpm.org.ma/ [Accessed 3rd October 2024].

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Wildlife economy activities in the country

Wildlife economy activities in Morocco include ecotourism, fishing, hunting, carbon, and forest products. These activities contribute to the economy through job creation, revenue generation, sustainable development, poverty alleviation, trade and exports amongst others. This section provides relevant information on the main wildlife economy activities and attempts to illustrate their significance to Morocco's broader economy, as well as conservation. **Comparable, consistent, up-to-date data for most activities was difficult to find**, but the data which was found still illustrates a large contribution to the local as well as national economy. **The regular collection of consistent, robust data on the value of the different wildlife economy activities is essential in order to support sustainable decision- and policy-making.**

Tourism

Tourism is significant in Morocco's economy, drawing on several strengths that make it globally competitive (Alkhatib et al., 2008; Steenbruggen, 2014). The country's culture is a captivating fusion of Arab, Amazigh, and various African and European influences (Stanić & Plenković, 2013). This, in addition to its strategic location, unique attractions, and affordability, has contributed to its substantial tourist influx, especially from European tourists (Ibid.). **Morocco maintains stability and security as a tourist destination and weathered the Arab Spring revolutions with minimal impact on its tourism** (Saeid et al., 2012; Steenbruggen, 2014). The country's stability enhances its allure to global tourists. Additionally, it has enacted various measures to improve tourism, such as fostering public-private partnerships, establishing a tourism academy to bolster sector training, undergoing digital transformation, investing in human capital, enhancing competitiveness among tourism stakeholders, regulating the industry, and promoting domestic tourism (Chellik et al., 2023; Saad, 2020). Text box 4 outlines some of the initiatives put in place to improve tourism in Morocco.

In 2024, the tourism industry in Morocco ranked among the top ten in Africa on the Travel and Tourism Development Index (TTDI) (WEF, 2024). The TTDI evaluates the attractiveness and competitiveness of a country's travel and tourism industry (Ibid.). International tourism is crucial to Morocco's economy (Didast & Bousstta, 2023; Steenbruggen, 2014). **In 2019, Morocco welcomed approx. 13 million tourists, with a significant proportion (33%) coming from Europe, particularly France and Spain, which accounted for 23% of the total visitors (Saad, 2020; WTTC, 2023).** Despite the COVID-19 pandemic interrupting travel in 2020/21, the industry has gradually recovered, as shown in Figure 2. In 2022, international tourist arrivals reached 10.87 million. Europe accounted for 29% of arrivals, led by France and Spain with a combined share of 22% (WTTC, 2023). However, domestic tourism still needs to catch up and be improved to maintain the industry's sustainability (Cherkaoui et al., 2020). **The slow growth in domestic tourism could be related to the tourism policy in Morocco which promoted more international tourism to increase foreign exchange and reduce the trade deficit** (Kagermeier et al., 2019). Nonetheless, Morocco has the potential to create a more resilient and sustainable tourism industry by fostering domestic and regional tourism alongside international tourism.

In the first quarter of 2023, Morocco witnessed a remarkable surge in tourism, attracting 2.9 million tourists (Africanews, 2023). This surge represents a 17% increase compared to the pre-COVID-19 levels of the first quarter of 2019 (Ibid.). While Morocco maintains a strong tourism industry, its contribution towards GDP has not reached the pre-pandemic contribution levels. Tourism also provides employment opportunities for skilled and unskilled labour and has significantly contributed to reducing poverty and improving living standards in the country (Ibid.). **Tourism accounted for approx. 1.35 million jobs in 2019, and approx. 1.23 million jobs in 2022 (WTTC, 2023).** These contributions were approx. 12.4% and 11.2% of the total employment in 2019 and 2022, respectively (Ibid.). One reason for the drop is that during the COVID-19 pandemic, many businesses in Morocco's accommodation and catering sectors saw major cuts in employment as firms scaled down operations under lockdowns and travel restrictions (UNECA, 2024).

Travel and tourism contributed 11.2% to Morocco's GDP in 2019, with forecasts of 11.5% in 2023 and 13.4% in 2033 (WTTC, 2023). In value terms, the sector generated USD 14.6 billion in 2019, declining slightly to USD 14.2 billion in 2022, which represented 10.9% of GDP (Ibid.).

Figure 2: International tourist arrivals by region in

Text box 4

Tourism development initiatives in Morocco

In preparation for hosting major global events such as the 2030 FIFA World Cup, Morocco introduced several initiatives to strengthen its tourism sector. Tourism contributes significantly to national GDP and supports employment in hospitality, crafts, and transport. To enhance infrastructure, the government invested in roads, airports, ports, and accommodation, including the new Benslimane stadium and expansion of the Tangier Med port. The high-speed rail line between Tangier and Casablanca, together with 10 international airports and a 2,000 km motorway network, improves connectivity and visitor mobility across the country.

To attract a wider international audience, the Moroccan National Tourist Office launched **VisitMorocco.com**, a multilingual platform promoting Morocco's cultural richness, landscapes, and experiences, alongside practical travel information. The international campaign **"Morocco, Kingdom of Light"** complements this by showcasing the nation's blend of tradition and modernity through global media outreach. Both initiatives aim to increase visibility and appeal to diverse travel markets.

These actions form part of Vision 2030, a long-term strategy seeking to place Morocco among the world's top twenty tourist destinations through sustainable growth, diversification of tourism products, and balanced regional development. Vision 2030 promotes cultural, wellness, and ecotourism, supported by strong public-private partnerships. To encourage investment, the government offers incentives under the *Charte d'Investissement* and Go Siyaha programmes, providing tax relief, subsidies, and technical assistance. The Cap Hospitality scheme modernises hotels with subsidised loans, while Moukawala Siyaha supports small and medium-sized enterprises by covering up to half of project costs.

Through combined efforts in infrastructure, promotion, and investment, Morocco is reinforcing its position as a leading tourism destination in Africa. These initiatives aim not only to increase visitor numbers but also to enhance service quality, sustainability, and economic impact, ensuring the sector's growth benefits communities across the country.

Source: Kirmi & El Meziani, 2024

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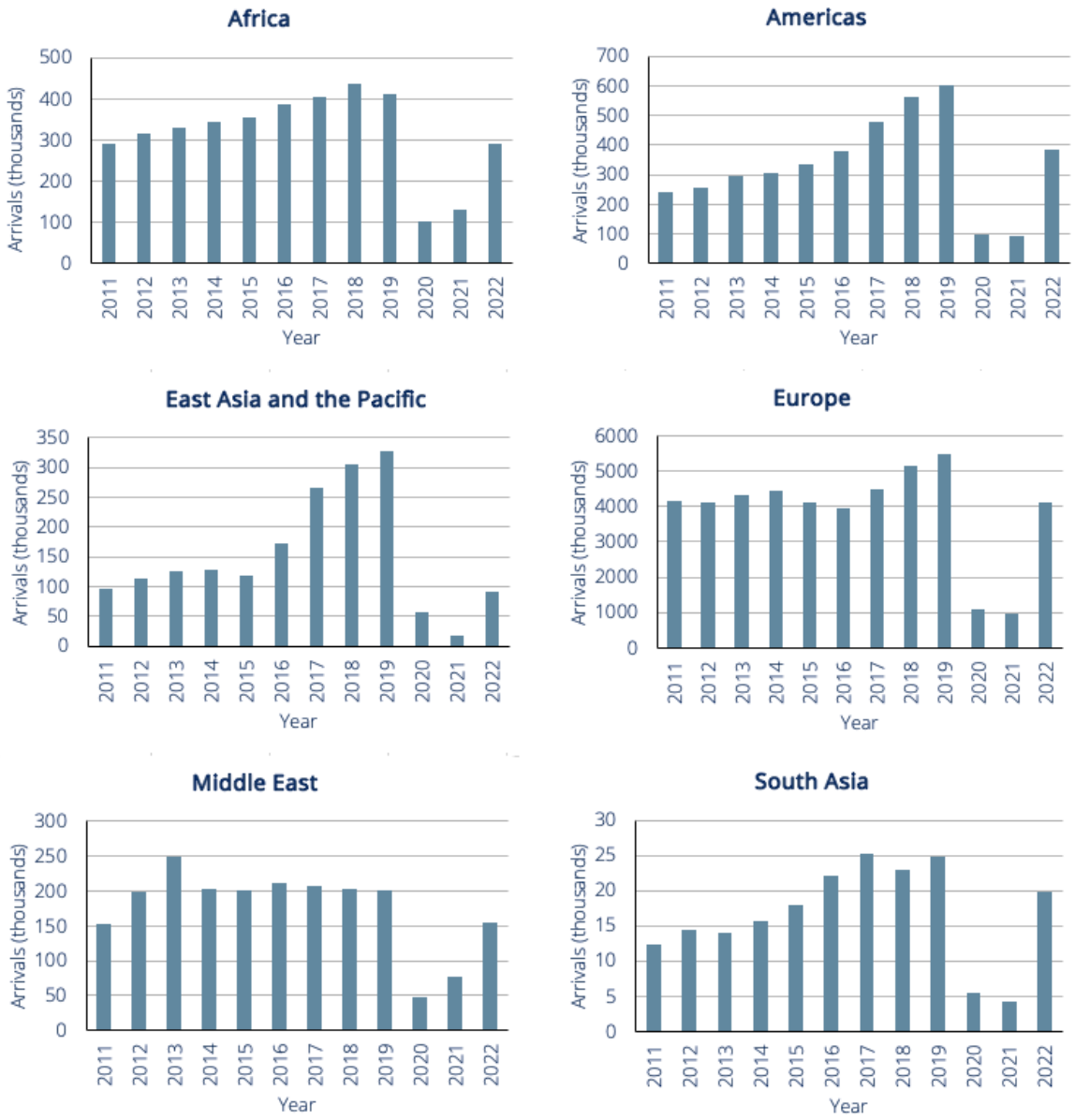
Morocco (2011-2022)



Source: UNWTO, 2023

Ecotourism

In Morocco, ecotourism is predominantly focused on coastal attractions, and the government has continually committed to developing and sustainably managing coastal ecotourism (Balsam, 2023; Caffyn & Jobbins, 2003; Lamnadi, 2010). While other sustainable ecotourism activities such as mountain hikes, nature walks, and cultural visits exist, coastal attractions are more popular (Chellik et al., 2023; Lamnadi, 2016).

Morocco manages coastal tourism activities through planning, regulation, and coordination, using a top-down approach in planning, with the central government leading in developing coastal tourism plans (Balsam, 2023; Kagermeier et al., 2019). These tourism plans are shared with national and international tourism stakeholders who own most of the tourist facilities in the country (Kagermeier et al., 2019). Bottom-up development approaches and the participation of the local population are still in their infancy (Boukherouk & Ed-Dali, 2019) (see Text box 5). Nonetheless, for coordination purposes, different stakeholders, such as government agencies, local communities, and private sector entities, are involved in developing and managing coastal tourism (Ibid.). This approach ensures that diverse perspectives are considered, fostering a balanced and sustainable growth trajectory for Morocco's coastal ecotourism industry (Balsam, 2023).

Toubkal National Park, nestled in the High Atlas Mountains, is Morocco's most famous park, home to diverse species and the towering Toubkal Mountain: a premier hiking and trekking destination in North Africa (Chellik et al., 2023; Selkani, 2020; Wakass et al., 2023). Other top travel destinations in Morocco include the Arganeraie Biosphere Reserve (ABR), Souss Massa, Alhoceima, and Talassemtane National Parks (Dakki et al., 2020, Kusi et al., 2020). **The diverse ecosystems and natural sites in these areas make them ideal for ecotourism and bird watching** (Dakki et al., 2020; Wakass et al., 2023). An overview of ecotourism in Morocco is discussed in Text box 6.

Despite the several challenges, ecotourism contributes significantly towards Morocco's economy. **In 2015, ecotourism generated MAD 2.31 billion (approx. USD 230 million), constituting 3.9% of total tourist income, highlighting its economic significance** (Thopson, 2022).

Text box 5

Tourism, local communities and governance

Despite the increase in visitation to Morocco's protected areas, local communities still need to be involved in managing these areas. The government either manages these areas or delegates this responsibility to private corporations. The bottom-up development approaches and local population participation are relatively new in Morocco and still need to be implemented.

The National Park of Souss Massa (PNSM) is managed by the Park Service within the Regional Directorate of Water and Forests and the Fight against Desertification. Specific regulations govern park management, involving multiple government organisations, including the Ministry of Agriculture and other ministries related to tourism, agriculture, and urbanisation. Although there is a park advisory committee comprising institutional actors, local authorities, and various public and private stakeholders, the involvement of local communities could be more extensive.

Local NGOs and regional councils participate in projects within the park, providing financial and technical support. However, efforts to promote collaborative environmental governance need to be more effective. The local communities require more support, and many projects need to be more aligned with their needs to gain their support. The environmental governance of PNSM reveals insufficient actions and inadequate regulatory approaches, with the local population primarily excluded from decision-making processes. **More effective communication and long-term projects to empower the local population are needed to achieve good environmental governance.**

Source: Boukherouk & Ed-Dali, 2019

Text box 6

Overview of ecotourism and opportunities for growth

Morocco's ecotourism potential lies in its 10 national parks (now 11), 154 Sites of Biological and Ecological Interest (SIBE), and three Biosphere Reserves (now four). These areas are valuable but need to be more protected, and their potential unlocked for socio-economic beneficiation through ecotourism. The strategic development of the ecotourism industry could facilitate increased visitation to these areas and provide viable economic opportunities for local communities. However, Morocco's ecotourism sector faces challenges, and the promotion of sustainable ecotourism has been slow, especially in protected areas.

Various challenges impede the progress of ecotourism, including limited government support, the exclusion of local communities from management plans, a lack of stakeholder organisation, and an overemphasis on coastal tourism. Superficial approaches to tourism management have also hindered progress, with many regions needing more infrastructure and support. To build a more resilient ecotourism industry, Morocco needs more concerted efforts toward community involvement, collaborative initiatives, diversification, and comprehensive management solutions to unlock its full potential and effectively promote sustainable tourism.

Source: Lamnadi, 2016

Private organisations within the ecotourism sector also play a crucial role in enhancing the socio-economic development of local communities through taxes, employment, and corporate social responsibility initiatives (Ibid.). For instance, in 2022, a partnership between public and private organisations launched an ecotourism initiative in Tafoughalt, Oriental Region, to conserve the environment, protect endangered wildlife, and create employment opportunities (Benazizi, 2022). The project had a budget of MAD 10 million (approx. USD 980,437) and was projected to generate 20 direct and 30 indirect jobs (Ibid.). These ecotourism-driven initiatives have the potential to support rural livelihoods in remote areas with high unemployment rates, such as the Chefchaouen area (Berriane & Moizo, 2014). In 2002, the Ministry of Tourism estimated that approx. 650,000 people engaged in rural tourism in Morocco, which was projected to reach 2.9 million by 2010 (Ibid.). While these targets were not achieved, there is still the potential for ecotourism to make a genuine socio-economic contribution to communities (Ibid.). The potential economic impact of ecotourism in the Souss-Massa National Park is detailed in Text box 7.

Text box 7

The economic contribution of the Souss-Massa National Park

The Souss-Massa National Park faces substantial challenges from mass tourism development and population growth around the Park. This is largely due to its proximity to Agadir, a resort town. A comprehensive survey conducted between May 2007 and March 2008, encompassing 3,790 face-to-face interviews, was done to highlight the park's potential to significantly contribute to the region's Gross Domestic Product (GDP). This study showed that the Souss-Massa National Park attracts an annual influx of 300,000 tourists. Most of these tourists visited the park as an extension of their conventional beach vacation. This contributed a substantial annual economic impact of approx. EUR 1.2 million (approx. USD 1.3 million). Although these values are outdated, they show how the Souss-Massa National Park has the potential to be a valuable asset, capable of driving economic growth and creating local employment.

Source: Arnegger, 2010

Opportunities and challenges for ecotourism in Morocco

1. **Morocco hosts a wide range of flora and fauna, making the country a prime destination for ecotourism**. The unique species such as the endangered northern bald ibis (*Geronticus eremita*), and the Mediterranean monk seal (*Monachus monachus*) and their habitats offer significant opportunities for nature-based tourism, attracting birdwatchers, wildlife enthusiasts, and conservationists (Tekken & Kropp, 2015).
2. **Morocco's history, influenced by various civilisations**, including the Amazighs, Romans, Arabs, Jews, French, and Spanish, offers a rich cultural heritage (El Aouami & Louhmadi, 2020). This diversity is reflected in the country's architecture, languages, cuisine, and traditions, providing a compelling draw for cultural tourists, who frequently also engage in other related ecotourism activities.
3. **Significant investments in infrastructure have enhanced accessibility across Morocco**. Improved roads, airports, and rail networks make it easier for tourists to travel between major cities and more remote areas, facilitating tourism growth in less-visited regions. Future infrastructure projects, including constructing new highways and expanding existing transportation networks, might further enhance the country's connectivity, making it easier for tourists to explore diverse destinations. It is important though that these are sustainably managed so as not to impact negatively on the country's biodiversity.
4. **Developing ecotourism and cultural tourism in rural areas can stimulate local economies**, create jobs, support local businesses, and reduce urban migration by providing sustainable income sources for rural communities. These initiatives can help preserve and promote traditional crafts, music, and other cultural practices by creating a market for these products. This can support local artisans and help maintain cultural heritage.

While Morocco's ecotourism sector is flourishing, some challenges remain:

1. **Uneven development across regions means that some areas lack the infrastructure and established practices necessary to cater to ecotourists effectively**. Additionally, ensuring proper waste management throughout the country is crucial to conserving the natural beauty that attracts visitors in the first place.
2. **The popularity of natural attractions such as Souss-Massa National Park and the Atlas Mountains, if not properly managed, can lead to environmental problems such as erosion, pollution, and habitat degradation** (Chellik et al., 2023). Tourist activities can disrupt the natural behaviours of wildlife. For instance, in Jemaa el-Fna Square, Barbary macaques (*Macaca sylvanus*) are often used as photo props, causing stress and behavioural changes in these endangered animals (Ibid.).
3. **Major cities such as Marrakech, Fez, and Agadir attract most tourists, leading to overcrowding, traffic congestion, and pressure on local infrastructure**. High visitor numbers can accelerate wear and tear, while modern infrastructure needs can disrupt the historical integrity of these sites.

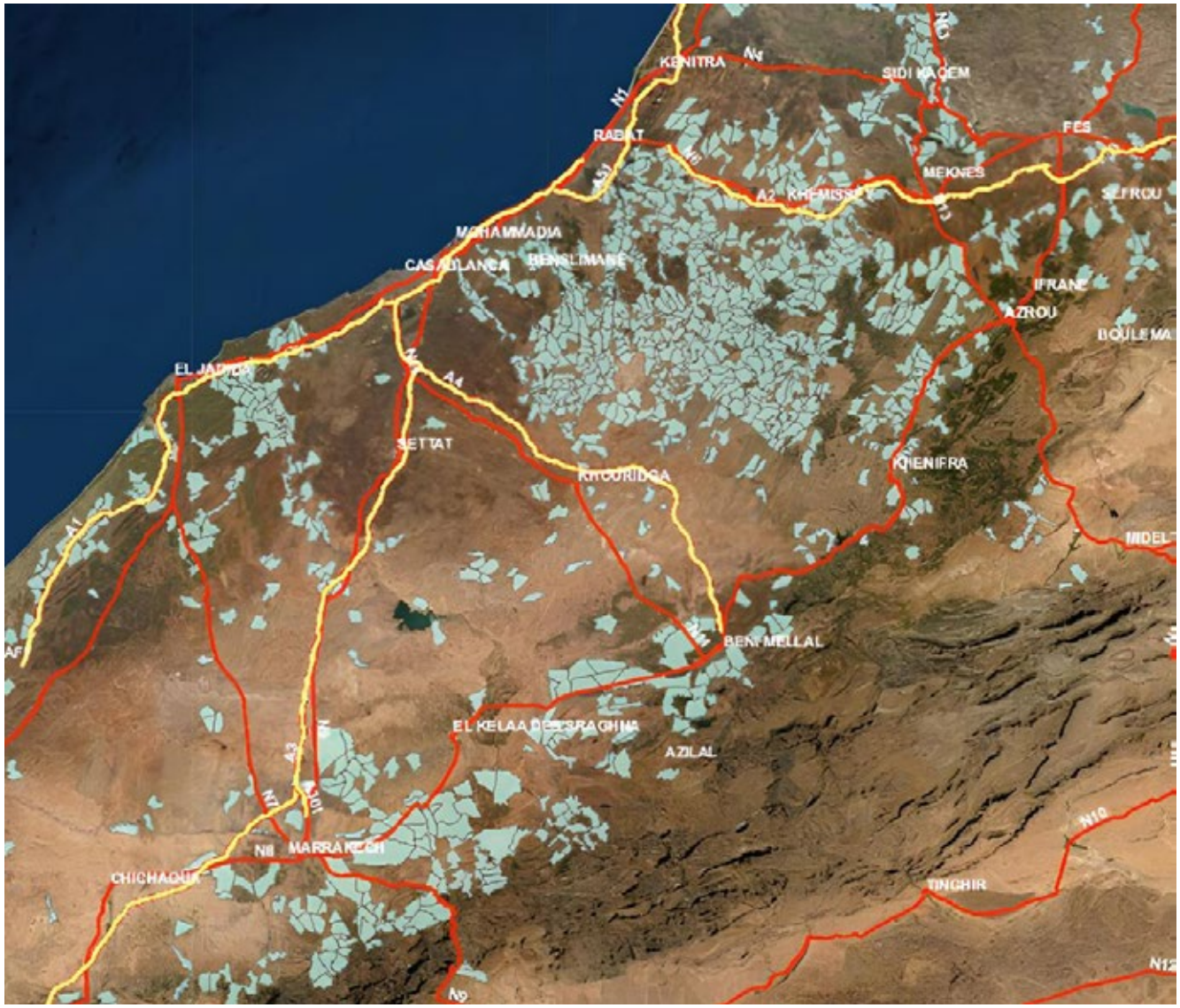
Tourism continues to be a key driver of Morocco's economy, supported by strong infrastructure, cultural richness, and effective promotional strategies. The government's long-term planning and investment have strengthened its global appeal, with recovery after the pandemic showing steady progress. Sustained growth will depend on balancing international and domestic tourism while ensuring inclusivity and environmental responsibility.

Hunting

The regulatory framework governing hunting in Morocco is primarily established by Royal Decree 2.12.248 (Bencherif, 2022; Eliason, 2019). The Royal Decree is a comprehensive framework for all hunting rules and guidelines. This Decree meticulously outlines essential aspects of hunting, including specific details on hunting seasons, permissible game species, designated hunting areas, and the necessary permits and licences (Ibid.). This comprehensive regulatory structure ensures the effective management of hunting practices in Morocco, balancing the interests of conservation, tourism, and individual enthusiasts while enforcing strict measures against any breaches of established regulations.

The government regulates hunting, and it has the authority to grant hunting rights to tourism companies or individuals (Bencherif, 2022). These entities are required to secure licences, encompassing permissions not only to carry firearms but also to engage in hunting activities (Ibid.). Morocco offers a diverse range of species for hunting enthusiasts, including partridges (*Alectoris spp.*), waterfowl (*Anatidae spp.*), pigeons (*Columba spp.*), doves (*Streptopelia spp.*), hares (*Lepus spp.*), wild boars (*Sus scrofa*), foxes (*Vulpes spp.*), and various other animals. Some of the available hunting areas in Morocco are shown in Figure 3. The Moroccan Department of Water and Forests official map estimates **an extensive network of hunting areas, collectively spanning over three million hectares** (Bencherif, 2022). These areas predominantly consist of forest plots, with hunting tourism companies often leasing them from the government or private landowners (Ibid.). Alongside these regulated hunting practices, **falconry holds a unique cultural and historical significance in Morocco,** as highlighted in Text box 8.

Figure 3: Some of the hunting areas spread across Morocco



Source: Bencherif, 2022

Text box 8

Falconry in Morocco

Falconry is recognised by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as a living human heritage and was inscribed on the Representative List in 2021 with Morocco among the participating countries. Falconry is defined as the traditional art of training and flying birds of prey, is practised in many countries by people of all ages, and is transmitted through families, mentoring and clubs. Modern practitioners emphasise safeguarding falcons, quarry and habitats, and the wider community includes hospitals, breeding centres, conservation agencies and traditional equipment makers.

In Morocco, falconry appeared with the arrival of the Arabs in the Maghreb from the twelfth century and spread among ruling elites and nomadic and semi-nomadic communities. Historical texts show close royal interest from the Almohad to the Alaouite periods, and the sultans encouraged the Kouassem families of Doukkala who have maintained the tradition. Transmission occurs from father to son and through associations, with women contributing to bird care, equipment and costume, and the practice is showcased at events such as the Moussem Moulay Abdelah Amghar. About a hundred practitioners live mainly in rural areas, and youth interest has grown since the element was first recognised by UNESCO, reinforcing visibility at festivals.

Falconry is among the hunting methods authorised by the Dahir of 21 July 1923 during the open season, while the *arrêté* of 3 November 1962 prohibits the capture, hunting, possession and peddling of diurnal and nocturnal raptors including falcons (*Falco*). Annual authorisations for possession and, to sustain the tradition, limited capture are issued by the High Commission for Water and Forests to members of falconry associations upon proof of legal acquisition and veterinary attestations. Falcons are also covered by international conventions ratified by Morocco, including the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Convention on Migratory Species (CMS), and safeguarding measures include awareness, training, documentation and support for equipment and events.

The principal quarry is the North African houbara bustard (*Chlamydotis undulata*), and dedicated reserves have been established in pre-Saharan regions to support this resource. To reinforce wild stocks, the Emirates Centre for Wildlife Propagation (ECWP) opened at Missour in 1995 with a second facility at Enjil in 2006, and in 2001 a permanent eco-reserve was created with Moroccan authorities that excludes hunting. Collectively, the Moroccan centres have bred more than 278,000 North African houbara and released more than 230,000 into the wild, while across its network IFHC reports 795,569 houbara bred and 624,827 released for conservation, indicating large-scale investment in species recovery. **This model links a regulated cultural practice with conservation breeding and site protection to sustain falconry and its quarry in Morocco.**

Sources: IFHC, 2021; UNESCO, 2020; UNESCO, 2021

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Text box 9

Illegal hunting and challenges in Morocco

Legal hunting is a recognised activity in Morocco, yet the country faces serious challenges from illegal and excessive hunting. A 2018 report by the National Agency for the Environment warned of the dangers posed by such practices. The problem was highlighted in 2019, when foreign hunters in Marrakech killed around 1,500 turtle doves (*Streptopelia turtur*), a vulnerable species, in a single day. The incident, shared widely on social media, caused public outrage and raised concerns about how wealthy locals and tourists can breach hunting limits with little consequence.

Illegal hunting increased during the COVID-19 lockdowns as reduced law enforcement made it easier for violations to occur. According to the High Commissioner for Water and Forests and the Fight Against Desertification (HCEFLCD), these practices threaten Morocco's biodiversity. Species such as the Dorcas gazelle (*Gazella dorcas*), Barbary macaque (*Macaca sylvanus*), wild boar (*Sus scrofa algira*), and European rabbit (*Oryctolagus cuniculus*) face population decline due to overhunting and habitat loss.

The Barbary macaque, listed under Appendix I of the Convention on International Trade in Endangered Species (CITES), is protected by law in both Morocco and Algeria. Offenders can face fines of up to USD 10,000 per animal in Morocco and USD 1,000 in Algeria (Bergin et al., 2018). Despite these penalties, weak enforcement and fines that are not high enough to deter wealthy offenders allow illegal hunting to persist.

Public awareness of wildlife protection has grown, and environmental groups are working to raise understanding of endangered species and promote conservation. However, without stronger control and consistent law enforcement, Morocco's wildlife will remain at risk from unsustainable hunting.

Source: Bencherif, 2022

Hunting contributes significantly to Morocco's economic development by generating revenue and creating jobs. Annually, hunting adds over MAD 1.2 billion (approx. USD 125.6 million) to the Moroccan economy, through the **participation of over 80,000 Moroccans and 3,000 tourists** (Bencherif, 2022; Eliason, 2019). The Moroccan High Commission for Water and Forestry aims to boost this figure to 15,000 tourists by 2024 and utilise it as a catalyst for rural development (Ibid.). This development is envisioned through revenue streams derived from the sale of hunting licences, permits, and equipment, as well as the expenditure of hunters on travel, accommodation, and related goods and services. **In 2018, an average hunter spent MAD 15,000 (approx. USD 1,570) on hunting, covering transportation, accommodation, and associated expenses** (Eliason, 2019). During the same period, direct revenue from hunting permits, licence and taxes reached MAD 43.5 million (approx. USD 4.5 million), reflecting a 4.5% increase from 2017 (Ibid.). However, illegal hunting in the country (discussed more in Text box 9) threatens the industry's profitability (Bencherif, 2022).

Fisheries

Morocco's fisheries sector is of paramount economic importance, contributing significantly to the country's economy. In 2016, fish consumption per person stood at 20.3 kg, slightly declining to 19.5 kg per capita by 2020 (FAO, 2023). The national fisheries strategy, the "*Halieutis Plan*," launched in 2009, had aimed to raise fish consumption to 16 kg per person per year by 2020, a target that was later surpassed (Badr et al., 2015). The strategy also aimed to increase aquaculture production to 200,000 tonnes per year, or more than 10% of the global fish production (Ibid.). Several factors have contributed to the decline in fish consumption in Morocco, including the fact that fish occupies a lower rank in Moroccan food habits and preferences than other protein sources (Naji, undated). **In Morocco, fish consumption is notably lower in rural areas, while coastal zones exhibit moderate to high levels of fish consumption** (Ibid.). The most commonly consumed fish in Morocco is sardine (*Sardina pilchardus*), particularly in rural areas where it represents 76.4% of the fresh fish consumed (Badr et al., 2015). This percentage is approx. 50% in cities (Ibid.).

The price is the most significant factor affecting consumer preference for marine fish species (Ibid.). The sardine's price is approx. four times less than the average selling price of marine white fish (Ibid.).

Carp *(Cyprinidae spp.)* are the most important commodity traded in quantity, accounting for approx. 85% of the total quantity of traded freshwater fish (Badr et al., 2015). The other main groups of traded species are black bass (*Micropterus salmoides*), and pike perch (*Sander lucioperca*) (10%), the rest is represented by species derived from small-scale fish farming (trout (*Salmo akairos*) and tilapia (*Oreochromis spp.*)) or imported from abroad (Badr et al., 2015; Bousseba et al., 2020). Although most of the fish consumed in Morocco are invasive (e.g., black bass, tilapia and pike perch), they have remained in the freshwater systems because of their appeal as sport fish or for their tasty meat (Ainou et al., 2024; GISD, 2024).

The country's capture fisheries production was substantial in 2017, reaching approx. 1.4 million tonnes, with the bulk of the catch coming from the Atlantic (FAO, 2023). By 2020, the total fish production from fisheries and aquaculture had reached 1.37 million tonnes, with European pilchard (*Sardina pilchardus*, sardine) and Atlantic chub mackerel (*Scomber colias*) being prominent species (Ibid.).

The fisheries sector contributed approx. 0.99% to Morocco's GDP in 2020 and provided direct employment to 111,464 people in 2017 (FAO, 2023). Although the contribution towards GDP is low, Morocco is a notable player in the global fish trade. In 2017, it exported fish and fisheries products worth USD 2.2 billion while importing goods valued at USD 174.7 million (FAO, 2023). **In 2020, fish and fish product imports were estimated at USD 187 million, while exports amounted to USD 2 billion, reflecting a significant trade surplus** (Ibid.). This robust performance highlights the importance of the fisheries sector in Morocco's economic landscape, both in production and international trade. The total import and export of fish and fish products is shown in Figure 4. While fisheries in Morocco remain profitable, the existence of jellyfish blooms in most fishing environments threatens the profitability of the fisheries industry in the country. Blooms have negatively affected fishing activities over the past decade in the Moroccan Mediterranean, and the degree of impact varies considerably by fishery and location. Mghili et al., (2022) reported that the species mainly responsible for these losses are *Pelagia noctiluca*, *Rhizostoma pulmo* and *Chrysaora hysoscella*. The **annual direct damage caused by jellyfish was estimated to be as high as USD 3.26 million per year** for the fleet at the port of M'diq (Ibid.). When jellyfish outbreaks occur, fishers must spend time repairing nets damaged by jellyfish, which adds more than 1,783 person-hours of work per year (Mghili et al., 2022).

Figure 4: The total import and export of fish and fish products (2015-2021)

Source: FAO, 2023

Aquaculture

A collective of government departments in Morocco manage the national aquaculture sector. The Livestock Directorate at the Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests (MAPMDREF) enforces health regulations, and inland aquaculture falls under the purview of the High Commissioner for Water and Forests and the Fight Against Desertification (HCEFLCD) (FAO, 2023). The Maritime Fisheries Department of MAPMDREF manages marine aquaculture and is responsible for authorising aquaculture projects, as well as the import and marketing of aquaculture products, in collaboration with the Livestock Directorate (Ibid.). Meanwhile, the Ministry of Public Works issues permits for the occupation of the public maritime domain.

Fish species reared in Morocco involve two fish species categories: cold-water and warm-water (Naji, 2024). Historically, inland aquaculture has focused on the production of coldwater fish, such as rainbow trout (*Oncorhynchus mykiss*) and pike (*Sander lucioperca*), for restocking natural environments (Ibid.). Warm water fish are mainly represented by cyprinids (*Cyprinidae*) and tilapia (*Oreochromis spp.*) (Naji, 2024). In 2004, Morocco's aquaculture production amounted to 1,690 tonnes, making up a mere 0.19 % of the country's total fish production (FAO, 2023). **Most of this aquaculture output, accounting for 47% of the national aquaculture production, was derived from marine aquaculture,** primarily focused on the European seabass (*Dicentrarchus labrax*) and gilthead seabream (*Sparus aurata*), contributing to 91% of the total production (Ibid.). These two species were intensively farmed in floating cages in lagoons and open water. Other indigenous species farmed include brown trout (*Salmo trutta fario macrostigma*), barbel (*Barbus barbus*), the European eel (*Anguilla anguilla*), allis shad (*Alosa alosa*), twaite shad (*Alosa finte*) and flathead grey mullet (*Mugil cephalus*) (FAO, 2023).

In 2017, aquaculture production reached approx. 1,200 tonnes despite several challenges, such as collapsing European market prices and the closure of aquaculture companies (FAO, 2023). Although aquaculture production increased to 1,900 tonnes in 2021, aquaculture production lags capture fisheries, as shown in Table 6. The state of fisheries and aquaculture in the first quarter of 2023 is discussed in Text box 10. Despite efforts to develop and promote freshwater aquaculture in Morocco, neither investors nor small farmers appear to be interested in this niche (Badr et al., 2015). The freshwater fish market is not well developed, and the economic value is kept at a relatively low level. Among the causes of this situation is the consumers' attitude and perception toward buying and using freshwater fish. This lack of interest in freshwater fish is likely due to different barriers such as the products (e.g. flavour, texture and taste), the individual (e.g. attitudes, values, perceptions) and the environment (e.g. situation, culture) (Ibid.). Nonetheless, aquaculture has supported livelihoods in different areas in the country. **In 2017, there were 250 jobs in aquaculture, with most employment opportunities concentrated in marine coastal fishing** (FAO, 2023).

Table 6: Total capture and aquaculture production 2015-2021 (tonnes)

	2015	2016	2017	2018	2019	2020	2021
Aquaculture	1,050	1,142	1,197.7	1,136.9	1,325.3	1,428	1,922.2
Capture	1,364,943	1,447,020	1,377,454	1,371,716.5	1,458,594.2	1,375,314	1,411,771

Source: FAO, 2023

Text box 10

Morocco's robust fisheries sector

Morocco's fisheries and aquaculture are important pillars in its economic landscape, securing its 13th global and top-ranking African position in fish production in 2022. The first quarter of 2023 witnessed a notable surge, with coastal and artisanal fishing landings surpassing 210,000 tonnes - an impressive 9% increase compared to the same period in 2022. This surge translated into a substantial economic impact and amounted to MAD 3 billion (approx. USD 298 million) in the first quarter of 2023 alone.

Diversification was evident in the rising trends across various categories. Seaweed landings, for instance, soared by 51%, reaching an impressive 4,000 tonnes, while shellfish experienced an equivalent percentage increase, totalling 46 tonnes. Crustacean landings also contributed significantly, surpassing 2,500 tonnes and marking a substantial 39% increase.

Pelagic fish witnessed an impressive surge of 13%, amassing over 158,700 tonnes. Following closely, white fish demonstrated a robust 22% increase, reaching 25,700 tonnes. Notably, Mediterranean ports contributed nearly 5,000 tonnes to the fishing products, despite a 13% decrease in quantity, offset by a 9% increase in value.

Should this positive trajectory persist throughout, it would reinforce a consistent upward trend witnessed over recent years, underscoring the sustained growth and improvement in Morocco's fisheries sector. The country's commitment to harnessing its marine resources, if sustainably managed, bodes well for continued economic prosperity and sustainable development of fishing and aquaculture.

Source: Aamari, 2023

Recognising the challenges in developing the aquaculture sector, Moroccan authorities have been striving to establish an economically viable and sustainable aquaculture industry (FAO, 2023). This commitment led to a 1997 collaboration with FAO to assess national aquaculture potential (Ibid.). In 2003, the first National Aquaculture Days were organised to engage all stakeholders in the sector, and the High Commissioner for Water and Forests and the Fight Against Desertification (HCEFLCD) conducted a survey on inland aquaculture and its potential for development (FAO, 2023). Since 2018, the government has been promoting floating cage aquaculture in dam reservoirs for 11 aquaculture cooperatives, with a production capacity exceeding 500 tonnes annually (Naji, 2024). **The semi-arid desert climate in much of Morocco necessitates new aquaculture systems that emphasise water conservation, the use of non-conventional water sources, and the integration of aquaculture with agriculture** (Ibid.). Hydro-agricultural infrastructures, such as dams, irrigation storage basins, and canals, designed for agricultural purposes, offer significant potential for integrated agriculture-aquaculture (IAA) development.

Artisanal fisheries (maritime and continental or freshwater)

Morocco's artisanal fishing industry plays a crucial role in the lives of coastal communities, particularly along the Mediterranean coast (Awadh et al., 2018). It serves as a significant contributor to livelihoods by creating jobs and generating income domestically and through foreign exchange. In Morocco, the industry boasts a sizable fleet, with over 3,100 boats registered in 2019 in the Alboran Sea alone (Malouli Idrissi & Benziane, 2021). These vessels operate from a network of 90 landing sites, encompassing a diverse range of infrastructure: six fishing ports, five fishing towns, and eight dedicated landing points (Ibid.). **The typical artisanal fishing boat in Morocco is a wooden vessel with a tonnage between one and two Gross Registered Tonnes (GRT) and a length under six metres** (Demiathi et al., 2022; Malouli Idrissi & Benziane, 2021). Despite their modest size, these boats are equipped with various fishing gear to target a wide range of marine resources.

Common gear types include gillnets, longlines, hand lines, purse seines, and traps, allowing artisanal fishers to capture both pelagic (open water) and demersal (seabed) fish populations (Malouli Idrissi & Benziane, 2021). The cumulative weight of the artisanal fleet's landings from 2013 to 2018 was 25,792 tonnes (Ibid.). Over 50 species were caught, and the most significant portion of the overall landings was made up of cephalopods and pelagic species (Malouli Idrissi & Benziane, 2021).

In 2018, the combined artisanal and coastal sectors accounted for a staggering 95% of the total fish produced, dwarfing offshore fishing (4%) and other activities (1%) (DMF, 2018). In the same year, artisanal and coastal fishing yielded a combined catch of 1.31 million tonnes, with a value exceeding MAD 7.3 billion (approx. USD 752 million) (Ibid.). This underscores the significant economic contribution of these fishing sectors.

In 2018, sales from the artisanal fishing sector exceeded EUR 23 million (approx. USD 24 million), representing a substantial 39% of all fish market sales (Malouli Idrissi & Benziane, 2021). While job growth within the artisanal fishing sector (small-scale, traditional fleets) has not shown a clear upward trend (Malouli Idrissi & Benziane, 2021), it is believed to offer more stability in terms of employment compared to the coastal fishing industry (medium-scale, commercial fleets).

Industrial fisheries

While coastal and artisanal fisheries play a major role, Morocco's waters also attract foreign industrial fishing vessels. These ships operate under agreements or fishing charters with the Moroccan government (Sambe, 2012). Their primary target is pelagic fish, a category primarily consisting of small, schooling fish species found in the upper water column (Ibid.). The economic significance of foreign fishing activity is extensive. Over 60% of Morocco's sea fishing production, primarily small pelagic fish, is directed towards the "halio-industrial" sector (fishing industry involved in the processing of fish and seafood products onshore), encompassing onshore processing facilities (Doukkali & Kamili, 2018). In 2015, halio-industrial activities generated production of 718,800 tonnes, with a revenue exceeding MAD 21.2 billion (USD 2 billion) (Ibid.). These activities are primarily supported by onshore freezing enterprises (38%), canneries (29%), and fresh fish packaging businesses (10%) (Doukkali & Kamili, 2018). Industrial fisheries do not, however, generally form part of the wildlife economy, as their activities frequently do not align with conservation objectives. They have been included here to show the large contribution that they make to GDP and, therefore, the importance of conserving the natural resource base on which they depend.

Recreational fishing

Recreational fishing (angling) in Morocco is conducted for sport or leisure, typically with rod and line, and it can be consumptive or catch-and-release depending on the water and the rules in force (Government of Morocco, 2014).

Recreational fishing areas are concentrated in the Middle and High Atlas for salmonids and cyprinids, with coastal sport fishing along the 2,000 km Atlantic frontage and parts of the Mediterranean (Hespress, 2023; Oubaidallah, 2022). Inland, popular trout (*Salmoninae*) fisheries include the Amghass 2 reservoir near Ifrane, along with rivers such as Zaouit Ifrane, Guigou, Oum-Er-Rbia, Tizguite, and waters at Ait El Haj and Békrit, under the oversight of the National Agency for Water and Forests (Hespress, 2023). The National Center for Hydrobiology and Fish Farming (CHNP) at Azrou supports these fisheries through stocking and restoration programmes, including releases of rainbow (*Oncorhynchus mykiss*) and native (*Salmo spp.*) trout strains to maintain angling opportunities while conservation actions proceed (Benmahoud, 2021).

Marine recreational fishing takes place from shore and boats, with licensing and catch rules under the maritime fisheries code, and with strong niche products emerging such as surfcasting in Dakhla and billfish (*Xiphioidea*) charters near Mohammedia (Elghoubachi, 2024; Government of Morocco, 2014; Lewis, 2023). Dakhla has been promoted in national tourism plans as a nature and desert sports destination where sport fishing is to be structured and promoted alongside kitesurfing and eco-lodges, signalling policy recognition of angling's tourism value (Tourisma Post, undated). Specialist media report consistent white marlin (*Kajikia albida*) fishing off Mohammedia with occasional blue marlin (*Makaira nigricans*) and dorado (*Dentex dentex*), anchoring a high-value charter segment that can complement wider coastal tourism (Lewis, 2023).

Direct revenue streams include inland fishing permits, special licences for designated waters, day access to special waters, and marine recreational licences including collective licences for organised sea fishing trips and charters (Government of Morocco, 2014; Government of Morocco, 2017). Current inland fees publicised for 2025/26 indicate an annual sport-fishing permit of MAD 600 (approx. USD 65) for anglers aged 15 and over, MAD 80 (approx. USD 9) under 15, daily permits at MAD 80 (approx. USD 9) for residents and MAD 200 (approx. USD 22) for non-resident foreigners, plus special permits of MAD 150 (approx. USD 16) for listed waters and MAD 50 (approx. USD 5) for designated no-kill waters (SFM, 2025).

Organised sport fishing exists in both freshwater and marine contexts, including black bass (*Micropterus salmoides*) "no-kill" competitions, with a 2016 event in Agadir Province drawing many anglers and raising the profile of catch-and-release practice (BAM, 2016). The economic value of individual fish is enhanced under catch-and-release, as the same specimen can be caught, photographed and released many times, sustaining guide days and charter days while keeping stock biomass in the water, which is consistent with international evidence on the economic and conservation benefits of recreational fisheries (NPS, 2018). The maritime code even formalises reporting for releases in *"pêche* no-kill," aligning practice with conservation and enabling future monitoring of live fish value in sport fisheries (Government of Morocco, 2014).

Strategic opportunities include expanding designated catch-and-release zones for salmonids, piloting angler logbooks and visitor surveys to quantify spend and effort, marketing world-class white marlin (*Kajikia albida*) and surfcasting niches, and training local youth as certified guides to lock in rural livelihood benefits. Data at national scale on angling tourist numbers, length of stay and average spend are limited, indicating a clear need for systematic recreational fisheries monitoring in Morocco.

Wildlife trade

Morocco is a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which regulates the international trade of endangered species. **The legal wildlife trade in Morocco is regulated by the High**

Authority for Water and Forests (HCEFL) under the Ministry of Agriculture, Maritime Fisheries, Rural Development and Water and Forests (MAPMDREF). HCEFL is responsible for issuing permits to export and import certain species. The trade primarily focuses on the export of live animals, such as birds and reptiles, and hunting trophies and hides (see Text box 11). Before 2011, Morocco lacked specific legislation addressing wildlife trade, with hunting laws being the closest regulatory framework available. In 2011, the CITES National Legislation Project assisted in establishing Law 29-05 on the Protection of Species of Flora and Fauna and the Control of their Trade, officially promulgated at the national level (Bergin, 2019). This Law, which applies to domestic and international trade, was enacted in 2015. Law 29-05 is comprehensive, clear, and enforceable. It prohibits the trade of species protected under Morocco's national protected species list, developed in 1923, and those listed in the CITES Appendices (Ibid.). Some of these species include the Barbary leopard (*Panthera pardus pardus*), waldrapp (*Geronticus eremita*), Mediterranean monk seal (*Monachus monachus*), Barbary hyena (*Hyaena hyaena)*, Cuvier's gazelle (*Gazella cuvieri*) and the Spanish imperial eagle (*Aquila adalberti*). Any trade involving these protected species requires a permit and proof that the trade will not threaten their wild populations (Bergin, 2019). The implementation of this law has empowered the Directorate of Water and Forests (*Eaux et Forêts*) to more effectively combat illegal wildlife trade, both nationally and internationally, imposing fines of up to MAD 100,000 (approx. USD 10,000) for violations (Bergin et al., 2018; Bergin, 2019).

The number of species legally traded in Morocco from 2015-2021 is shown in Table 7. These species and species derivatives were mainly exported to Singapore (5,703,000 species or specimens), Hong Kong (3,586,341), South Korea (1,683,408 species or specimens), the United States of America (1,047,789 species or specimens) and the Netherlands (384,320 species or specimens) (CITES, 2024). The purpose and source of the wildlife parts and specimens are shown in Table 8. The corresponding USD values for this trade were not found but would be substantial.

Text box 11

Trade in reptiles in contemporary Morocco for medicinal purposes

Reptiles have long been sought after globally for their purported medicinal properties, and Morocco is no exception to this trend. While historical accounts abound regarding the traditional use of reptiles in Moroccan medicine, there remains a dearth of contemporary quantitative data on the extent of this trade. However, a comprehensive study conducted between 2013 and 2014 sought to shed light on this issue by surveying 49 wildlife markets spread across 20 towns in Morocco, including the Spanish enclaves of Ceuta and Melilla. The findings of this study revealed a **thriving trade in reptiles for medicinal purposes within Morocco**, with a staggering 1,586 specimens from at least nine different species being recorded. These specimens, with a combined value of approx. USD 100,000, were observed for sale in 14 of the Moroccan markets surveyed. Notably, the markets in Marrakesh, Meknes, Casablanca, and Fez emerged as particularly prominent hubs for this trade.

Among the species traded, the Mediterranean chameleon (*Chamaeleo chamaeleon*) and Bell's Dabb lizard (*Uromastyx acanthinura*) stood out as the most commonly encountered. Both dried and live specimens of these reptiles were available, with Marrakesh and Meknes featuring markets trading equal quantities of both forms, while Casablanca and Fez predominantly dealt in dried specimens. Additionally, the study identified the presence of over 200 African rock python (*Python sebae*) skins, suggesting possible illicit imports from other parts of Africa. Despite legal protections afforded to these species locally within Morocco and internationally through CITES, the trade in reptiles for medicinal purposes continues unabated. Alarmingly, traders often fail to disclose the legal status of these species or the restrictions on their trade to potential buyers.

The significant turnover rate observed for species such as the Mediterranean chameleon (*Chamaeleo chamaeleon*) and Bell's Dabb lizard (*Uromastyx acanthinura*) is particularly concerning, indicating a high demand for these animals in Moroccan traditional medicine. Repeat surveys over four weeks revealed a turnover rate of 66% for both species, translating to an estimated annual turnover of 1,520 chameleons and 775 lizards. Given the implications of this trade for the conservation of important species, there is an **urgent need for increased enforcement of existing wildlife protection legislation in Morocco.** Without concerted efforts to curb the over-utilisation of reptiles for medicinal purposes, the illegal wildlife trade could further imperil these species and disrupt fragile ecosystems.

Source: Nijman & Bergin, 2017

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Table 7: Number of legally traded wildlife species or specimens in Morocco (2015-2021)

Common Name	Scientific Name	Total exporter reported quantity	Total importer reported quantity
Addax	*Addax nasomaculatus*	108	34
American alligator	*Alligator mississippiensis*	41	81
Barbary sheep	*Ammotragus lervia*	16	9
European eel	*Anguilla anguilla*	2,102,892	1,672,664
Agarwood	*Aquilaria malaccensis*	0	0
Okoumé	*Aucoumea klaineana*	384,160	0
Caracal	*Caracal caracal*	1	0
Macqueen's bustard	*Chlamydotis macqueenii*	1	0
Undulated bustard	*Chlamydotis undulata*	29,332	9,218
Red coral	*Corallium elatius*	3	0
Nile crocodile	*Crocodylus niloticus*	112	2
Black rosewood	*Dalbergia nigra*	0	0
Elephants	*Elephantidae spp.*	1	1
Hawksbill sea turtle	*Eretmochelys imbricata*	1	0
Canary island spurge	*Euphorbia resinifera*	0	0
Saker falcon	*Falco cherrug*	116	67
Hybrid falcon	*Falco hybrid*	932	569
Peregrine falcon	*Falco peregrinus*	8	28
Gyrfalcon	*Falco rusticolus*	1,140	595
Falcons	*Falco spp.*	2	0
Mushroom coral	*Fungia fungites*	1	0
Northern bald ibis	*Geronticus eremita*	179	0
Griffon vulture	*Gyps fulvus*	1	0
Shortfin mako	*Isurus oxyrinchus*	730	0
Cuban frogfish	*Lapemis curtus*	212	0
African elephant	*Loxodonta africana*	3	3
Barbary macaque	*Macaca sylvanus*	25	160
Reticulated python	*Malayopython reticulatus*	1,012	805
Prickly pear cactus	*Opuntia ficus-indica*	23,565	1,050
Killer whale	*Orcinus orca*	1	0
Mexican Candelabra Cactus	*Pachycereus pringlei*	20	10
African lion	*Panthera leo*	13	2
African leopard	*Panthera pardus*	4	0
Tiger	*Panthera tigris*	4	0
Indian peafowl	*Pavo cristatus*	3	0
Ankel's pocillopora	*Pocillopora ankeli*	1	0
African cherry	*Prunus africana*	4,393	4,393
Grey Parrot	*Psittacus erithacus*	7	5
Puma	*Puma concolor*	6	0
Burmese python	*Python bivittatus*	133	67
Brongersma's python	*Python brongersmai*	26	71
Royal python	*Python regius*	1	1
African rock python	*Python sebae*	12	0
Pythons	*Python spp.*	4	0
Large-flowered cactus	*Selenicereus grandiflorus*	500	500
Scalloped hammerhead	*Sphyrna lewini*	1	0
Smooth hammerhead	*Sphyrna zygaena*	1	0
Common ostrich	*Struthio camelus*	48	48
Spur-thighed tortoise	*Testudo graeca*	9	0
Bell's dabb lizard	*Uromastyx acanthinura*	3	0

Source: CITES, 2024

Table 8: The purpose and source of the wildlife parts and specimens traded in Morocco (2015-2021)

Source	Purpose	Count
Artificially propagated	P	1
Artificially propagated	T	2
Bred in captivity	B	17
Bred in captivity	E	1
Bred in captivity	M	1
Bred in captivity	N	13
Bred in captivity	P	129
Bred in captivity	Q	47
Bred in captivity	S	11
Bred in captivity	T	61
Bred in captivity	Z	11
Bred in captivity (Appendix-I)	E	3
Bred in captivity (Appendix-I)	P	7
Bred in captivity (Appendix-I)	Q	1
Born in captivity	B	4
Born in captivity	P	7
Born in captivity	Q	1
Born in captivity	S	1
Born in captivity	T	1
Confiscated or seized	P	6
Confiscated or seized	T	4
Pre-convention specimen	P	1
Pre-convention specimen	Q	4
Pre-convention specimen	T	6
Ranched specimen	T	27
Unknown	P	7
Wild	B	6
Wild	E	10
Wild	H	7
Wild	M	2
Wild	P	80
Wild	Q	4
Wild	S	14
Wild	T	146
Wild	Z	5

Where B = artificial propagation, E = Educational, H = Hunting trophy, M = Medicinal, N = Reintroduction or introduction, P = Personal, Q = Circus or travel exhibition, S = Scientific, T = Commercial, Z=Zoo.
Source: CITES, 2024

As highlighted in Text Box 11, Morocco faces issues with illegal wildlife trade. There are **concerns about the effectiveness of the regulatory framework and the enforcement of regulations to curb illegal wildlife trade** (Nijman et al., 2016; Nijman & Bergin, 2017). The illegal wildlife trade poses a significant threat to global biodiversity, driving numerous species towards extinction (Bergin & Nijman, 2014). The animals in these illegal markets suffer terribly due to poor conditions and animal cruelty (Dasgupta, 2018; Bergin & Nijman, 2018). While Morocco as a member of CITES, has taken steps to combat this issue with a draft law against animal cruelty (Bergin & Nijman, 2018), the illegal trade in wild animals persists, particularly in open markets. These markets primarily deal in skins of endangered carnivores such as leopard (*Panthera pardus*), lion (*Panthera leo*), and serval (*Leptailurus serval*) which are sometimes sourced outside the country (Bergin & Nijman, 2018). In 2015, Bergin and Nijman's (2015) research revealed a disturbing trend: **leopard (*Panthera pardus*) skins remained readily available in Morocco even after new regulations outlawed such trade**.

The wildlife trade is often fuelled by deeply ingrained cultural beliefs. For instance, chameleons (*Chamaeleonidae*) are believed to possess magical powers, monitor lizards (*Varanus*) are thought to harbour the souls of the departed, and the Bell's Dabb lizard (*Uromastyx acanthinura*) is reputed to bring good fortune (Highfield & Bayley, 2007; Bergin, 2019). These beliefs perpetuate the demand for certain species, driving their exploitation and further exacerbating the threats already vulnerable wildlife populations face. The situation is further compounded by the disproportionate targeting of carnivores. A study by Bergin and Nijman (2015) found that 33% of imported wildlife specimens belonged to carnivore species, compared to just 6% for all mammals and reptiles combined. Furthermore, 80% of the skins identified were illegal imports lacking permits or classified as national treasures (Bergin & Nijman, 2015). Despite this, vendors openly admitted to acquiring these skins from other sub-Saharan African countries without authorisation (Bergin & Nijman, 2015). Although suspected to originate from outside Morocco, leopards are particularly sought after for their skins, prized for decoration and perceived medicinal benefits. Lion (*Panthera leo*) and serval (*Leptailurus serval*) skins, while less common, are also available for purchase as decorative items (Nijman et al., 2016; 2019). The derivatives of these carnivore species are often used in the production of souvenirs and decorations for tourists and local people (Bergin, 2019).

Forest products

Morocco has a remarkably diverse range of forest species due to its varied climate and ecological conditions. **These forests cover nearly nine million hectares** (Laaribya, 2023; Serbouti et al., 2023), with the majority (over 6.2 million hectares) concentrated in the north, between coastal plains and hills (ANEF, 2021). Lush broadleaf forests dominate the landscape, covering 71% of the area and featuring species such as Holly oak (*Quercus rotundifolia*), Cork oak (*Quercus suber*), and Pyrenean oak (*Quercus pyrenaica*) alongside coniferous giants (Maritime pine (*Pinus pinaster*), Black pine (*Pinus nigra*), and Atlas cedar (*Cedrus atlantica*)) (Muller et al., 2015). These forests thrive across diverse climates, from semi-arid to humid. Lowland areas boast the Aarar tree (*Tetraclinis articulata*), pine forests (*Pinus sp.*), Oleaster (*Olea europaea sp.*), and carob trees (*Ceratonia siliqua*) (Benabid, 1985; Muller et al., 2015).

Scattered throughout are pockets of unique and threatened species such as Argan (*Argania spinosa L.*) and Moroccan cypress (*Cupressus atlantica*) (Genin & Simenel, 2011; Msanda et al., 2021).

Arid and Saharan ecosystems are dominated by steppes and herbaceous plants, representing approx. 11% of forest cover (Serbouti et al., 2023). These arid expanses are primarily adorned with steppes, predominantly perennial grass (*Stipa tenacissima),* in the eastern Sahara and Moulouya plain, while *Acacia sp.* formations thrive in the southern provinces (Blanco et al., 2015; Rhanem, 2009). **Over the past four decades, annual reforestation efforts have significantly increased, from 10,000 hectares per year in the early 1980s to over 44,000 hectares per year during the 2010-2020 campaigns** (Alaoui et al., 2020; ANEF, 2020). While Aleppo pine (*Pinus halepensis*) remains the most commonly planted species during these endeavours, reforesting with natural stands has been somewhat overlooked (Alaoui et al., 2020; ANEF, 2020).

Despite the extensive forest landscape, **Morocco's forests face significant challenges**. Forest cover declined by 4,100 ha or 0.08% per year over the 1990 and 2010 period (Mongabay, 2010). From 2001 to 2023, Morocco lost 58.6 kha of tree cover, equivalent to a 9.0% decrease in tree cover since 2000 (Global Forest Watch, 2024). In 2023, it lost 3.51 kha of natural forest (Ibid.). Ellatifi (2005) estimated that **deforestation and forest degradation could cost approx. 0.2% of the country's GDP**. This degradation is driven by various factors, including unsustainable logging, agricultural expansion, and climate change, which all contribute to the loss of forest cover and the health of these vital ecosystems (Laaribya, 2023; Serbouti et al., 2023; Waroux & Lambin, 2012). The drivers of argan woodland degradation are outlined in Text Box 12, while Text Box 13 focuses on the broader impacts of land degradation in Morocco.

Morocco's forests are important for the country's economy, society, environment, and culture. People in Morocco rely on a wide variety of forest products for their daily lives (Laaribya, 2023) (see Text box 14). These products include essentials such as food (fruits, nuts, vegetables), fuel, and construction materials (timber), as well as other valuable resources such as cork (from cork oak (*Quercus suber*)), medicine (from various plants such as the strawberry tree (*Arbutus unedo*)), and dyes

Text box 12

Degradation in arid and semi-arid forests and woodlands: The case of the Argan woodlands

Despite extensive studies on deforestation in tropical forests and land degradation in drylands, there remains a surprising lack of understanding regarding the extent and processes of degradation in these ecosystems. **The argan tree (*Argania spinosa*) is endemic to southwestern Morocco** and covered approx. 950,000 hectares in 2010. These argan woodlands form part of the Mediterranean Acacia-Argania dry woodlands ecoregion and were designated as a UNESCO "Man and the Biosphere Reserve" in 1998. Tree density within these woodlands varies widely, ranging from under 30 trees per hectare to over 80 trees per hectare. Argan trees exhibit diverse sizes, from shrubs less than one metre tall to towering trees exceeding five metres. They thrive at altitudes ranging from sea level to 1,500 metres, in areas experiencing rainfall levels between 150 and 400 millimetres per year. The argan tree's resilience to arid conditions is partly attributed to its deep-reaching roots and ability to shed leaves during severe droughts. Traditionally, argan trees have provided numerous ecosystem goods and services, including fruits used to produce argan oil, leaves and young shoots consumed by livestock such as sheep, goats, and camels, and wood for fibre and fuel.

A study conducted in southwest Morocco which aimed to investigate the degradation of argan woodlands, found a significant decrease in forest density in the region. The study showed that between 1970 and 2007, tree density had changed from an average of 27.4 trees per hectare to 15.2 trees per hectare, representing a decline of 12.2 trees per hectare, or 44.5%. Despite the widespread use of firewood for baking and cooking among households in the study area, the results suggested that fuelwood extraction and wood trade may have had minimal or no impact on forest decline. Additionally, the study revealed a lack of correlation between livestock density and forest density decline, challenging the commonly held belief regarding the direct detrimental effects of browsing on trees compared to other stress factors. **The observed high rates of change in dryland forests were primarily attributed to the impacts of aridity on trees**, with increasing aridity contributing to the observed decline. This study highlighted how social, biophysical, and local and distant factors combine to drive forest density decline in argan woodlands, underlining the importance of considering them as a whole rather than in isolation.

Source: Waroux & Lambin, 2012

The argan tree is endemic to southwestern Morocco

Provides numerous ecosystem goods and services

Tree density decline of 44.5% between 1970 and 2007

Text box 13

The economic imperative and environmental significance of addressing land degradation

Land degradation in Morocco affects up to 40% of its territory, resulting in an estimated annual cost of USD 591 million. Degraded lands are often unable to hold rainwater leading to further soil erosion and flooding. Land degradation not only reduces soil fertility and increases water pollution in rivers but also directly impacts employment by reducing agricultural productivity, which many citizens rely on for their livelihoods.

Addressing land degradation is crucial for maintaining biodiversity and ecosystem health, as it conserves the habitats of countless plant and animal species. This would also help to mitigate climate change, conserve biodiversity and increase food production. **To minimise the effects of land degradation Morocco has adapted the "Noor-Ouarzazate solar power plant"** which will provide 18% of Morocco's annual electricity requirements. This project will save one million tonnes of oil and prevent the emission of 3.7 million tonnes of CO_2.

The Agriculture, Forestry, and Other Land Use (AFOLU) sector accounts for 13% of Morocco's greenhouse gas (GHG) emissions. However, Morocco committed to reducing its GHG emissions by 17% in 2024, a step that will help combat land degradation and address other climate challenges, such as air pollution. **Tackling land degradation is projected to save Morocco 0.54% of its GDP**, freeing up resources to invest in critical sectors such as tourism and education, thereby fostering broader economic growth**.** Adopting no-tillage soil conservation techniques would help Morocco to maintain its land, support diversity of species, and impact the expansion of tourism through safekeeping of habitats such as reserves, national parks and others.

Source: IAEA, undated

(from plants such as the bramble (*Rubus ulmifolius)*) (Serbouti et al., 2023). Forests serve much more than just as a source of timber; they are a vital reservoir of natural materials, supplying tannins, gums, and resins that are essential for various industries. For instance, the stone pine (*Pinus pinea*) common in Morocco provides materials for cosmetics and handicrafts (Laaribya, 2023). Forests also provide a wealth of essential services, safeguarding the soil from erosion, offering recreational areas for leisure, and serving as sacred spaces for cultural and religious practices (Montanari et al., 2023). However, the economic windfall from forests is not always evenly distributed. For example, the **Market Research Future (MRFR) predicted a staggering 7.1% compound annual growth rate (CAGR) for argan oil between 2019 and 2024, with a projected market value of USD 676.51 million** (Montanari, 2023). This figure shows huge potential in the argan oil industry, yet the reality of women working within argan-related cooperatives tells a different story (see Text box 15).

Text box 14

Forest management and the functional shaping of rural forests in southern Morocco

Forests and rural livelihoods have a long historical interconnection. Forest resources provide food, fuelwood, and materials for construction, handicrafts and medicinal and ritual purposes. Amazigh rural societies have managed their forest resources at different scales (individual trees, tree stands, landscapes) and have shaped their forest landscapes into diversified patches to satisfy material, social, cultural and long-term needs. The management system is influenced by the functions that trees and forests contribute to the livelihoods of local populations. However, the potential of this endogenous forest management system is seldom recognised by the authorities in charge of forest management, and its ecological and social impacts are poorly documented. Amazigh communities in Morocco occupy an extensive area mainly stretching from the mountains of the Middle and High Atlas to the southern parts of the Anti-Atlas chain and pre-Saharan zone.

Moving forward, there is a **need to recognise and support Amazigh communities' traditional forest management practices, fostering sustainable stewardship of forest resources while safeguarding these landscapes' ecological and cultural integrity.** By acknowledging the invaluable contributions of local populations to forest conservation and management, the country can ensure the continued resilience and vitality of forest ecosystems for generations to come.

Source: Genin & Simenel, 2011

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Text box 15

Benefit sharing and access to argan oil for rural women in Morocco

In Morocco's Souss Massa region, the argan tree is a cornerstone of the ecosystem and economy. Traditionally, women have played a vital role in managing the argan forest, collecting nuts, and using their time-tested methods to extract argan oil for culinary and cosmetic purposes. This practice not only provided for their families but also created economic opportunities through sales in local markets. However, a recent study investigating the impact of the booming international argan oil trade on women's cooperatives revealed a complex situation. While cooperatives initially empowered women by offering income and participation in development programmes, the surge in demand has attracted new players who often bypass these established structures. This shift in dynamics has significantly impacted women's control over nut collection and, consequently, their income. The emergence of illegal harvesters has exacerbated the situation, particularly since the COVID-19 pandemic, leading to increased competition and even harassment of women collecting nuts in the forest. Furthermore, the study found that not all cooperatives operate fairly. Some exploit women's labour, offering little to no compensation despite the thriving argan oil market. These findings highlight the **urgent need for a sustainable development model that ensures women's roles in the argan oil trade are valued**. Their traditional knowledge and labour are fundamental to the argan ecosystem's health and cooperatives' success.

Moving forward, **Morocco should prioritise including women in decision-making processes related to resource access and control**. Fair compensation mechanisms are crucial to ensure women are valued for their knowledge and labour. Recognising the argan tree and its associated traditional knowledge as a symbol of Amazigh identity would further empower these communities. Finally, multinational corporations must be held accountable for their role in the argan oil trade by financially supporting initiatives aligned with the Nagoya Protocol, which promotes the fair and equitable sharing of benefits from genetic resources such as the argan tree. By implementing these recommendations, Morocco can ensure a future where the argan oil trade benefits both the environment and the women who have stewarded this valuable resource for generations.

Source: Montanari et al., 2023

Forests contribute significantly to Moroccan diets by providing vitamins, minerals, and various food sources. These include fruits (pears (*Pyrus mamorensis*), walnuts (*Juglans regia*), acorns (*Quercus spp*., oaks), pine nuts (*Pinus pinea*, stone pine), argan fruits (*Argania spinosa*, argan tree), olives (*Olea europaea*, olive tree), jujubes (*Ziziphus lotus*, jujube tree)), vegetables (asparagus (*Asparagus angustifolius*)), herbs (thyme (*Thymus sp.*), rosemary (*Rosmarinus officinalis*)), and even meat from animals that graze in the forest (such as sheep (*Ovis aries*), goats (*Capra aegagrus hircus*), and cattle (*Bos taurus*)) (Laaribya, 2023; Serbouti et al., 2023). Ellatifi (2000) estimated that over eight million livestock graze in Moroccan forests for half a year, contributing substantially to the country's meat (67,300 tonnes) and dairy production. Species such as eucalyptus (*Eucalyptus spp.*), olives (*Olea europaea*), asparagus (*Asparagus angustifolius*) and prickly pear cactus (*Opuntia spp.*) are not indigenous to Morocco but have naturalised in its forests, further contributing to the ecological and economic value of these landscapes.

Unlocking the full economic potential of these forests and their products hinges upon sustainable utilisation by local populations (Laaribya, 2023). Forest products such as fruits, nuts, and medicinal plants have immense promise, yet their significance and value are often unrecognised due to insufficient awareness and fragmented statistical data at the national level (Croitoru, 2007; Laaribya, 2023). **The economic contribution of forests is estimated at approx. 1% of Morocco's annual GDP** (Chebli et al., 2021; Nerfa et al., 2020). It is also **estimated that approx. seven million people live or rely directly on forest products for their livelihoods** (Chebli et al., 2018; Moukrim et al., 2019). However, **the oversight in the socio-economic contribution of forest products can potentially make deforestation for alternative land uses seem more appealing, resulting in unsustainable harvesting of specific forest products** (Benabou et al., 2022; Croitoru, 2007). These circumstances frequently culminate in long-term losses of welfare and forest product benefits (Ibid.). Although outdated, Table 9 provides the values of forest products in Morocco. The data in Table 9 may, however, no longer accurately reflect current trends: it would be useful to update these values.

The underappreciation of forest products, coupled with fragmented data, hampers the recognition of their true value. Without proper awareness and effective policies, there is a risk of prioritising short-term gains, such as deforestation for alternative land uses, over the long-term sustainability of forest resources. Therefore, addressing these gaps in knowledge and promoting sustainable practices will be key to conserving both the socio-economic benefits and ecological health of Morocco's forests.

Table 9: The value of forest products in Morocco per category (USD/ha, 2005 prices)

	Firewood	Grazing	Cork	Mushrooms	Honey	Other NTFPs	Total NTFPs
Value (USD/ha)	21.93	39.99	1.29	1.29	5.16	1.29	70.95

Source: Croitoru, 2007

Apiculture

Beekeeping is a fundamental pillar of agricultural development in Morocco, particularly in regions where agriculture contributes significantly to the regional gross domestic product (Aglagane et al., 2022; Bakour et al., 2021). **Despite the potential for high honey production, Moroccan honey exports remain relatively low and limited to small quantities intended for exhibitions and fairs** (Khaoula et al., 2019). Annual production **figures of honey have fluctuated between 2,500 and 3,800 tonnes, displaying stagnation or even declines in some instances** (Meneau, 2008). In 2019, efforts were underway to facilitate Moroccan honey access to the European market (Khaoula et al., 2019). A key obstacle, however, lies in the incomplete understanding of Moroccan consumers' habits, needs, and preferences, coupled with a lack of accurate marketing knowledge, hindering the establishment of effective marketing strategies and programmes to expand market share both domestically and internationally (Khaoula et al., 2019). Addressing these challenges and implementing comprehensive strategies will be crucial for revitalising the Moroccan honey industry and unlocking its full potential for economic growth and sustainability (Moujanni et al., 2017).

In the Fez-Meknes region, an agricultural hub in Morocco, beekeepers primarily work with the *Apis mellifera intermissa* breed, known for its swarming behaviour, aggressive tendencies and for its high honey production (Bakour et al., 2021). Within this region, **apiaries typically yield between 20 and 60 kg of honey per hive, with some achieving even higher production levels** (Ibid.). Beekeepers produce and market honey, and other bee products such as beeswax, fresh bee pollen, propolis, dry bee pollen, queen bee rearing, royal jelly, bee venom, fresh bee bread, and dry bee bread (Ibid.). Text box 16 discusses apiculture in Morocco's largest apiary.

Text box 16

Morocco's Inzerki Apiary

The Inzerki Apiary, located in Argana in the Souss-Massa region, 82 kilometres north of Agadir, is the **world's largest traditional collective apiary.** Known locally as *Taddart Ugerram* or the Saint's Apiary, it was built in 1850 and stands approx. 1,000 metres above sea level. Constructed from mud, palm, wood, and braided reeds, it showcases traditional Amazigh architecture and has been carefully restored after major floods in 1990 and 1996, with assistance from UNESCO (United Nations Educational, Scientific and Cultural Organization), USAID (United States Agency for International Development), and Morocco's Green Morocco Plan.

The collective apiary belongs to approx. 250 holders, each responsible for 15 to 20 hives within its vast structure, similar to collective granaries that store farmers' harvests. With over 3,700 hives housing tens of thousands of Saharan yellow bees (*Apis mellifera sahariensis*), an endemic North African subspecies, the apiary sustains pollination across a wide range of flora including argan, thyme, acacia, almond, lavender, juniper, and orange blossom. This contributes to high-quality honey production, especially thyme honey, and supports the argan groves that hold cultural and economic significance for local Amazigh communities.

Economically, the Inzerki site generates an estimated **MAD 4 million (approx. USD 402,000) in annual honey value**, with a **total potential of MAD 10 million (approx. USD 1 million)** when pollination and wider ecosystem services are included. Recognising the effects of climate change and biodiversity loss, a **GEF/UNDP circular economy project** has reoriented the apiary's management from a production model to an **ecosystem service approach**, introducing **payment for ecosystem services (PES)** and a **biosphere reserve ecolabel**. This model rewards local beekeepers and landholders for conservation practices such as regulated grazing, habitat restoration, and sustainable transhumance.

Under the PES system, participants may receive **up to MAD 700 (approx. USD 70) per hectare** for habitat protection and **MAD 10 (approx. USD 1) per kilogram** for ecolabelled honey. The newly established **Argan Biosphere Reserve Ecolabel Moroccan Association (ABR.EMA)** oversees certification, governance, and fair-trade standards for honey, argan oil, and other local products. Through this integrated approach, Inzerki combines heritage conservation, sustainable production, and rural development, serving as a model for linking traditional apiculture with modern ecological and economic resilience in Morocco.

Sources: Haddouch & Faouzi, 2024; MWN, 2020

Wood

Forest ecosystems play a crucial role in bolstering the local economy and meeting daily needs by providing various ecosystem services. Among these services, wood products constitute a significant portion of their economic value (see Text box 17) (Alaoui et al., 2020; Benabou et al., 2022). **In Morocco, the economic value of wood is substantial and generates an annual socio-economic value exceeding MAD 199 million (approx. USD 20 million), or MAD 5,981 (approx. USD 599) per hectare per year** (Alaoui et al., 2023). Of this value, 66.8% is derived from the right-use system (legal rights or permits granted to individuals or groups for the sustainable use of forest resources), totalling over MAD 133 million (approx. USD 13.4 million), followed by auction sales accounting for 31.09%, and illegal cuts amounting to MAD 4.2 million (approx. USD 424,324) (Alaoui et al., 2023). **The annual economic direct use value of wood surpasses MAD 50 million (approx. USD 5 million) for timber and exceeds MAD 3 million (approx. USD 300,000) for firewood, totalling approx. MAD 53.6 million (approx. USD 5.3 million)** (Alaoui et al., 2023). Additionally, the annual average value of taxes levied on wood is estimated at MAD 8.2 million (approx. USD 828,443) (Ibid.). Consequently, the annual average use value exceeds MAD 61.89 million (approx. USD 6.2 million), with the majority (95.92%) stemming from timber (Alaoui et al., 2023).

Text box 17

Ecosystem services of forest stands in Maamora

In Morocco, the national accounting system does not adequately recognise the diverse contributions of the forestry sector to the economy, particularly non-timber forest products and services. Instead, these contributions are grouped under the broader category of 'Agriculture, Forestry, and Fishing', resulting in an insufficient emphasis on the economic role of forest ecosystems.

Benabou et al. (2022) mapped the spatial distribution of various ecosystem services in the Maamora forest, located in northwestern Morocco near the Atlantic Ocean. Their research distinguished between the capacity of forest ecosystems to produce these services and the actual flow of those services. By analysing this relationship, the study sought to create detailed maps illustrating the spatial balance between the capacity and flow of selected ecosystem services.

Using ecosystem service capacity and flow as indicators, the study provided relevant and accurate measures of ecosystem services within the Maamora forest. Results highlighted different aspects of forest management, including firewood harvesting, timber and industrial wood harvesting, forage production, cork harvesting, carbon storage, and acorn gathering. Eucalyptus (*Eucalyptus spp.*) exhibited high capacities and flows for most parameters, underscoring its significance in resource availability and utilisation (Table 10). Conversely, species such as Acacia (*Acacia spp.*) and Pine (*Pinus spp.*) showed relatively lower capacities and flows than others. Notably, cork oak (*Quercus suber*) emerged as a significant contributor to carbon storage, reflecting its ecological and economic importance (Figure 5). It should, however, be noted that eucalyptus, pine and acacia are not indigenous to Morocco and, therefore, do not generally form part of the wildlife economy, which focuses on activities which align with conservation objectives.

Source: Benabou et al., 2022

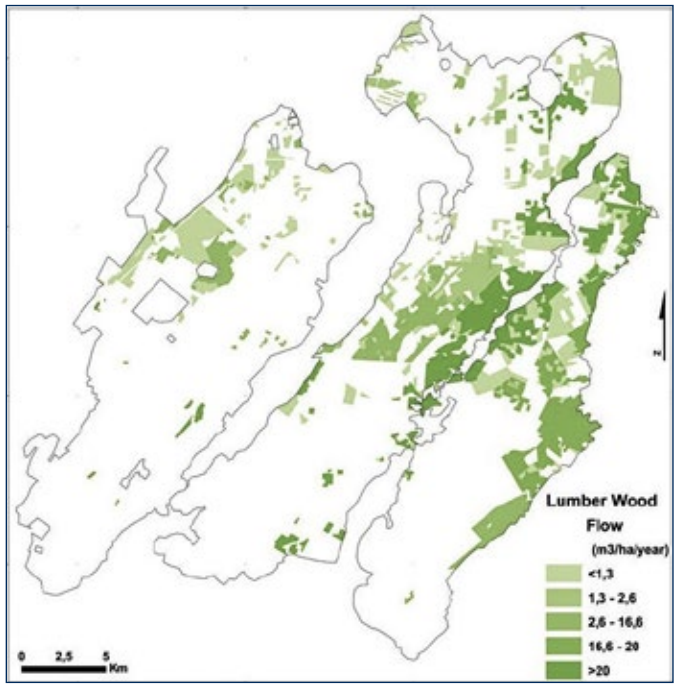
Table 10: Accounting tables for ecosystem service

Species	Firewood harvesting (Stere/year)		Harvesting of timber and industrial wood (m^3/year)		Forage (SLU*/year)		Cork harvesting (Stere**/ year)		Carbon storage (MgC)	Acorn gathering (Tonne/year)
	Capacity	Flow	Capacity	Flow	Capacity	Flow	Capacity	Flow	Capacity	Capacity
Acacia	4,526	12,234	4,464	1,857	402	546			168,872	
Eucalyptus	13,744	46,627	292,729	218,083	1,543	4,325			1,430,545	
Pine	3,369	9,453	5,415	4,576	600	1,421			202,331	
Cork Oak	28,177	99,463			52,396	172,011	77,261	74,170	6,869,864	34,487
Bareland									33,078	
Total	**49,816**	**167,777**	**302,607**	**224,515**	**54,941**	**178,303**	**77,261**	**74,170**	**8,704,689**	**34,487**

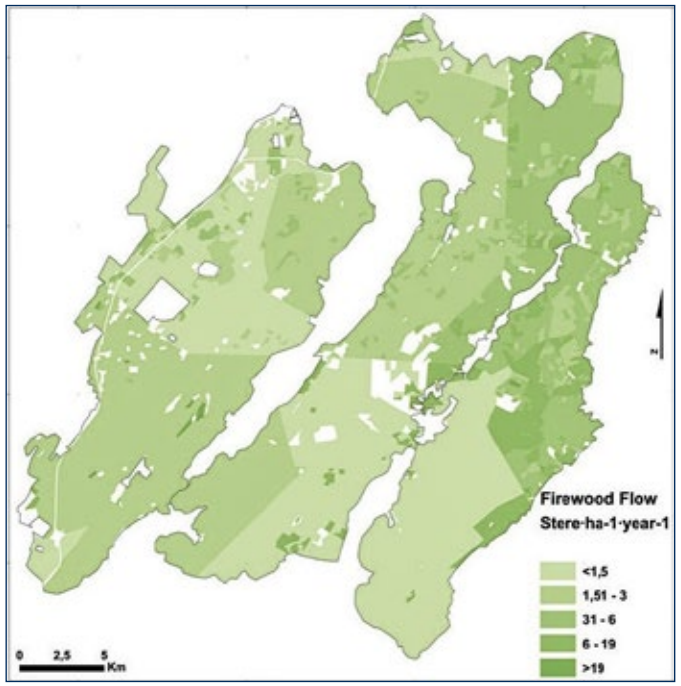
*SLU is Standard Livestock Unit and **Stere is the unit of measurement used to quantify firewood, timber, or wood for fuel.

Source: Benabou et al., 2022

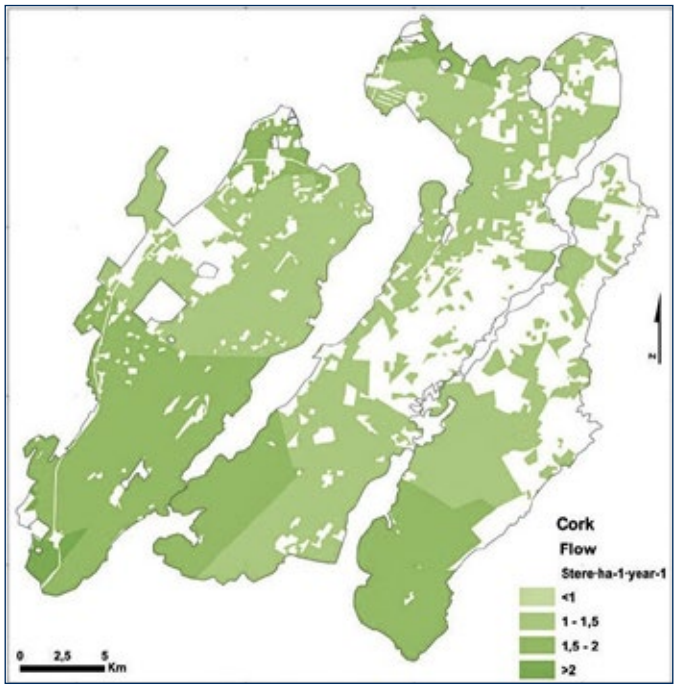
Figure 5: Maps of the ecosystem services flow



a) Timber and industrial wood harvest



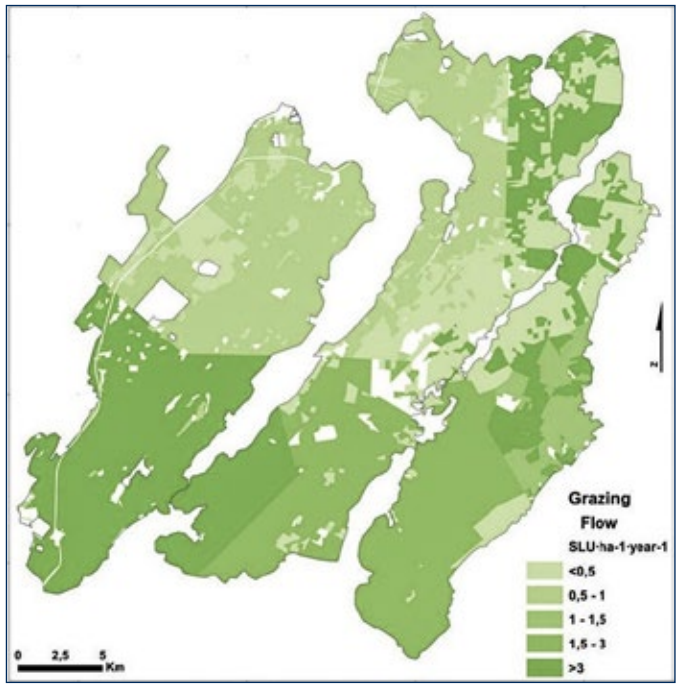
b) Firewood harvest



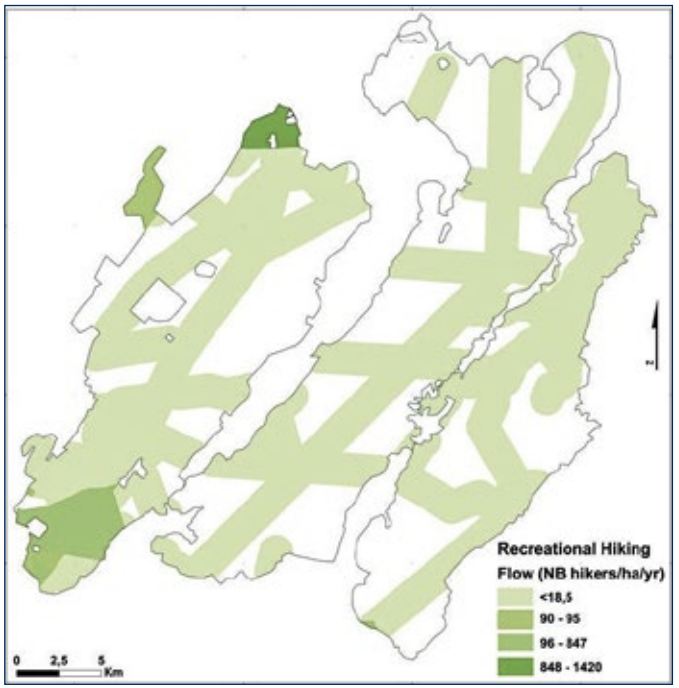
c) Cork harvest

Source: Benabou et al., 2022

Figure 5: Maps of the ecosystem services flow



d) Forage production



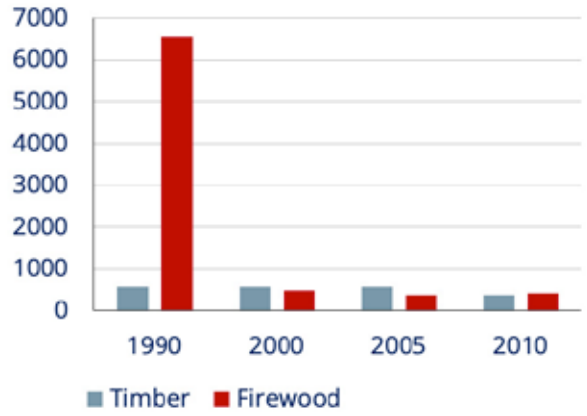
e) Recreational hiking

Source: Benabou et al., 2022


© Credit Rémi LOZACH from Pixabay

Wood utilisation activities generate income for both the workforce and logging operations, with the estimated number of workdays created for the population being part of wood's economic direct use value (Alaoui et al., 2023). This highlights the significance of timber value compared to imports of processed wood products (Alaoui et al., 2023; Pettenella & Masiero, 2013). Morocco's roundwood production, encompassing timber and fuelwood, significantly declined between 1990 and 2010 (Pettenella & Masiero, 2013). Timber production dropped over 34%, falling from 583 m^3 to 383 m^3 (Ibid.) (see Figure 6). Fuelwood production followed a similar trend, with a peak of 574 m^3 in 2005, and a decrease to 372.1 m^3 in 2010 (a decline of roughly 35%) (Pettenella & Masiero, 2013). This decline is mirrored in roundwood production per hectare value, which plummeted from USD 235.69 in 1990 to USD 67.46 in 2010 (a decrease of over 70%) (see Figure 7). Several factors, including changes in forest management practices, environmental shifts, and evolving market dynamics, likely contributed to this downward trend (Masiero et al., 2016; Pettenella & Masiero, 2013). **In order to focus on the wildlife economy, the planting of indigenous trees is encouraged, along with sustainable forest management and harvesting practices.** It should be noted that the figures referenced are over 15 years old, and no updated national data on roundwood or timber production in Morocco could be found.

Figure 6: Roundwood production in Morocco (1,000 cubic metres)



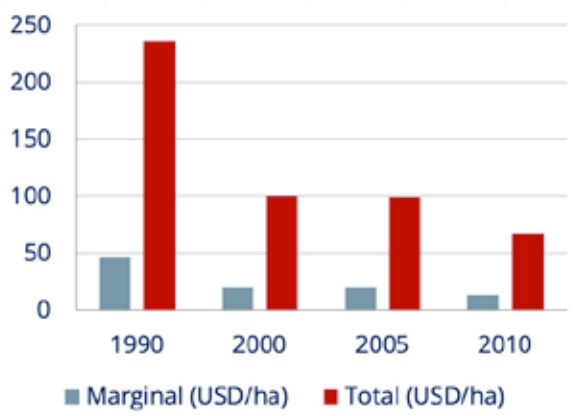
Source: Pettenella & Masiero, 2013

Medicinal plants

Morocco's ecological diversity and varied climate support more than 4,200 plant species, over 800 of which are valued for their aromatic and medicinal properties (Zrira, 2017). The longstanding **tradition of utilising traditional medicinal and aromatic plants for therapeutic purposes is deeply ingrained in Moroccan culture** (Ait-Sidi-Brahim et al., 2019; Fakchich et al., 2022). This tradition has been further enriched by the knowledge brought in by diverse ethnic groups that have migrated to Morocco from various regions, including Arabs from the Middle East, Andalusians Jews from Europe, and people from Sudan, Senegal, and Niger (Fakchich et al., 2022).

According to Kachmar et al. (2021) and Fakchich et al. (2022), **the most commonly used plants for medicinal purposes in Morocco**, especially by traditional healers, are Compact oregano *(Origanum compactum),* Chamomile *(Matricaria chamomilla L.),* Common sage *(Salvia officinalis L.),* Syrian rue *(Peganum harmala L.),* French lavender *(Lavandula dentata L.),* Spanish barberry *(Berberis hispanica Boiss. & Reut.),* and Rosemary *(Rosmarinus officinalis L.)*. Argan oil extracted from the fruits of the argan tree (*Argania Spinosa L.*) is renowned for its diverse pharmacological properties, including its role in cardiovascular disease prevention. and protection against atherosclerosis (Mohammed & Eddouks, 2023; Zrira, 2017). In most cases, **leaves are the most commonly utilised part of the plants**, followed by stems, seeds, roots, flowers, fruits, and barks (Ait-Sidi-Brahim et al., 2019; Kachmar et al., 2021). This preference for leaves in traditional medicine can be attributed to their widespread availability, ease of harvest, and richness in therapeutic compounds (El Haouari et al., 2021). Text box 18 illustrates how some medicinal plants found in Morocco have been used in cancer treatment and a non-exhaustive list of medicinal plants species is shown in Table 11. While some of these medicinal plants are vital for community needs, some of them are not native to Morocco (e.g., ginseng (*Panax ginseng*), Common sage *(Salvia officinalis L.)* and Compact oregano *(Origanum compactum)*). These species were either introduced through historical cultivation, hybridisation, or other human activities.

Figure 7: Roundwood production value in Morocco (USD/ha)



Source: Pettenella & Masiero, 2013

Morocco holds significant potential as a global exporter of aromatic and medicinal plants, particularly rosemary *(Rosmarinus officinalis L.)*, which alone covers an extensive area of approx. one million hectares and produces approx. 60 tonnes of essential oils (Taleb, 2017) (see Text box 19). In 2013, rosemary was the second most exported herb, and the country has seen a notable increase in export quantities and revenues, rising from 0.6 tonnes (equivalent to MAD 574,666 (approx. USD 57,466) in 2001 to 13 tonnes (equivalent to MAD 12.3 million (approx. USD 1.2 million)) in 2006 (Taleb, 2013). Additionally, pennyroyal (*Mentha pulegium* L.) boasts a substantial production potential of essential oils, estimated between 10 and 30 tonnes per year, with average exports reaching approx. 10 tonnes annually, valued at approx. MAD 2 million (approx. USD 200,000) (Ibid.). Morocco also possesses considerable potential in caper bush (*Capparis spinosa* L.), with capers constituting a significant portion of international trade, with 95% of domestic production being exported to European and American markets (Taleb, 2013). Another sought after medical plant is the strawberry tree (*Arbutus unedo L*) , which is native to Morocco (Ait Lhaj et al., 2021; El Haouari et al., 2021). The plant has several properties mainly from its chemical composition which is rich in secondary compounds with antioxidant properties, namely: phenols, vitamins C and E, carotenoids and organic acids (Wahid et al., 2019). The plant is also used for the consumption and production of alcoholic beverages, jams, jellies and marmalades (Ibid.).

Text box 18

Medicinal plants used to treat cancer

Cancer stands as a formidable global health challenge, exacting an intolerable toll on lives worldwide, particularly in impoverished regions such as rural Morocco and other developing countries, where access to modern treatment remains constrained by financial barriers. Despite modern medicine advancements, medicinal plants continue to have significant therapeutic relevance in Morocco. An ethnobotanical survey conducted at the Moroccan National Institute of Oncology in Rabat revealed the **extensive use of 39 medicinal plants from 27 botanical families and 38 genera in cancer treatment**. Long aristolochia *(Aristolochia longa),* Black cumin *(Nigella sativa),* Ephedra *(Ephedra alata),* Resin spurge *(Euphorbia resinifera),* and French lavender *(Lavandula dentata)* emerged as the most utilised ethnospecies. However, Black cumin is non-native but naturalised in Morocco. Leaves were the preferred plant part, and decoction was the primary method of remedy preparation.

These medicinal plants exhibit promising anticancer properties, targeting various checkpoints in cancer progression such as angiogenesis, inflammation inhibition, cell cycle arrest, metastasis, induction of cell apoptosis, and autophagy, owing to their valuable chemical constituents. Moreover, these medicinal plants hold promise in the treatment of various cancer types, including prostate, gastrointestinal, uterine, leukaemia, brain, skin, oral, kidney, and pancreatic cancer. However, concerted efforts are **imperative to prioritise the conservation and protection of certain medicinal plants, as their over-utilisation for traditional uses may endanger their existence**.

Source: El Hachlafi et al., 2022

Text box 19

Diversity and socio-economic role of medicinal plants

Aromatic and medicinal plants, renowned for their essential oils, play pivotal roles in various industries, including cosmetics, perfumery, and aromatherapy. Harvesting these plants not only diversifies agricultural production but also sustains local economies by generating employment opportunities. **In 2011, the transformation and recovery activities of aromatic and medicinal plants facilitated the export of approx. 1,000 tonnes of essential oils, various extracts, and approx. 400 tonnes of dried herbs, amounting to a total value of approx. MAD 300 million (approx. USD 30 million).** This industry provided approx. 500,000 working days and generated additional income for rural communities, with the use of rosemary *(Rosmarinus officinalis L.)* alone contributing approx. 81,000 workdays per year, valued at MAD 4 million (approx. USD 400,000). While the production primarily relies on the spontaneous growth of medicinal and aromatic plants, cultivated crops contribute to approx. 2% of the total output.

Despite the economic significance of aromatic and medicinal plants, the utilisation of most resources lacks regulation and often occurs in an anarchic manner. Apart from exceptions such as argan *(Argania spinosa)* and rosemary *(Rosmarinus officinalis* L.*)*, which are recognised for their roles in rehabilitating degraded areas and supporting local community development, many other species do not have adequate management or protection. The absence of a law governing access and benefit sharing exacerbates this issue, highlighting **the need for legislative measures to ensure sustainable and equitable utilisation of these valuable natural resources.**

Source: Taleb, 2017

Table 11. Some of the medicinal plants found in Morocco (a number of these species are not indigenous to Morocco)

Common name	Scientific name	Local name	Mode of administration
Gum arabic	*Acacia gummifera Willd.*	*arq ṭalḥ*	Oral
Grains of paradise	*Aframomum melegueta (Roscoe) K. Schum.*	*lġûza ṣṣaḥrâwiya*	Oral
Bugleweed	*Ajuga iva (L.) Schreb.*	*ššandġûra*	Oral
Garlic	*Allium sativum L.*	*tûm*	Oral
Lemon verbena	*Aloysia citriodora Palau*	*mâlwîza*	Oral
Lesser galangal	*Alpinia officinarum Hance*	*l-ḵodanjal*	Oral
Woolly cumin	*Ammodaucus leucotrichus Coss. & Durieu*	*l-kammûnṣṣûfî*	Oral
Toothed ammodaucus	*Ammoides pusilla (Brot.) Breistr.*	*nnûnḵa*	Oral
-	*Anabasis aretioides Coss. & Moq. ex Bunge*	*adġa'*	-
Pellitory	*Anacyclus pyrethrum (L.) Link*	*'aqar qarḥa*	Oral
Rose of Jericho	*Anastatica hierochuntica L.*	*kaf maryam*	Oral
Celery	*Apium graveolens L.*	*lakrâfaṣ*	Oral
Wild strawberry tree	*Arbutus pavarii Pamp.*	*sâsnû*	Oral
Argan	*Argania spinosa (L.) Skeels*	*argân*	Oral
Fontane's aristolochia	*Aristolochia fontanesii Boiss. & Reut.*	*barrazṭam*	Oral
White wormwood	*Artemisia herba alba Asso*	*šîḥ*	Oral
Gum tragacanth	*Astracantha gummifera (Labill.) Podlech*	*lakṯîra*	Oral
Oat	*Avena sativa L.*	*zwân*	-
Spanish barberry	*Berberis hispanica Boiss. & Reut.*	*aġrîs*	Oral
Beet	*Beta vulgaris L.*	*šmandar*	Oral
Frankincense	*Boswellia sacra Flueck.*	*ṣalabân*	Inhalation
Calamint	*Calamintha nepeta (L.) Savi*	*nnabṭa*	Oral
Field marigold	*Calendula arvensis (Vaill.) L.*	*Jhamra*	Oral
Tea	*Camellia sinensis (L.) Kuntze*	*atây*	Oral
Cannabis	*Cannabis sativa L.*	*laḥšîš*	External
Caper	*Capparis spinosa L.*	*l-kabbâr*	Oral

Common name	Scientific name	Local name	Mode of administration
Cayenne pepper	*Capsicum annuum L.*	*l-falafel laḥmar*	Oral
Carline thistle	*Carlina gummifera (L.) Less.*	*addâd*	Inhalation
Caraway	*Carum carvi L.*	*l-karwiya*	Oral
Senna	*Cassia senna L. var. senna*	*sanâ*	Oral
Carob	*Ceratonia siliqua L.*	*l-ḵarrûb*	Oral
Mexican tea	*Chenopodium ambrosioides L.*	*mḵînza*	Oral
Chinese cinnamon	*Cinnamomum cassia (L.) J.Presl*	*l-qarfa*	Oral
White rockrose	*Cistus populifolius L.*	*irgal*	Oral
Bitter apple	*Citrullus colocynthis (L.) Schrad.*	*ḥanẓal/ḥandal*	Foot bath
Lemon	*Citrus limon (L.) Burm. f.*	*l-ḥâmaḍ/lîmûn/llîm*	Oral route
Lime	*Citrus salicifolia Raf.*	*waẓmî*	Oral route
Coriander	*Coriandrum sativum L.*	*l-qaṣbar*	Inhalation
Cyprus purslane	*Corrigiola telephiifolia Pourr.*	*sarġîna*	Inhalation
Seaside costus	*Costus (ND)*	*al-qisṭ al-baḥrî*	External
Hawthorn	*Crataegus monogyna Jacq.*	*admâm/zzaʿrûr*	Oral
Saffron	*Crocus sativus L.*	*zaʿfrân zzaġba/zaʿfrân lhûr/zaʿfrân ššaʿra*	Oral
Cumin	*Cuminum cyminum L.*	*l-kammûn*	Oral
Turmeric	*Curcuma longa L.*	*l-ḵarqûm/l-karkam/l-ʿûd laṣfar*	Oral
Quince	*Cydonia oblonga Mill.*	*ṣfarjal*	Oral
Artichoke	*Cynara cardunculus L.*	*l-ḵoršaf/l-ḥak*	Oral
Spurge	*Daphne gnidium L.*	*alazzâz*	External
Thorn apple	*Datura stramonium L.*	*šdaq jmal*	-
Stavesacre	*Delphinium staphisagria L.*	*qiqaw*	External
Fennel	*Foeniculum vulgare Mill.*	*bisbâs*	Oral
Fenugreek	*Trigonella foenum-graecum L.*	*hilba*	Oral
Wormwood	*Artemisia absinthium L.*	*al-ʿabsîn*	Oral
Silene	*Silene vulgaris (Moench) Garcke*	*šasšaf ṣâwy*	Oral
Shallot	*Allium ascalonicum L.*	*bâṣal al-maqdûm*	Oral
Sage	*Salvia officinalis L.*	*mrayḥan*	Oral

Table 11. Some of the medicinal plants found in Morocco (a number of these species are not indigenous to Morocco) (continued)

Common name	Scientific name	Local name	Mode of administration
Carob	*Ceratonia siliqua L.*	*khiyâr al-jamâr*	Oral
Sweet clover	*Melilotus officinalis (L.) Pall.*	*l-ʿusba*	Oral
Nigella	*Nigella sativa L.*	*habba al-ṣawdâ*	Oral
Tobacco	*Nicotiana tabacum L.*	*tumbâk*	Inhalation
Olive	*Olea europaea L.*	*zayt l-zaytûn*	External
Oregano	*Origanum compactum Benth.*	*zatar*	Oral
Peppermint	*Mentha × piperita L.*	*nâʿnaʿ*	Oral
Red thyme	*Thymus vulgaris L.*	*zaʿtar*	Oral
Cowslip	*Primula veris L.*	*dafîr al-maġâdî*	Oral
Pomegranate	*Punica granatum L.*	*râmân*	Oral
Garlic	*Allium sativum L.*	*tûm*	Oral
Cabbage	*Brassica oleracea L.*	*kurumbâm*	Oral
Parsley	*Petroselinum crispum (Mill.) Fuss*	*bâqdlis*	Oral
Onion	*Allium cepa L.*	*bâṣal*	Oral
Tamarisk	*Tamarix (ND)*	*athl*	Oral
Walnut	*Juglans regia L.*	*jôz*	Oral
White willow	*Salix alba L.*	*selsal*	Oral
Ginseng	*Panax ginseng C.A.Mey.*	*ʿarq l-ḥayat/jînsîng*	Oral
Poppy	*Papaver rhoeas L.*	*bannaʾmân*	Oral
Opium poppy	*Papaver somniferum L.*	*ḵaršâša*	Fumigation & Oral
Syrian rue	*Peganum harmala L.*	*l-ḥarmal*	External, Inhalation, Oral
Mock privet	*Phillyrea angustifolia L.*	*mlîlâs*	Oral
Date palm	*Phoenix dactylifera L.*	*tmar/naḵla*	Oral
Anise	*Pimpinella anisum L.*	*ḥabbatḥlâwa/l-yansûn*	Oral
Cubeb pepper	*Piper cubeba L. f.*	*l-kabbâba*	Oral
Long pepper	*Piper longum L.*	*dâr falfal*	Oral
Black pepper	*Piper nigrum L.*	*labzâr/labzâr lakḥal/ labzâr*	Oral
Pistachio	*Pistacia atlantica Desf.*	*labṭam*	External

Common name	Scientific name	Local name	Mode of administration
Mastic tree	*Pistacia lentiscus L.*	*drû/fâdîṣ*	External, Oral
Almond	*Prunus dulcis (Mill.) D. A. Webb*	*lûz*	Oral
Pomegranate	*Punica granatum L.*	*rommân*	Oral
Portuguese oak	*Quercus faginea Lam.*	*l-aṣfa*	External
Cork oak	*Quercus suber L.*	*dbâġ/tzâḵt*	Oral, External
Castor bean	*Ricinus communis L.*	*l-ḵarwaʾ/lakrank*	External, Oral
Rose	*Rosa centifolia L.*	*ward*	Oral, External
Rosemary	*Rosmarinus officinalis L.*	*azîr/yazîr*	Oral
Wild madder	*Rubia peregrina L.*	*l-fowwa*	Oral
Rue	*Ruta chalepensis L.*	*l-fîjal/awirmî*	Oral, External, Inhalation
Sage	*Salvia officinalis L.*	*sâlmiya*	Oral
Sesame	*Sesamum indicum L.*	*janjlân*	Oral
Sorghum	*Sorghum bicolor (L.) Moench*	*l-bašna*	External, Oral
Clove	*Syzygium aromaticum (L.) Merr. & L. M. Perry*	*l-qronfol/ʿûd nnûwwâr*	Oral, Mouthwash
Tamarind	*Tamarindus indica L.*	*tmar hindî*	Oral
Telephium	*Telephium imperati L.*	*ḵayyâṭa*	External
Indian gooseberry	*Terminalia chebula Retz.*	*hlîlaj*	Oral, External
Sandarac gum tree	*Tetraclinis articulata (Vahl) Mast.*	*l-ʿarʿâr*	Inhalation, Oral
Tetraena	*Tetraena gaetula (Emb. & Maire) Beier & Thulin*	*l-ʿaggâya*	Oral
Thymelaea	*Thymelaea hirsuta (L.) Endl.*	*l-matnân*	Oral
Broussonnet Thyme	*Thymus broussonetii Boiss.*	*zʿîtra/ajûkannî*	Oral
Linden	*Tilia sylvestris Desf.*	*zzayzafûn*	Oral
Fenugreek	*Trigonella foenum-graecum L.*	*l-ḥalba*	Oral, External
Common nettle	*Urtica dioïca L.*	*l-ḥorrîġa*	Oral
Spindle tree	*Valeriana celtica L.*	*ssanbal*	Oral
Broad bean	*Vicia faba L.*	*l-fûl*	Oral
Mistletoe	*Viscum album L.*	*linjbâr*	Oral

Table 11. Some of the medicinal plants found in Morocco (a number of these species are not indigenous to Morocco) (continued)

Common name	Scientific name	Local name	Mode of administration
Grapevine	*Vitis vinifera L.*	*ddâlya*	Oral
Desert thistle	*Warionia saharae Benth. & Coss.*	*afassâs*	Massage
Maize	*Zea mays L.*	*ddra*	Oral
Ginger	*Zingiber officinale Roscoe*	*sakkîn jbîr*	Oral
Jujube	*Ziziphus lotus (L.) Lam.*	*ssadra*	Oral

Source: Fakchich et al., 2022

Edible plants

For centuries, people have relied on wild plants for survival. **Morocco has a unique geography that nurtures a vast array of wild edibles** (Ait Said et al., 2013; Cadi et al., 2021). Wild edibles are deeply woven into Moroccan traditions, especially in rural areas (Ait Lhaj et al., 2021). Amazigh and Messiwa people, for example, have long used these plants for both food and medicine (Ghanimi et al., 2022). Despite their importance, there is a surprising lack of information about these plants and their social and economic value. Documenting their socio-economic value is crucial (see Text boxes 20 and 21). These abundant, nutrient-rich plants also hold great promise for addressing food insecurity (Aboukhalaf et al., 2020; Aboukhalaf et al., 2022). By understanding how these plants contribute to livelihoods, it is possible to develop sustainable practices for their use and conservation. A non-exhaustive list of some of the edible species common in Morocco are shown in Table 12. It should be noted, however, that some of these species are not native to Morocco.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Text box 20

The socio-economic value of the argan forest in southwestern Morocco

In southwestern Morocco, the argan tree is an important pillar of the rural economy. This unique tree provides income for thousands through various products and services. From firewood and argan nuts to grazing opportunities and crops grown beneath its canopy (Laaribya et al., 2013). In 2017, approx. **3 million people, with 2.2 million residing in rural areas, relied on the argan tree for subsistence.**

Family income derived from argan products can range from 25% to 45%, significantly impacting livelihoods. **Annual household incomes typically fall between 9,000 and 15,000 Moroccan Dirhams (MAD) (approx. USD 900 - 1,500)**. The argan tree industry provides over 20 million working days, with 7.5 million dedicated solely to argan oil extraction, primarily undertaken by women. **The number of women's cooperatives producing argan oil has skyrocketed, growing from a handful involving a few hundred women in 1999 to over 100 cooperatives with nearly 4,000 women by 2010**. These rural women employ traditional methods passed down through generations to extract argan oil, which involves harvesting, drying, pulping, grinding, sorting, milling, and mixing the fruit. Prized for its high nutritional and therapeutic value, argan oil has applications in cooking, medicine, and cosmetics.

However, **the argan tree industry faces a significant threat from over-utilisation of the forest without adequate regeneration practices** (see Text box 15 for other challenges related to the argan industry). Land clearing for agriculture, wood harvesting for fuel, overgrazing by livestock, and urban expansion contribute to forest degradation. To ensure the future of the argan industry, modernisation and improved practices are essential. A holistic approach that encompasses production, processing, and marketing is crucial. This would align with the stringent standards for food safety, traceability, and quality assurance from niche markets where the argan oil and its by-products are sold. Implementing these practices will not only protect the argan ecosystem but also enhance the industry's sustainability and profitability. **By fostering responsible management and leveraging the unique qualities of argan products, stakeholders can secure both environmental health and economic growth for local communities reliant on this valuable resource.**

Source: Laaribya et al., 2017

Text box 21

The importance of the cactus pear in Morocco

In Morocco, the cactus pear (*Opuntia spp.*) holds significant importance, particularly for rural populations. It serves a diverse array of functions, making it an invaluable resource in both agricultural and non-agricultural contexts. Traditionally, cactus pear is planted as a hedge around field crops, providing protection against grazing animals and serving as a natural barrier for homes and villages. Beyond its utility as a boundary plant, it is widely valued for its edible fruit and use as fodder for livestock.

Cactus pear has gained attention for its applications in the pharmaceutical and cosmetic industries due to its demonstrated health benefits. The plant has anti-cancer, anti-viral, and anti-diabetic properties, making it a promising natural resource for therapeutic uses. Additionally, its antioxidant properties play a vital role in preventing degenerative diseases in humans, enhancing its appeal as a health-promoting food source.

The plant's nutritional profile further underlines its versatility. The pulp of the cactus pear fruit is rich in glucose, fructose, and pectin, making it a sweet and functional ingredient in various food products. The peel is equally nutrient-dense, containing vitamins E and K1, sterols, ethanol-soluble carbohydrates, glucose, protein, cellulose, calcium, and potassium. These qualities make the cactus pear an excellent forage option for livestock, providing a nutritional boost during times of scarcity.

Moreover, the juice of the cactus pear fruit has been reported to exhibit strong antioxidant activity and is also a significant source of glucose and fructose. These attributes contribute to its growing use in health-focused beverages and other dietary applications, further emphasising its economic and cultural value in Morocco.

Through its multifunctional uses, ranging from agriculture to health and nutrition, the cactus pear has become an essential plant in Morocco, supporting livelihoods and contributing to the well-being of both rural communities and the broader population. **It is important to note however, that cactus pear is not indigenous to Morocco and, in terms of the wildlife economy, focus should rather be placed on the planting and use of indigenous species.**

Source: El Kharrassi et al., 2016

Table 12: Some of the edible plants that are found in Morocco (a number of these species are not indigenous to Morocco)

Common Name	Species	Local name	Part used
Beet	*Beta macrocarpa Guss (BM7)*	*Boumselli*	Tender stems
			Young leaves, tender stems
Mexican tea	*Dysphania ambrosioi-des (L.)*	*Mkhinza*	Leaves
Nettle-leaved goose-foot	*Chenopodium murale L (BR5)*	*Berremram*	Young leaves, tender stems
			Seeds
			Leaves, stems
Rosy garlic	*Allium roseum L (KR12)*	*Korrita*	Bulbs
			Leaves, stems
Bishop's weed	*Ammi majus L*	*Trilal*	Leaves, stems
			Whole plant
			Roots
Heart-leaved alexan-ders	*Elaeoselinum asclepium (L.)*	*Kolikha*	Roots
			Leaves, stems
Fennel	*Foeniculum vulgare Mill (BS22)*	*Besbas beldi*	Young leaves and tender stems
			Fruits
			Aerial parts
			Leaves, stems, Roots
			Roots, seeds
			Tender stems
Corn parsley	*Ridolfia segetum (L.) Moris*	*Tebch*	Young leaves, tender stems
			Roots
Shepherd's needle	*Scandix pecten-veneris L (MT6)*	*Mechita*	Tender stems and leaves

Common Name	Species	Local name	Part used
Alexanders	*Smyrnium olusatrum L (HR70)*	*Elhiyar*	Young leaves, tender stems
			Roots
Villous thapsia	*Thapsia villosa L (AB35)*	*Abo*	Roots
			Leaves, stems
			Roots
Friar's cowl	*Arisarum vulgare O.Targ.Tozz (YN3)*	*Yarni*	Bulbs
Wild asparagus	*Asparagus acutifolius L (SK12)*	*Sekoum*	Young shoot
			Tender stems
			Roots
			Leaves
Moroccan chamomile	*Anacyclus maroccanus (Ball) Ball (RN13)*	*Rabiana*	Flowers
Starflower	*Calendula stellata Cav (JM1)*	*Ejjamra, Hamra- jamra*	Young leaves, Tender stems
			Flowers
			Tender stems
			Flowers
			Roots
Woolly distaff thistle	*Carthamus lanatus L (AS45)*	*Asfar*	Roots
			leaves, stems
			Flowers
			Whole plant
			Flowers and leaves
			Roots
Acaule	*Rhaponticum acaule (L.) DC. (TG56)*	*Tafgha*	Roots, Leaves

Table 12: Some of the edible plants that are found in Morocco (a number of these species are not indigenous to Morocco) (continued)

Common Name	Species	Local name	Part used
Moroccan chamomile	*Chamaemelum fuscatum (Brot.) Vasc (BJ12)*	*Babounj*	Flowers
Wild artichoke	*Cynara humilis L (TT23)*	*Timta*	Tender stems
			Young leaves
			Receptacle
			Roots
			leaves, roots, stems
			Roots
Crown daisy	*Glebionis coronaria (L.) Cass. ex Spach (KJ 20)*	*Rjel djaja, kraa djaja*	Young leaves, tender stems
			Tender stems
			Leaves
Blue globe thistle	*Echinops spinosissimus Turra (TR56)*	*Taskra*	Roots
			Whole plant
			Roots
Golden thistle	*Scolymus hispanicus L (GR1)*	*El guernina*	Young leaves, tender stems
			Roots, tender stems
			Tender stems
			Roots
Milk thistle	*Silybum marianum (L.) Gaertn (CH27)*	*Choka hmar*	Receptacle
Wall-rocket	*Diplotaxis catholica (L.) DC (HR 62)*	*Kalkaza*	Whole plant
Wild radish	*Raphanus raphanistrum L (BH12)*	*Bouhammo u*	Leaves, tender stems
			Leaves
White mustard	*Sinapis alba L (HA12)*	*Elharra, ellaftiya*	Tender stems, leaves

Common Name	Species	Local name	Part used
Hairy rupturewort	*Herniaria hirsuta subsp. cinerea (DC.) Cout. (HL63)*	*Harassat lehjar*	Leaves
Silver nailwort	*Paronychia argentea Lam (MF37)*	*Mosuif*	Leaves
Bladder campion	*Silene vulgaris (Moench) Garcke (TC39)*	*Tighecht*	Whole plant
Purple nutsedge	*Cyperus rotundus L (TM56)*	*Tamousayt*	Roots
Annual mercury	*Mercurialis annua L (HS3)*	*Horriga lmalssa*	Young leaves
Syrian milkvetch	*Astragalus boeticus L (KB40)*	*Krenbouch*	Seeds
Tangier pea	*Lathyrus clymenum L (RN40)*	*Rig elhench*	Seeds
Prickly scorpion's-tail	*Scorpiurus muricatus L (KW37)*	*El-kelwa, kelwat rnab*	Young leaves, stems
			Tender stems
Barbary nut	*Moraea sisyrinchium (L.) Ker Gawl (SW43)*	*Lmessiw*	Rhizome
			Roots
Spiny rush	*Juncus acutus L (SE60)*	*Essmar*	Seeds
			Leaves
			Stems
Germander	*Ajuga iva (L.) Schreb. (CG5)*	*Chendgoura*	Young leaves
			Leaves
Fernleaf lavender	*Lavandula multifida L (ZR22)*	*Zririka, kohhila*	Whole plant
Wild clary	*Salvia verbenaca L (KW50)*	*Khwiwita, khiyata*	Whole plant including and roots
Moroccan thyme	*Thymus broussonetii Boiss (ZH30)*	*Zaatar lhmir*	Leaves
			Aerial parts

Table 12: Some of the edible plants that are found in Morocco (a number of these species are not indigenous to Morocco) (continued)

Common Name	Species	Local name	Part used
Tree mallow	*Malva multiflora (Cav.) Soldano, Banfi & Galasso (KZ1)*	*Elkhobbiza, El-bakkoula*	Young leaves, tender
Striated wrinklewort	*Corrigiola littoralis subsp. telephiifolia (Pourr.) Briq*	*Serghina*	Roots
			Tender stems
			Leaves
Bermuda buttercup	*Oxalis pes-caprae L (MD10)*	*Elhomida safra*	Young leaves
			Tender stems
European fan palm	*Chamaerops humilis L (DD53)*	*Eddoum, lghaz*	Fruits
			Roots
			Leaves
Corn poppy	*Papaver rhoeas L (LL12)*	*Belaaman*	Young leaves
			Flowers
			Leaves
			Flowers
Common fumitory	*Fumaria agraria Lag (EB39)*	*Ennar elbarda*	Leaves
Statice	*Limonium sinuatum (L.)*	*Khnounet ennaja*	Tender leaves
			Leaves
Bermuda grass	*Cynodon dactylon (L.) Pers (EN35)*	*Enjem*	Roots
Italian ryegrass	*Lolium multiflorum Lam (MN67)*	*Elmedhoun*	Roots
Fiddle dock	*Rumex pulcher L (HH12)*	*Hommaida mchowka*	Young leaves, tender stems
			Leaves
Spiny emex	*Emex spinosa (L.) Campd (HS5)*	*Hommaida*	Tender stems
			Fruits, leaves
Purslane	*Portulaca oleracea L (ER5)*	*Errejla*	Young leaves, tender stems
Wild madder	*Rubia peregrina L (WW12)*	*El fouwwa*	Roots
Great mullein	*Verbascum sinuatum L (SH9)*	*maslahndar*	Leaves
			Flowers
American black nightshade	*Solanum americanum Mill (DD76)*	*Eneb eddib*	Fruits and Leaves
Stinging nettle	*Urtica dioica L (HH12)*	*Horiga harcha*	Leaves

Source: Aboukhalaf et al., 2022

Carbon market

Morocco has several laws intended to assist sustainable forest management and climate action. These include Article 31 of the Morocco Constitution ratified in 2011, the National Charter for the Environment and Sustainable Development ratified in 2010, the Mohammed VI Foundation for the Protection of the Environment founded by King Mohammed in 2001, and the National Energy Strategy implemented in 2009 (Morocco On The Move, undated). These laws are integrated and acknowledge the value of forest conservation and support national efforts to create a framework that would allow for the sustainable management of forests (Ibid.). These policies are integral to Morocco's commitments outlined in its Nationally Determined Contributions (NDCs).

In its first Nationally Determined Contribution (NDC) in 2020, Morocco set an unconditional GHG emissions reduction target of 17% by 2030, relative to the Business-As-Usual scenario (OECD, 2021). In 2021, the revised NDC set a new reduction target of 18.3% by 2030 (Government of Morocco, 2021). The adaptation component in the NDC has also been expanded with more actions to address climate risks, and the country has set up an online measurement, reporting, and verification (MRV) platform dedicated to monitoring the implementation of the NDC (Ibid.). Morocco does not have an explicit carbon tax, nor a CO_2 emissions trading system (Ibid.). However, it does collect energy taxes, including excise taxes on coal and petroleum coke, fuel oil, diesel, gasoline, liquefied petroleum gas (LPG) and natural gas, as well as an electricity excise tax on residential, commercial and public electricity consumption (OECD, 2021).

In 2008, Morocco launched its first carbon fund (Fonds Capital Carbone Maroc (FCCM)) to promote and participate in the development of Moroccan projects connected with the implementation of the Kyoto Protocol on climate change under the Clean Development Mechanism (CDM) (EIB, 2008). FCCM was owned by Caisee de Depot et de Gestion (CDG) (50%), European Investment Bank (25%) and Caisse de Depots et Consignations (25%). The FCCM was set up with an initial carbon trading fund of MAD 300 million (approx. USD 30 million) and aimed to actively contribute to the country's economic and social development (Ibid.). Later in 2012, there were attempts to initiate a pilot carbon pricing in the country, which is yet to attain its targets. More about carbon pricing is discussed in Text box 20. For examples of Morocco's early carbon finance projects, see Text boxes 23 and 24.

These initiatives reflect Morocco's broader commitment to integrating climate policy with economic and environmental development. While progress towards a full carbon pricing system has been gradual, the foundations established through national strategies, carbon funds, and pilot projects provide a strong basis for future market-based climate action and sustainable land management.

Text box 22

Carbon pricing in Morocco

In 2012, Morocco obtained USD 350,000 under the World Bank Partnership for Market Readiness (PMR) to launch its pilot carbon market. The project included a plan to establish a domestic Emission Trading Scheme (ETS) and programmes to issue carbon credits based on Nationally Appropriate Mitigation Actions (NAMAs). The government identified three main areas of action: electricity generation, cement production and phosphate extraction. The government started the PMR preparation phase in 2013 and intended to establish a pilot carbon market instrument based on Climate Change Legislation - Morocco five NAMAs by 2016. A domestic carbon market started operating in 2018, and by 2020 the market was set to be linked with international carbon markets. Morocco joined the Low-Emission Capacity Building Project to develop an Emission Strategy, a NAMA project portfolio, Measurement, Reporting, and Verification (MRV) systems, and an associated knowledge base.

Source: Nachmany et al., 2015

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Text box 23

Carbon farming and afforestation in arid zones

From 2018 to 2022, St1, Mohammed VI Polytechnic University (UM6P), OCP Group, and the Natural Resource Institute Finland (LUKE) conducted a joint pilot project in Benguerir, Morocco, to test carbon farming and afforestation methods in arid zones. The project aimed to assess how fast-growing tree species could act as carbon sinks while restoring degraded drylands and mined areas. Funded by Business Finland, the initiative formed part of a wider strategy to promote nature-based climate mitigation through carbon sequestration and sustainable land management.

The research focused on seven tree species, **moringa (*Moringa oleifera*)**, **eucalyptus (*Eucalyptus camaldulensis*)**, **acacia (*Acacia saligna*)**, **carob (*Ceratonia siliqua*)**, **pine (*Pinus halepensis*)**, **paulownia (*Paulownia tomentosa*)**, and **pistacia (*Pistacia lentiscus*)**, grown under various irrigation systems (drip, tank, and rainfed) and soil treatments (biochar and peat moss). More than 8,000 seedlings were planted across two test sites. The experiment also included agroforestry trials to evaluate the compatibility of trees with crops such as quinoa (*Chenopodium quinoa*), wheat (*Triticum aestivum*), fava beans (*Vicia faba*), and peas (*Pisum sativum*). Findings showed that eucalyptus and moringa had the highest carbon sequestration rates, storing between **13.5-22.5 tonnes of CO_2 per hectare** and **7-11.6 tonnes of CO_2 per hectare** respectively within the first two years.

Despite limited water use, most tree species achieved survival rates above 90% under drip and tank irrigation, proving that afforestation can succeed in semi-arid climates without competing with agriculture. Biochar demonstrated stability as a long-term carbon sink, while peat moss (*Sphagnum*) degraded over time. The study also highlighted the benefits of **Growboxx** water-conserving technology, which maintained seedling growth using just one-third of the normal irrigation volume.

The project emphasised the importance of local value creation through **multi-purpose agroforestry**, combining carbon sequestration with food and fodder production, erosion control, and biodiversity conservation. Moringa and carob were identified as promising species for integrated systems due to their food and economic uses and low water competition.

This pilot demonstrates that afforestation in arid areas can generate measurable environmental and economic benefits, supporting both global climate goals and local livelihoods. It also provides a foundation for developing verified carbon sequestration models in dry regions, aligning with Morocco's wider efforts to combat desertification and promote sustainable land use.

Source: St1 Nordic Oy, 2023

Text box 24

Municipal Solid Waste Carbon Finance Programme

The Municipal Solid Waste Carbon Finance Programme was designed to help Moroccan municipalities develop carbon assets from improved waste management and gain access to international carbon markets. Coordinated by the Fonds d'Équipement Communal (FEC) and supported by the World Bank's Carbon Partnership Facility, the initiative aimed to generate up to **2 million Certified Emission Reductions (CERs)**, equal to two million tonnes of CO_2, through methane capture and flaring or electricity generation from landfill gas.

At the time, Morocco produced approx. **5 million tonnes of municipal solid waste each year**, with projections reaching **6.2 million tonnes by 2020**. Rapid urban growth, increasing consumption, and limited municipal capacity had placed major strain on waste services. Before the national reform programme, municipal waste management focused largely on cleanliness rather than proper treatment or disposal, contributing to environmental degradation and health concerns. Waste management already accounted for approx. **10% of urban municipal budgets**, with most funding spent on collection and transport rather than safe disposal.

With support from the World Bank, Morocco began implementing reforms in 2009 to improve governance, strengthen legal and institutional frameworks, and integrate environmental and social considerations into waste sector planning. The carbon finance initiative was intended to complement these reforms by linking landfill management with emission reduction incentives. Under this programme, municipalities or groups of municipalities could voluntarily develop **Clean Development Mechanism (CDM)** projects, benefiting from shared technical support and reduced transaction costs through the FEC.

The first phase of the programme focused on **controlled landfill sites**, beginning with **Oum Azza near Rabat**, which received approx. **1,400 tonnes of waste per day**. Ten landfill projects were identified as potential participants, representing approx. **2.9 million tonnes of waste per year** and an estimated reduction of **735,000 tonnes of CO_2 annually** (7.35 million tonnes over ten years). Revenue from the sale of CERs was expected to help cover the cost of environmentally sound waste disposal and improve the financial sustainability of local waste services.

The project illustrated how carbon finance could be used to support national waste sector reforms, combining climate mitigation, urban management, and economic development goals within Morocco's growing cities. Projects such as this support with the maintenance and protection of the wildlife asset base of the wildlife economy.

Source: World Bank, 2011

Challenges and opportunities for the wildlife economy in Morocco

Challenges

- **Limited ecological asset base**: Morocco has strong wildlife management and infrastructure, but relatively weak ecological assets. Habitat loss, degraded mountain ecosystems, and fragmented protected areas limit the country's potential to expand high-value wildlife economy activities.
- **Pressures on biodiversity**: Overexploitation, invasive alien species, illegal hunting, unregulated wildlife trade, and climate change threaten many iconic species such as the argan tree (*Argania spinosa*), Barbary macaque (*Macaca sylvanus*), and Egyptian cobra (*Naja haje*). These pressures erode the natural capital that supports the wildlife economy.
- **Illegal and unsustainable practices**: Persistent illegal hunting, overharvesting of forest products, and open-market trade in endangered reptiles and carnivores undermine conservation efforts and reduce the profitability of legal wildlife industries. Weak enforcement and low penalties relative to profits allow these activities to continue.
- **Weak community participation**: Despite traditional systems such as Agdals, local communities remain marginal in protected area management, ecotourism, and forest governance. Exclusion reduces incentives for stewardship and leaves rural populations reliant on unsustainable practices for survival.
- **Unequal benefit-sharing**: The growing global demand for argan oil and medicinal plants has not consistently translated into fair income for rural women and smallholders. Cooperatives face challenges from illegal harvesters, exploitative practices, and unequal value chains.
- **Underdeveloped and undervalued wildlife economy sectors:** Domestic ecotourism is under-promoted, aquaculture remains weak compared to capture fisheries, and systematic data on recreational fishing, forest product values, and medicinal plants is limited. This lack of diversification reduces resilience and hides the true economic contribution of wildlife, both fauna and flora.
- **Carbon finance constraints:** Morocco has ambitious climate commitments but has not yet developed a robust carbon pricing system or fully scaled carbon market projects. This limits access to international climate finance that could support conservation and rural development.

Opportunities

- **Ecotourism growth and diversification:** Morocco's diverse ecosystems, cultural heritage, and strong international tourism brand provide a foundation for expanding ecotourism into rural, mountain, desert, and more coastal areas. Developing birdwatching, trekking, and cultural landscape tourism could increase visitor spending, grow tourism mulitpliers and spread benefits beyond cities.
- **Sustainable hunting and fisheries:** Regulated hunting already contributes over MAD 1.2 billion (approx. USD 125.6 million) annually, while Morocco ranks as one of Africa's top fisheries producers. Expanding sustainable hunting tourism, recreational angling, and aquaculture could diversify rural livelihoods and increase international revenue.
- **Community-based resource management:** Scaling traditional Agdal systems, Amazigh forest stewardship, and community ecotourism initiatives can align conservation with rural development. Greater recognition of local governance models would strengthen incentives for sustainable use and reduce pressure on wildlife.
- **High-value forest and plant products:** Morocco's forests and biodiversity support global niche markets in argan oil, cork, honey, mushrooms, and medicinal plants. Improving certification, traceability, and fair benefit-sharing can unlock more value while ensuring sustainability and gender equity.
- **Carbon and climate finance:** Morocco's leadership in renewable energy, reforestation, and ecosystem restoration provides a strong platform for scaling REDD+ and carbon market projects. Accessing climate finance could support conservation, generate rural jobs, and strengthen Morocco's role as a regional climate leader.
- **Policy and governance strengths:** Morocco scores highly in wildlife management, legal frameworks, and infrastructure on the Wildlife Economy Investment Index. Leveraging these institutional strengths can attract private investment, build partnerships, and position Morocco as a North African leader in wildlife economy development.

Conclusion

Morocco's wildlife economy reflects a mix of strong governance and institutional capacity but a relatively weak ecological asset base. Habitat loss, degraded ecosystems, and fragmented protected areas limit the country's ability to expand wildlife-based activities, while illegal trade, unequal benefit-sharing, and limited community participation add further pressures. These challenges underline the importance of restoring ecosystems, strengthening enforcement, and improving data to capture the real value of biodiversity and its role in national development.

At the same time, Morocco has clear opportunities to grow a more inclusive and sustainable wildlife economy. Strong policies, cultural heritage, and established tourism markets provide a solid foundation to scale ecotourism, regulated hunting and fishing, forest products, and carbon finance. **By linking ecological restoration with investment and local empowerment, Morocco can transform its wildlife economy into a strategic driver of rural development, biodiversity conservation, and long-term prosperity.**

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