

Mainstreaming Biodiversity Conservation into key Economic Sectors: Evidence from Morocco

Abstract

The objective of this paper is to conduct a value assessment of the strategies, plans, and programs implemented by Morocco to ensure the mainstreaming of biodiversity into three pivotal economic sectors: fisheries, forestry, and agriculture. This value assessment is based on evidence and aims to provide a clear understanding of the effectiveness and impact of these measures. To achieve this goal, we utilized the narrative analysis method, enabling us to critically analyze the implementation and outcomes of biodiversity mainstreaming efforts in the selected sectors.

In view of the results obtained, it seems that despite the political will expressed and Morocco's commitment to international efforts to mainstream biodiversity into economic sectors, the results are still insufficient. This is essentially due to five factors: the lack of motivation of the bureaucrats in charge of implementation, the low level of effectiveness of some laws, the ineffectiveness of some measures in the Moroccan context, the low level of coordination between the stakeholders concerned, and the low level of national scientific knowledge on biodiversity.

The economic incentives provided to operators in the economic sectors concerned, including local populations, have not been enough to compensate for the losses incurred due to the requirement of changing rules and practices concerning biodiversity preservation.

Key words: Biodiversity, Mainstreaming, Economic Sectors, NBSAPs, Sectoral Strategies, Assessment

HOURMAT ALLAH HIND

Author affiliation: Department of Management Sciences, Cadi Ayyad University

Contact information: Faculty of law, Economics and Social Sciences P.O. Box 2380, Daoudaite, 40000, Marrakech, Morocco

Email: hindhourmatallah@gmail.com

Phone number: +212661240570

1. Introduction

Biodiversity is one of the most valuable assets in the world, essential for human life and well-being. Unfortunately, this environmental commodity is experiencing alarming degradation worldwide, which threatens the balance of ecosystems and nature's ability to meet people's current and future needs. The rate of species extinction is between 100 and 1000 times higher than the natural rate (De Vos et al., 2015). Morocco is not exempt from this reality. In these circumstances, it is clear that mainstreaming biodiversity into national public policies and sectoral strategies is crucial to reverse this trend. The goal is to ensure that biodiversity, ecosystems, their services, and all associated values are fully considered in the design and implementation of public policies, as well as in the decisions made by private stakeholders such as investors, executives, and operators (Vergez, 2023:3). This means that the impacts and dependencies on biodiversity are fully taken into account throughout production and value chains.

The benefits of mainstreaming biodiversity into key economic sectors have been recognized by international treaties and agreements such as the Convention on Biological Diversity (CBD) and its Aichi Targets, the Convention on Wetlands, the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and the United Nations 2030 Agenda. However, global progress in this area remains very slow (Huntley and Redford, 2014). According to Whitehorn et al. (2019), countries are only just beginning to establish the groundwork for biodiversity mainstreaming, primarily through their National Biodiversity Strategy and Action Plans (NBSAPs). The majority of these countries consider mainstreaming biodiversity into economic development to be a significant challenge (Leadley et al., 2014).

Aware of this reality, the Moroccan government has committed to a process of institutional strengthening in the field of biodiversity. The idea is to prioritize and address the preservation of biodiversity as a national priority and an urgent matter. This commitment has led to the modernization of the legal arsenal and the development of appropriate action plans, in particular the National Strategy and Action Plan for Biological Diversity (2016-2020). Biodiversity has been recognized as a global public good and has been taken into account in the formulation and implementation of public policies and sectoral strategies related to key economic sectors such as agriculture, forestry and fisheries. Considering biodiversity in these sectors is crucial, as they are the main sources of direct pressures on biodiversity (Kok et al., 2018).

Although the situation of biodiversity in Morocco appears to be deteriorating, the public and academic debate on the mainstreaming biodiversity into public policies and sectoral strategies remains relatively weak. To contribute to the revival of this debate, we deemed it appropriate to analyze and examine the facts related to this subject in the Moroccan context. The objective is to make an assessment judgment on Morocco's strategies and, more importantly, to support this assessment with evidence.

Our main research hypothesis is that, despite the political will expressed, Morocco has had difficulty mainstreaming biodiversity into public policies and sectoral strategies. We will therefore seek to identify and understand the factors behind the gap between the objectives set and what has been achieved in each sector.

To test this hypothesis, we collected secondary data from national archives, including government reports, interviews with policy-makers and experts, evaluation reports, and other

relevant sources. We also used national and international databases such as the database of the National Observatory for the Environment and Sustainable Development, the International Union for Conservation of Nature's Red List of Threatened Species, and the FAO database. The results were reported using a descriptive-analytical narrative method, which consists in constructing narratives based on original empirical evidence and existing studies tackling the economic and political factors that shape the way mainstreaming biodiversity is taken into account in the development of sectoral policies.

The rest of this paper is organized as follows. Section 1 outlines the necessary conditions for successfully mainstreaming biodiversity into key economic sectors. Section 2 presents the Moroccan strategy for incorporating the biodiversity variable into sectoral strategies. Section 3 provides an evaluation of these strategies. Finally, the conclusion summarizes the main lessons learned and presents some implications in terms of economic policies.

2. Mainstreaming biodiversity into economic sectors: what conditions?

Successful implementation of biodiversity mainstreaming into key economic sectors requires several preconditions. In our view, two conditions are particularly important and decisive: strong and effective democratic institutions and appropriate economic incentives.

2.1. Democratic institutions

Democracy can have a positive impact on the consideration of biodiversity in economic policy-making. First, the political rights typically associated with democracy, such as freedom of association, freedom of expression, and freedom of the press, enable citizens to mobilize and exert pressure on their governments to take measures to conserve biodiversity. Citizens can also participate in democratic processes such as elections, public consultations, and parliamentary debates to express their support for policies that protect biodiversity. Democratic governments are accountable to their citizens and must justify their political decisions on sensitive issues such as biodiversity protection. Furthermore, freedom of the press encourages media outlets, in its various forms, to address biodiversity issues, shaping public opinion and influencing the political agenda (Li and Reuveny, 2006).

In a democratic society, elections serve as a peaceful means of accessing power and have the potential to reduce short-term uncertainty regarding political survival. This, in turn, allows policymakers to allocate more resources towards long-term strategies (Wurster, 2013). Consequently, it is expected that this would facilitate the development of well-informed and balanced public policies that are more aligned with the conservation of biodiversity for future generations.

Moreover, the legitimacy derived from the electoral process imposes judicial and legislative constraints, which can promote compliance with legislation and international treaties related to biodiversity (Li and Reuveny, 2006). These constraints placed on political decision-makers also limit their possibilities to act opportunistically, which, in turn, can encourage other actors to cooperate in biodiversity management. This cooperation is reinforced by mutual expectations of legal behavior (Sjöstedt, 2013).

Democratic governance has become a key concept indicating how contemporary management of society and within society works. It plays a significant role in promoting the responsibility and accountability of economic players towards biodiversity. Through

participatory and transparent policies and regulations, businesses are encouraged to incorporate biodiversity into their production and marketing strategies and practices. Additionally, democratic governance facilitates the monitoring and control of the impact of economic activities on biodiversity. It also enables the implementation of monitoring and sanction mechanisms in case of non-compliance with biodiversity conservation commitments.

Democratic governance ensures more balanced and sustainable decision-making that considers the long-term interests of nature and society as a whole. This would encourage more responsible management of natural resources, reduce negative impacts on biodiversity, and promote sustainable economic practices.

As a driver for change in democratic practices, civil society plays a significant role in the process of mainstreaming biodiversity into sectoral policies. First, it contributes to mobilizing individuals and groups involved in concrete actions to protect endangered ecosystems and species. Through communication campaigns, events, and educational programs, civil society helps to create a collective awareness and encourages individuals to take steps towards nature preservation. Second, civil society plays a monitoring and advocacy role (Glasbergen, 2011). It monitors the actions of governments and businesses that may have a negative impact on biodiversity, ensuring compliance with environmental laws and regulations. Additionally, civil society actively participates in coalitions, alliances, and consultation platforms to amplify its voice at national and international levels. Finally, civil society acts as an agent of change through its own initiatives and actions. It undertakes biodiversity conservation projects, which may involve establishing and managing nature reserves, restoring degraded habitats, protecting endangered species, and promoting sustainable practices in sectors such as agriculture, fishing, and forestry.

In a study conducted by Huntley (2014) on South Africa and Costa Rica, it was demonstrated that the process of mainstreaming biodiversity into the economic sectors of these countries has generally been successful, despite the high levels of threat. This achievement would not have been possible without the support of donors and, most importantly, the quality of democratic institutions. For their part, Karlsson-Vinkhuyzen et al (2017) argue that in order to be effective, integration strategies must be accompanied by proactive environmental policies and strong political support. They further assert that these conditions can only be guaranteed in a democratic system. Democratically elected governments often lead by example by adopting policies, laws, and regulations that promote biodiversity conservation.

Finally, Friedman et al (2018) observe that the mechanism established to promote the mainstreaming of biodiversity in the global fisheries sector has significantly evolved since the early 2000s. The authors attribute this success, in part, to the quality of institutions that have facilitated improved communication and the identification of shared interests between fisheries stakeholders and advocates for biodiversity. On the other hand, Rydén et al (2020:2) have identified three hypothetical arguments explaining the relevance of democracy in the process of mainstreaming biodiversity. It is about political rights, the vertical accountability electoral mechanism, and political constraints

2.2. Economic incentives

Economic incentives serve as an additional motivation for mainstreaming biodiversity into economic policy-making, especially in sectoral policies. This can encourage economic actors to adopt more sustainable practices that prioritize biodiversity conservation. For instance, tax

incentives or subsidies can be implemented for industries that adopt biodiversity conservation measures such as protecting natural ecosystems and reducing their ecological footprint. Furthermore, environmental regulations also play a crucial role in ensuring the consideration of biodiversity in the formulation of economic policies. Stringent regulations regarding the utilization of natural resources and economic activities that affect biodiversity can encourage businesses to adopt more responsible and environmentally friendly practices.

New information and communication technologies (ICT) serve as another incentive mechanism that can contribute to the preservation of soil, water, fauna, and flora in various ecosystems. For example, monitoring technologies, such as satellite remote sensing systems, can be used to track and observe changes in ecosystems and natural habitats. Similarly, water conservation technologies may enable more efficient utilization of water resources, reducing pressure on aquatic ecosystems. Image recognition technologies and the analytical capabilities of artificial intelligence can also help to better supervise and protect endangered animals using real data and accurate forecasting models. Early detection of parasites and viruses becomes possible, and measures can be taken to protect migrations, such as collaborating with farmers to create temporary wetlands.

The literature on the mainstreaming of biodiversity generally assumes that for it to be sustainable, it must provide added value to the primary objective it is integrated with (Smith et al., 2020:19). In a case study focusing on the integration of climate adaptation into biodiversity conservation, Burch et al (2014) emphasize the importance of ensuring that biodiversity can be linked to the economic interests of the stakeholders who wish to integrate it. In this regard, it is possible to talk about reciprocal mainstreaming (IIED and UNEP-WCMC, 2015), which refers to a form of compensation.

Polasky (2005) highlights the importance of developing economic incentives to promote biodiversity conservation in the agricultural and forestry sectors. These incentives can be in the form of subsidies, tax incentives, payments for ecosystem services, or biodiversity capital markets. The author argues that the use of these incentives can motivate farmers and foresters to adopt more biodiversity-friendly management practices by providing them with tangible economic advantages. Polasky also underscores the importance of considering the socio-economic context and local requirements when designing these incentives.

In a similar vein, Wiggering et al (2017) explore various forms of economic incentives employed in the context of biodiversity conservation and their potential impacts. The authors underscore the significant role economic incentives can play in promoting biodiversity conservation by offering tangible economic benefits to the involved stakeholders. They highlight several forms of economic incentives, such as payments for ecosystem services, tax incentives, subsidies, and biodiversity capital markets. The authors conclude that economic incentives can have a positive influence on stakeholders' decisions in favor of biodiversity conservation.

It is possible to distinguish between two types of funding, namely dedicated support for biodiversity under a separate budget, and the mobilization of sectoral resources (Kettunen and al., 2013). The first category, which includes public funding such as special funds for biodiversity under the CBD and national funding, is considered the "traditional way".

Few countries have implemented financial strategies to reconcile biodiversity objectives with sectoral development (CBD, 2010). Sectoral mobilization can be facilitated by "innovative

financing mechanisms", including payments for ecosystem services (PES), biodiversity offsets, green taxation, green product markets, certification of production and production regions, and integrated financing for biodiversity and climate. In their study for the CBD Secretariat and the Fourth Global Biodiversity Outlook, Kok et al (2014) suggest that these mechanisms could increase private funding for biodiversity, complementing existing public funding, and would be a crucial lever for mainstreaming within the production sectors themselves.

3. Morocco's experience in mainstreaming biodiversity in economic sectors

This section focuses on the main measures adopted by Morocco to effectively incorporate biodiversity into sectoral policies and strategies. These measures can be divided into two categories: legal measures and strategic measures.

3.1. An ambitious legal framework

Morocco has an extensive body of legislation dedicated to the conservation of biodiversity, indicating a commendable recognition of the importance of safeguarding diverse natural ecosystems. The Moroccan Biodiversity Information Exchange Centre (2020) estimates that there are over 250 legal documents specifically addressing this subject. Some of these texts are of a supranational nature, i.e. international conventions and treaties, while others are of a national nature.

Regarding the first category of legal texts, Morocco has ratified the majority of international treaties and conventions related to the preservation of biodiversity, such as:

- The Convention on Biological Diversity (CBD)
- The Protocol concerning specially protected areas and biological diversity in the Mediterranean
- The United Nations Convention to Combat Desertification ((UNCCD)
- The United Nations Framework Convention on Climate Change (UNFCCC)
- The Conventions on the Conservation of Migratory Species of Wild Animals (Bonn Convention ; CMS)
- The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean
- The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)
- The International Conventions for the Protection of Birds
- The Convention on Wetlands of International Importance Especially as Waterfowl Habitat, as amended by the Paris Protocol of 1982 and the amendments of May 1987
- The Regional Convention on Fisheries Cooperation among African States bordering the Atlantic Ocean.
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- The Convention for the Establishment of the European and Mediterranean Plant Protection Organization
- The International Plant Protection Convention (IPPC)
- The International Convention for the Prevention of Pollution from Ships (MARPOL)

Concerning national laws, Morocco has a repressive legal framework that is stringent in addressing offenses related to biodiversity endangerment, while also promoting the mainstreaming of biodiversity into key economic sectors. Generally inspired by the French

legal model, Moroccan laws have been significantly amended since the beginning of the 21st century. The aim is twofold: first, to take account of the alarming acceleration in climate change, and second, to bring national laws into line with the international conventions ratified by Morocco. Table 1 provides a non-exhaustive list of the key laws pertaining to the preservation of natural environments, ecosystems, and flora and fauna species. It should be noted that there are additional legal texts that indirectly contribute to the protection of biodiversity, although they are not included in this list.

Table 1: Main laws regulating the mainstreaming of biodiversity into Morocco’s economic sectors

Law	Years	Objectives
Law on the conservation and exploitation of forests	1917	Establishing the modalities for the conservation and exploitation of forests
Law relating to the creation of national parks	1934	Clarifying the procedures for creating national parks
Law 28-00 on waste management and disposal	2000	Establishing the terms and conditions of the sanitation and waste management system
Law 11-03 on the protection and enhancement of the environment	2003	Establishment of an arsenal of legal instruments to protect the environment against all forms of pollution and degradation
Law 12-03 on environmental impact assessments	2003	Illustration of the content of the environmental impact assessment procedure
Law 29-05 on the protection of wild fauna and flora and the control of their trade	2011	Implementing the requirements of CITES (The Convention on International Trade in Endangered Species of Wild Fauna and Flora)
Law 01-06 on the sustainable development of palm groves and the protection of date palms	2007	Setting legal and regulatory measures to ensure the preservation and sustainable management of forest resources
Law 22-07 relating to protected areas	2010	Closing the legal loopholes in the 1934 law for the creation of national parks
Law 81-12 related to the coastline	2015	Preservation and sustainable management of the coastline
Law 130-12 relating to fishing in continental waters	2022	Framing of fishing activity in continental waters
Law 113-13 on pastoral transhumance and the development and management of pastoral and sylvipastoral areas	2016	Framing pastoral activity at national scale
Law 99-12 on the National Charter for the Environment and Sustainable Development	2014	Strengthening the protection and preservation of natural resources and environments, biodiversity and cultural heritage
Law 36-15 relating to water	2016	Setting requirements for the use of water and wastewater discharges in internal waters
law no. 49-17 on environmental assessment	2020	Environmental assessment of public policies, programs and development plans.

Source: Environment Department, Rabat, 2023

One of the main new features of the legal framework for biodiversity in Morocco is the recent introduction, in 2020, of a requirement for all public and private investors to conduct an environmental impact assessment for their projects at every stage of the project life cycle, including construction, operation, extension, or dismantling. The impact assessment should include all environmental elements that are likely to be damaged, such as fauna, flora, soil, water, air, sites of biological and geological interest, fossils, protected areas, and natural landscapes. This is stated in Article 5 of Law 49-17 on environmental assessment.

All these laws have been supplemented by tax measures aimed at gradually transforming the economy towards carbon neutrality and safeguarding biodiversity. A dissuasive ecological tax on the plastics industry was introduced in the 2013 Finance Act, which applies to the sale, exit of the factory and import of plastic materials. Similarly, a special tax on sand was launched in 2013 to reduce pressure on the ecosystem, particularly in coastal areas and wetlands. Sand plays a crucial role in these ecosystems as it provides a habitat for numerous species. Excessive sand extraction can result in the destruction of these habitats, leading to the disappearance of the flora and fauna that rely on them.

De facto tax exemptions are also applied to specific areas or activities that explicitly incorporate the preservation of biodiversity. This includes national parks, nature reserves, and non-fruit bearing woodland plantations that aim to protect the soil from erosion caused by wind and rain.

3.2. A wide variety of sectoral strategies

Given the increasingly alarming state of biodiversity and in accordance with its international obligations, Morocco has progressively developed sectoral policies and strategies that consider the various aspects of biodiversity. This commitment has accelerated since the ratification of the Convention on Biological Diversity in 1995, leading to the initiation of the first national study on the state of biodiversity in Morocco in 1998. This study was subsequently updated in 2012 and again in 2019, and supplemented with thematic reports on ecosystems. Its purpose was to establish an inventory of flora, fauna, and natural habitats (Observatoire National de l'Environnement et du Développement Durable, 1998).

The findings of this study served as a roadmap to help choose priorities and draw up plans and strategies dedicated to the protection of biodiversity. Cross cutting plans and strategies are then drawn up by the responsible ministerial department namely the Department of the Environment, attached to the Moroccan Ministry of Energy, Mines and the Environment. Some of these plans and strategies include the 2004 National Biodiversity Strategy and Action Plan, the 2015-2024 National Wetlands Strategy, the 2016-2030 National Sustainable Development Strategy, the National Forestry Development Strategy, the 2013 Protected Areas Master Plan, the 2004 Moroccan Oasis Management and Development Strategy, and the National Action Programme to Combat Desertification. Additionally, a Biodiversity Information Exchange Centre was established in 2004, and a national biodiversity database has been implemented.

However, the most significant measure is the formulation of the National Biodiversity Strategy and Action Plan for the period 2016-2020. This new strategy represents a significant advancement compared to the 2004 strategy. It has been designed to align with the strategies currently being implemented or planned by various national sectors, as well as to address national priorities in terms of biodiversity conservation and enhancement. Furthermore, it

takes into consideration the international concerns outlined in the 2011-2020 Strategic Plan of the Convention on Biological Diversity and the Aichi targets.

To implement Morocco's vision for the conservation and sustainable use of biodiversity, the National Biodiversity Strategy and Action Plan consists of six strategic areas, which are further divided into twenty-six operational objectives (Table 2).

Table 2: The Main Axes of the National Biodiversity Strategy and Action Plan for the period 2016-2020

Axes	Number of Objectives
A. Strengthening the conservation of species, ecosystems and the services they provide.	5 objectives : A1 à A 5
B. Ensure the sustainable use of biodiversity and biological resources.	5 objectives : B1 à B5
C. Contribute to improving people's living conditions through the efficient implementation of the NBSAP.	3 objectives : C1 à C3
D. Consolidate the governance of biological diversity	7 objectives : D1 à D7
E. Improve, develop and share knowledge about national biodiversity.	4 objectives : E1 à E4
F. Promote a willingness among citizens to change their behavior towards the national biodiversity heritage.	2 objectives : F1 et F2

Source: Ministry of Energy Transition and Sustainable Development, 2016

To achieve the 26 objectives outlined in the National Biodiversity Strategy and Action Plan for the period 2016-2020, the designers recommended the implementation of 159 actions. These actions were designed to be part of a participatory approach that involves all stakeholders concerned with biodiversity. To ensure effective coordination and management of this strategy, a National Biodiversity Committee was established. The committee is composed of representatives from ministerial departments responsible for biodiversity, research and training institutions, and non-governmental organizations. This cross-cutting approach allows for a comprehensive and collaborative effort to address biodiversity-related issues.

It is essential to highlight that the National Biodiversity Strategy and Action Plan for the period 2016-2020 was developed within an overall multidimensional and multisectoral framework that prioritizes three key sectors of the economy agriculture, forestry, and fisheries. The rationale behind this prioritization lies in the close interdependence of these sectors with diverse terrestrial, marine, and aquatic ecosystems, which serve as habitats for a wide array of living organisms (fauna, flora, and bacteria, etc.). In addition to the cross-cutting measures mentioned above, the ministerial departments overseeing these economic sectors have independently undertaken initiatives to facilitate and promote the mainstreaming of biodiversity. The most important measures are presented in Table 3.

Table 3: Main biodiversity mainstreaming measures into priority economic sectors

Sectors	Examples of measures adopted to mainstream biodiversity
Fishing	<ul style="list-style-type: none"> Sustainable fishing regulations to ensure the preservation of marine species and the sustainability of fisheries

	<ul style="list-style-type: none"> • Creation of marine protected areas to preserve sensitive marine habitats and marine biodiversity • Establishment of a biological rest period for cephalopod • Supervision and control to combat illegal, unreported and unregulated (IUU) fishing • Active participation of fishermen and local communities in the management of marine resources. • Awareness and education to inform fishermen and stakeholders about the importance and necessity of preserving marine biodiversity • Conservation of coastal ecosystems, which host a wealth of marine biodiversity. • Deploying a research and knowledge strategy for the marine ecosystem
Agriculture	<ul style="list-style-type: none"> • Encouraging the adoption of agro-ecological and organic farming practices. • Conservation of plant genetic resources and local animal breeds. • Creation of conservation areas and management of biodiversity, such as wetlands and nature reserves, in order to protect agricultural biodiversity • Introducing the Green Morocco Plan in 2008 • Setting up ecological compensation programs to offset the damage caused to biodiversity by agricultural activities. • Organization of awareness-raising and education campaigns for farmers and stakeholders in the agricultural sector to promote sustainable management of natural resources and better mainstreaming of biodiversity into farming practices
Forest	<ul style="list-style-type: none"> • Creation of several nature reserves and national parks to protect forest ecosystems and their biodiversity (Toubkal National Park, Arganeraie Biosphere Reserve, Southern Morocco Oases Biosphere Reserve, Cedrai Biosphere Reserve, etc.). • Drawing up sustainable forest management plans that take biodiversity into account is crucial. The latest of these plans is the "Moroccan Forests 2020-2030" forestry strategy. • Conserving endemic and threatened species found in the forests. • Implementing ecological restoration programs aimed at rehabilitating and enhancing degraded forest ecosystems. • Identifying 19 Important Plant Areas (IPAs), which are home to very rare endemic species. • Involving local communities in the management of forest resources. • Raising awareness and educating stakeholders about the importance of forest biodiversity and promoting its conservation."

Source: Table based on strategies drawn up by the concerned ministerial departments (2022)

4. What progress has been made in mainstreaming biodiversity into economic sectors in Morocco?

The measures taken to ensure that biodiversity is properly mainstreamed into Morocco's priority economic sectors are diverse and diverse. However, the results have not lived up to expectations, primarily due to resource constraints and governance issues. As a consequence, the mainstreaming of biodiversity into the economic sectors is still not as effective as desired.

4.1. Rather mixed results

A review of the latest evaluation report on Morocco's National Biodiversity Strategy and Action Plan reveals that out of the 26 Operational Objectives, only three (3) show no noticeable change (11.53%), and eleven (11) objectives (42.32%) are considerably behind schedule in relation to the set targets (BIP, 2019).

In fact, only the objectives that require fewer resources and commitment, or those where Morocco was already well ahead of schedule, have shown any significant progress. This is the case for the establishment of legislative and institutional frameworks for the operationalization of the Nagoya and Cartagena Protocols, extension of the areas of protected zones, the development of the National Biodiversity Information Clearing House, the development of an awareness-raising roadmap to encourage positive behavior towards national biodiversity preservation, and the enhancement of formal and informal educational programs addressing biological diversity challenges.

Among the objectives not achieved, and which have a direct or indirect link with the integration of biodiversity into the primary economic sectors, we can mention the following:

- Drawing up a hierarchical list of endangered species in Morocco and implementing appropriate conservation scenarios to stabilize their populations by 2020.
- Compiling an inventory of national marine genetic resources and establishing a preservation program for these resources.
- Developing management plans for the most heavily exploited stocks of fish and marine invertebrates to prevent their collapse.
- Strengthening national, regional, and local coordination structures to foster convergence and participation.
- Improving knowledge of ecosystem resilience to climate change and developing and applying indicators for monitoring and evaluation.

The final assessment of Morocco's progress in achieving Aichi target on the mainstreaming of biodiversity is insufficient, according to the Convention on Biological Diversity and the World Environment Situation Room (2021). This objective states that by 2020, the values of biological diversity should have been integrated into national and local development, poverty reduction strategies, planning processes, and are being incorporated into national accounting and reporting systems.

According to the Red List index¹, compiled by the International Union for Conservation of Nature, the risk of species extinction has decreased from 0.91 in 1993 to 0.88 in 2022. This indicates an overall unfavorable trend, as a lower index value indicates a higher risk of extinction. This index is between 0 and 1. A value of 1 indicates that there is no current extinction risk to any of the included species. A value of 0 would mean that all included species are extinct.

Considering the sectoral strategies, it seems that the fishing sector continues to be subject to strong anthropogenic pressure, which poses a major threat to marine biodiversity. While Morocco has invested considerable efforts in protecting its territorial waters, with the proportion of protected marine areas increasing from 0.46% in 2016 to 0.68% in 2021, the issues of overfishing and illegal practices persist. Table 4 illustrates the quantity of fish caught illegally². The data shows a considerable increase in the quantity of illegally caught fish, rising from 196.5 thousand tons in 1978 to 1.19 million tons in 2018, ranking Morocco second in the world for illegal fishing, just behind China.

¹ Extinction risk estimates for mammals, birds, cycads, amphibians and corals are used to calculate the Red List Index. National Red List Indices is calculated by weighting by the fraction of each species' distribution occurring within them.

² Bottom trawling is a fishing method in which a large, heavy net is dragged along the seafloor to catch fish and other marine life

Table 4. Wild fish catch from bottom trawling³

Years	1978	1988	1998	2008	2018
Quantity Caught (in tons)	196587	828858	699822	875047	1191146
Number of protected marine areas	-	-	1	3	6

Source: FishStat via Pauly, Zeller and Palomares de Sea Around Us Concepts, Design and Data

Despite the implementation of the catch certification procedure under the Halieutis plan⁴, there is a recurring issue of undeclared and unregulated fishing, resulting in a significant amount of fish products evading official traceability. This problem is particularly evident in the fishing of cephalopods, especially octopus. First, licensed cephalopod fishers do not regularly declare their catches as required. Second, significant portions of octopus exports come from informal artisanal fishing. Consequently, there is a concerning phenomenon of disguising octopus export activities, as this species is highly sought after in foreign markets.

In addition to the depletion of fish stocks and marine biodiversity, there has been a continuous degradation of the coastal and marine environment. This degradation is primarily caused by pollution resulting from the increasing concentration of populations (including urban waste) as well as industrial, commercial, and tourist activities.

Regarding the forestry sector, the actions undertaken have successfully preserved a significant portion of the forested areas (as shown in table 5). Through an average afforestation rate of approximately 8%, Morocco has effectively restored forests that were previously damaged by fire or disease.

Table 5. Percentage covered by forest in Morocco

	2000	2020
Share of land covered by forest	12.4%	12.9%
Share of forest area within protected areas,	4.58%	4.59%

Source: Food and Agriculture Organization of the United Nations and historical sources

Despite the positive outcome mentioned, the forest ecosystem in Morocco continues to face the detrimental impacts of global warming and human activities. The terrestrial mammalian fauna consists of nearly 98 species, with 13 of them considered threatened. The avifauna includes over 480 species, with 46 of them being threatened. The herpetofauna, which includes reptiles and amphibians, comprises at least 125 species and subspecies, with 18 of them being threatened (Observatoire National de l'Environnement et du Développement Durable, 2023). Among the wild mammals, seven species are listed in Appendix I of CITES, (Oryx algazelle, Addax, Cuvier's Gazelle, Gazelle dama, Cheetah, European Otter, and Panthera). The marine fauna is not yet fully documented.

In terms of flora, over 24% of the estimated 7,000 species and subspecies of flora in Morocco are included in the list of rare or threatened vascular plants (Centre d'Echange d'Information

³ Bottom trawling is a fishing method in which a large, heavy net is dragged along the seafloor to catch fish and other marine life.

⁴ Launched in 2009, this plan aims to develop sustainable fishing and preserve fishing heritage

sur la biodiversité du Maroc, 2023). This list is regularly updated as new information becomes available.

The agricultural sector in Morocco is causing significant harm to biodiversity. This is primarily because farmers have not fully embraced the concept of mainstreaming biodiversity into their practices. They continue to overuse pesticides and chemical fertilizers. However, the excessive use of these chemicals products contaminates soils, waterways and groundwater, leading to the death of organisms and disrupting ecosystems. Additionally, forests are frequently cleared to make way for intensive agriculture, particularly for cereal and olive cultivation. This leads to the loss of natural habitats and a decline in the populations of plant and animal species that rely on these ecosystems.

The expansion of monocultures and the abandonment of traditional farming practices, such as agroforestry or terraced farming, have detrimental effects on biodiversity. These changes in agricultural practices result in the reduction of habitat diversity and species, while also increasing vulnerability to diseases and pests. Moreover, the gradual abandonment of traditional farming practices can lead to the loss of ancestral know-how on the sustainable management of natural resources and the conservation of biodiversity.

4.2. The barriers to mainstreaming biodiversity

There are several reasons, linked to governance issues that have made it challenging to effectively mainstream biodiversity into Morocco's priority economic sectors. First, one of the main obstacles is the weak capacity of the bureaucrats responsible for implementing biodiversity mainstreaming plans and strategies. Many of these individuals are often demotivated and lack the necessary knowledge and determination to initiate meaningful changes and achieve the desired outcomes.

Second, the effectiveness of many laws related to biodiversity is problematic. In fact, most legislative texts concerning biodiversity rely on regulatory application decrees. Most of these are drawn up late, which hampers their application. A notable example is the establishment of national parks. The Court of Auditors (2020) has highlighted that the legislative process for national parks has consistently been slow and incomplete. In fact, the first text on protected areas was introduced in 1934 with the Dahir (Royal Decree) relating to national parks, and it was only amended in 2010 through the enactment of Law No. 22-07 on protected areas. However, the implementing decree for this law has not yet been issued, preventing its effective application. Similarly, Law 29-05 on the protection of species of wild flora and fauna and control of their trade was introduced as a bill in 2005 but was not officially promulgated until 2011. In addition, some international conventions on biodiversity conservation take a long time to be ratified. This is the case of CITES (The Convention on International Trade in Endangered Species of Wild Fauna and Flora), signed by Morocco in 1976 and only ratified in 2011.

Thirdly, the effectiveness of certain measures is doubtful. This is the case of the special tax on sand. The purpose of this tax was to curb the exploitation of coastal dunes and beaches. However, it has resulted in many businesses in the formal sector migrating to the informal sector. As a result, sand from the informal sector has become more competitive and profitable. Another example is the tax exemption for the agricultural and fishing sectors, which are largely dominated by rent-seeking behavior. This policy has led to the overexploitation of resources such as water, soil, and fish. The economic operators in these

sectors, including agricultural and marine professionals, often prioritize their financial gains and rarely consider biodiversity, especially since they receive significant financial support from the government. While strategies for revitalizing these two sectors like the Green Morocco Plan and the Halieutis strategy involve private operators for investment purposes, biodiversity conservation objectives are often given less priority (BIB, 2020).

Likewise, indigenous and local communities are recognized as official partners in biodiversity mainstreaming strategies. However, their actual participation in the three selected sectors is minimal. It appears that the economic incentives provided to them have not been sufficient to offset the losses incurred due to the requirement of changing rules and practices related to biodiversity conservation. This is what Tang and Tang (2014) call 'hierarchical exclusion effects'. Additionally, the local population lacks trust in the government officials responsible for implementing biodiversity mainstreaming strategies. NGOs generally try to act as mediators, but their actions are often modest.

Fourthly, at the political level, the mainstreaming of biodiversity into economic sectors involves a multitude of public players (including the Ministry of Agriculture, the Ministry of Ecological Transition and Sustainable Development, the Ministry of the Interior, the General Secretariat of the Government, the National Water and Forestry Agency, the National Observatory for the Environment and Sustainable Development, and the National Agency for the Development of Oasis Zones and the Argan Tree, etc.). Each player expresses its own specific concerns and adopts its own working approach. However, the level of coordination among the plans and strategies developed by these entities remains relatively limited. As a result, it is often challenging to distinguish between activities that provide positive incentives for the mainstreaming of biodiversity and those aimed at eliminating the adverse effects of biodiversity degradation.

Fifthly, the level of national scientific knowledge on biodiversity and ecosystems is deemed insufficient (BIB, 2020), which explains the massive recourse to the services of foreign experts. For example, all the assessment reports on Morocco's National Biodiversity Strategy and Action Plan were produced by a foreign consultancy firm. Also, the two references providing a complete inventory of amphibians, reptiles and mammals were carried out by foreign experts and did not involve any Moroccan experts (Martínez del Marmol et al., 2019). Although we do not doubt their competence, we believe that foreign experts may encounter greater challenges in disseminating the results of their expert assessments, particularly when faced with stakeholders who attempt to distort the facts or question the quality of the established evidence.

5. Conclusion

One of the primary challenges facing Morocco is to reconcile economic interests with biodiversity conservation objectives. Economic sectors frequently exert direct pressure on biodiversity through unsustainable practices, including deforestation, overfishing, overgrazing, soil degradation, and excessive use of fertilizers and chemicals. Striking a balance between economic needs and nature preservation is not an easily done task. This was confirmed by the analytical exercise we carried out in this paper, which focused on three key sectors of the economy: fisheries, agriculture and forestry.

Despite the political will expressed and Morocco's commitment to international efforts to mainstream biodiversity into sectoral policies and strategies, very little progress has been achieved. The responsibility is shared between the various stakeholders involved in these policies and strategies. First, the government shows the capability to put forth good projects on the political agenda and design effective policies and strategies. However, implementation is poor due to the limited capacity and motivation of bureaucrats. Second, businesses and the affected populations often hesitate to comply with the government's proposed policies and strategies. We know that each policy or strategy has a definite cost for clearly identified social groups, while the benefits are generally uncertain and may only be felt in the medium and long term. It is the discrepancy between these costs and benefits that often leads to discontent and consequently low levels of support. This is true of both government agencies and the scientific institutes concerned.

We consider that any credible and viable sectoral strategy aimed at mainstreaming biodiversity requires a combination of four factors, which do not always align. First, a long-term vision that prioritizes biodiversity as the core focus of economic, social, and scientific concerns. Secondly, a dynamic and fruitful debate around the different axes of transformative projects. Thirdly, an widespread shared by the public and other stakeholders. Fourthly, motivated bureaucrats capable of transforming the dissatisfactions identified into a concrete, effective and equitable project.

Mainstreaming biodiversity conservation into Morocco's economic sectors is undoubtedly a significant challenge, but it also presents a unique opportunity for the country to foster a more sustainable and resilient economy. By conserving biodiversity, Morocco can safeguard its invaluable natural resources, promote ecotourism, enhance food security, and support the well-being of local communities. Therefore, it is imperative for the government, businesses, civil society organizations, international bodies, and individual citizens to collaborate closely, making biodiversity conservation a national priority and a catalyst for sustainable development in Morocco. Only through a collective and coordinated effort can the country preserve its exceptional natural wealth for the benefit of future generations.

Bibliography

BIP (Biotope Ingénierie Biodiversité). 2019. 6e Rapport National sur l'Etat de la mise en œuvre de la convention sur la Diversité Biologique (6RNB), Rapport final

Burch John B, Augustine Alison Deckhut, Frieden Leslie A, Hadley Evan, Howcroft T. Kevin, Johnson Ron, Khalsa Partap S, Kohanski Ronald A, Li Xiao Ling. 2014. Macchiarini F. Advances in geroscience: impact on healthspan and chronic disease. *J. Gerontol. A Biol. Sci. Med. Sci.* 2014. 69 (Suppl. 1):S1–S3.

CBD, 2010. Global Monitoring Report 2010: Innovative Financing for Biodiversity. Secretariat of the Convention on Biological Diversity, Montreal.

De Vos Jurriaan M, Joppa Lucas N, Gittleman John L, Stephens Patrick R, Pimm Stuart L. 2015. 'Estimating the normal background rate of species extinction', *Conservation Biology*, 29, no. 2:452–462. <https://doi.org/10.1111/cobi.12380>

Friedman Kim, Garcia Serge, Rice Jake. 2018. Mainstreaming biodiversity in fisheries, *Mar. Policy*, 95 : 209-220. <https://doi.org/10.1016/j.marpol.2018.03.001>

Glasbergen Pieter. 2011. Understanding partnerships for sustainable development analytically: the ladder of partnership activity as a methodological tool

- Huntley, Brian J., Redford, Kent H. 2014. Mainstreaming Biodiversity in Practice: A STAP Advisory Document. Global Environment Facility, Washington, DC.
- IIED et PNUE-WCMC. 2015. L'intégration de la biodiversité et du développement : conseils et tâches à effectuer tirés de l'expérience africaine. IIED, Londres
- Karlsson-Vinkhuyzen Sylvia, Kok Marcel T, Visseren-Hamakers Ingrid J, Termeer Jim Collins. 2017. Mainstreaming biodiversity in economic sectors: an analytical framework. *Biological Conservation*. 210 :145-156
- Kettunen Marianne, D'Amato Dalia., Ten Brink Patrick., Mazza Leonardo, Malou Augustin, Withana, Sirini, Van der Esch, Stefan, Kok Marcel. 2013. Potential of Sectoral Resource Mobilisation to Implement the Aichi Targets in Developing Countries. An Explorative Study IIEP/PBL .
- Kok Marcel, Alkemade Rob. 2014. How sectors can contribute to sustainable use and conservation of biodiversity. In: Secretariat of the Convention on Biological Diversity (Ed.), CBD Technical Series. PBL Netherlands Environmental Assessment Agency, The Hague.
- Leadley Paul W., Krug Cornelia B., Alkemade Rob, Pereira Henrique M., Walpole Matt, Marques, Alexandra, Newbold Tim, Teh, Louis S.L., Van Kolck Jennifer, Bellard Čžline., Januchowski-Hartley, Stephanie R., Mumby Peter J. 2014. Progress Towards the Aichi Biodiversity Targets: An Assessment of Biodiversity Trends, Policy Scenarios and Key Actions. Technical Series Secretariat of the Convention on Biological Diversity, Montreal, Canada.
- Li Quan, Reuveny Rafael. 2006. Democracy and environmental degradation. *International Studies Quarterly* 50: 935–956. <https://doi.org/10.1111/j.1468-2478.2006.00432.x>.
- Martínez del Marmol Gabriel, Harris D. James, Philippe Geniez, Philip De Pous, et Salvi Daniele. 2019. Amphibians and Reptiles of Morocco. Edition Chimaira, 478 p
- Ministère de la Transition Énergétique et du Développement Durable. 2023. Conventions internationales. Disponible sur : <http://www.environnement.gov.ma/fr/lois-et-reglementations/conventions-et-accords>
- Ministère de la Transition Énergétique et du Développement Durable. 2016. Recueil des lois relatives à la protection de l'environnement. Rabat <http://www.environnement.gov.ma/fr/lois-et-reglementations/textes-juridiques>
- Ministère de la Transition Énergétique et du Développement Durable. 2016. Stratégie et Plan d'Actions National pour la Diversité Biologique du Maroc, 2016-2020
- Ministère de la Transition Énergétique et du Développement Durable (MTEDD) – Département du Développement Durable. 2009. Quatrième Rapport National sur la Biodiversité. Disponible sur : <https://www.cbd.int/doc/world/ma/ma-nr-04-fr.pdf>.
- Observatoire National de l'Environnement et du Développement Durable. 2023. indicateurs et données, <https://sine.environnement.gov.ma/indicateur>
- Pauly Daniel, Zeller Dirk, Palomares Maria L.D. (Editors). 2020. Sea Around Us Concepts, Design and Data, searoundus.org.
- Polasky Stephen, Costello Christopher, Solow Andrew. 2005. The economics of biodiversity, Chapter 29 of Handbook of Environmental Economics, edition 1, Volume 3, Chapter 29.
- Rydén Oskar, Zizka Alexander, Jagers Sverker C, Lindberg Staffan I., Antonelli Alexandre. 2020. Linking democracy and biodiversity conservation: Empirical evidence and research gaps. *Ambio* 49: 419-433. <https://doi.org/10.1007/s13280-019-01210-0>
- Sjostedt Martin. 2013. Horizontal and vertical resource dilemmas in natural resource management: The case of African fisheries. *Fish and Fisheries* 14: 616–624. <https://doi.org/10.1111/j.1467-2979.2012.00481.x>.
- Smith Jessica, Bass Steve, Roe Dilys. 2020. Biodiversity mainstreaming A review of current theory and practice, Report, International Institute for Environment and Development, London, 53p.

Tang Ching-Ping, Tang Shui-Yan., 2014. Managing incentive dynamics for collaborative governance in land and ecological conservation. *Public Adm. Rev.* 74 : 220–231.

Vergez Antonin . 2023. Intégrer la biodiversité dans les secteurs économiques prioritaires. Leçons tirées de l'évaluation des principales menaces dans 16 pays pilotes BIODÉV2030. Gland, Suisse : UICN, available At : <https://doi.org/10.2305/YJOE3433>

Weißhuhn Peter, Reckling Moritz, Stachow Ulrich, Wiggering Hubert. 217. Supporting Agricultural Ecosystem Services through the Integration of Perennial Polycultures into Crop Rotations. *Sustainability*. MDPI, 9. no. 12 :1-20. DOI:[10.25932/publishup-47441](https://doi.org/10.25932/publishup-47441)

Whitehorn Penelope, Navarro Laetitia M, Schröter Matthias, Fernandez Miguel , Rotllan-Puig Xavier, Marques Alexandra. 2019. Mainstreaming biodiversity: A review of national strategies. *Biological Conservation*, 235 :157-163. <https://doi.org/10.1016/j.biocon.2019.04.016>.

Wurster Stefan. 2013. Comparing ecological sustainability in autocracies and democracies. *Contemporary Politics* 19: 76–93. <https://doi.org/10.1080/13569775.2013.773204>.