

Landscape Alterations in the MENA Region

Threats, Factors, and Priority Actions

Oluwatobi Mary Owojori and Emem Anwana

5.1 INTRODUCTION

This chapter examines the legal and institutional frameworks for promoting landscape and biodiversity conservation in the Middle East and North Africa (MENA) region. It examines the drivers of landscape alterations and biodiversity loss in the region, the legal barriers that hinder coherent responses to such problems, and how such barriers can be coherently addressed.

As one of the world's oldest regions, the MENA region has one of the most diverse landscapes. Mountains, oceans, and rivers form the foundation for a diverse mosaic of subregions with different types of soil, plant cover, and microclimates.¹ The long-term struggle against aridity has profoundly altered the social and technological means of interacting with the landscape, giving rise to several local activities. Long-standing environmental and cultural systems have been destroyed as a result of the recent rapid urbanization that has altered and changed the integration of culture and the physical landscape.² As the number of people on earth grows geometrically, increasing amounts of land are set aside for their requirements, including housing and food production.

Due to its long history of human habitation, the MENA region possesses one of the highest population densities, and for hundreds of years it has been continuously losing biodiversity as a result of land cover alteration resulting from land grading, forest removal, and excavation activities, among other things.³ This practice, described as landscape alteration, results in the disturbance and invasion of natural habitat, including the flora and fauna. The MENA landscape is increasingly altered by natural and anthropogenic (human-induced) events, such as fires, storms, and/or human-driven construction, agricultural expansion, and urbanization, which have significant effects on biodiversity and ecosystem services.⁴ Previous research

¹ Sareh Moosavi, Jala Makhzoumi, and Margaret Grose, "Landscape Practice in the Middle East between Local and Global Aspirations" (2015) 41 *Landscape Research* 3, 265.

² Ibid.

³ Damilola Olawuyi, *Environmental Law in Arab States* (Oxford University Press 2022) 1–25.

⁴ Ibid.

has shown that variations in land use conditions have a negative worldwide impact on local biodiversity.⁵ Loss of biodiversity and the resulting reduction in ecosystem service delivery have substantial economic and social consequences that affect not only the ability to maintain the environment but also the ability to combat global poverty, hunger, and illness. As metropolitan regions and their human populations expand, effective landscape protection and biodiversity conservation become more crucial, not only to meet conservation goals but also because ecosystems supply services that humans and animals depend on. The MENA region's peace initiatives could be hampered by landscape conversion. A higher population competing for scarce natural resources such as water and arable land could complicate their distribution, leaving more people without access and resulting in greater hardship.⁶

A small number of studies have looked at the effects of landscape changes and conservation management strategies on trade-offs between biodiversity and ecosystem services.⁷ Studies on landscape alterations from the MENA region, however, have received minimal investigation. Since previous studies have not conducted a meta-analysis or integrated review, despite the fact that they have provided insightful information about the trends of land use change or the operation of natural ecosystems, this chapter fills a significant gap in this regard. This chapter uses an integrated review to identify the factors influencing landscape changes in the MENA region.

The subsequent sections of this chapter follow a structured sequence, delving deeper into the subject matter. Section 5.2 examines the nature, scope, and drivers of landscape changes and biodiversity loss in the MENA region, shedding light on their intricate dynamics. In Section 5.3, the focus narrows down to a survey of legal and institutional barriers that hinder effective landscape alteration and biodiversity preservation efforts. Section 5.4 provides a set of strategic legal and institutional recommendations designed to overcome the identified barriers. Finally, Section 5.5 concludes by synthesizing insights from the preceding sections, offering a forward-looking perspective on how these recommendations could reshape landscape and biodiversity preservation in the MENA region.

5.2 NATURE, SCOPE, AND DRIVERS OF LANDSCAPE CHANGES AND BIODIVERSITY LOSS IN THE MENA REGION

This section discusses the factors associated with landscape changes and biodiversity conservation in the MENA region. The review identifies natural/spatial, policy/

⁵ E. C. Ellis et al., "Used Planet: A Global History" (2013) 110 *Proceedings of the National Academy of Sciences* 20, 7978.

⁶ Katharina Waha et al., "Climate Change Impacts in the Middle East and Northern Africa (MENA) Region and Their Implications for Vulnerable Population Groups" (2017) 17 *Regional Environmental Change* 6, 1623.

⁷ L. Kirch et al., "World Risk Report Analysis and Prospects 2017" (2017) http://weltrisikobericht.de/wp-content/uploads/2017/11/WRR_2017_E2.pdf accessed January 27, 2024.

institutional, socio-economic, technological, and cultural factors as those influencing land alterations in the region.

5.2.1 Natural/Spatial Factors

Urban land use and land cover patterns can alter as a result of natural environmental occurrence or disasters such as climate change, flooding, erosion, and wildfires.⁸ Extreme weather conditions brought on by climate change, such as heavy and erratic rainfall, flooding, and droughts, influence landscape alterations. This is a major threat for biodiversity and ecosystem functioning.⁹ Major land alteration processes in the MENA region include overgrazing, wildfires, landslides, water and wind erosion, salinization, a reduction in soil fertility and organic matter, and salinization that impacts more than 40 percent of the region's land.¹⁰ Only 2.9 percent of the land in the MENA countries is covered by forests and bushes, many of which have been destroyed by wildfires, used as fuel, overgrazed, turned into agriculture, or destroyed by urbanization.¹¹

The various ecological components are greatly impacted by the local climatic conditions in the Arab region. The region's predominantly dry ecosystems are fragile by nature, which have significant effects. According to NASA, the current dry period in the MENA region is the worst it's been in 900 years.¹² Since 1998, the region has seen practically constant drought. These regions are predicted to have the highest population exposure to accelerated desertification, according to the Intergovernmental Panel on Climate Change assessment.¹³

Water scarcity and associated unsustainable practices constitute another factor responsible for increased land alterations and biodiversity loss. Prolonged water scarcity plays a prominent role in driving land alteration in the MENA countries.¹⁴ The region grapples with chronic water shortages due to factors such as excessive groundwater extraction, inefficient irrigation methods, and shifting precipitation patterns

⁸ Damilola Olawuyi (ed), *Climate Change Law and Policy in the Middle East and North Africa Region* (Routledge 2021) 1–11.

⁹ Virginie Lepetz et al., "Biodiversity Monitoring: Some Proposals to Adequately Study Species' Responses to Climate Change" (2009) 18 *Biodiversity and Conservation* 12, 3185.

¹⁰ Razieh Namdar, Ezatollah Karami, and Marzieh Keshavarz, "Climate Change and Vulnerability: The Case of MENA Countries" (2021) 10 *ISPRS International Journal of Geo-Information* 11, 794.

¹¹ Wilco Terink, Walter Willem Immerzeel, and Peter Droogers, "Climate Change Projections of Precipitation and Reference Evapotranspiration for the Middle East and Northern Africa until 2050" (2013) 33 *International Journal of Climatology* 14, 3055.

¹² Benjamin I. Cook et al., "Spatiotemporal Drought Variability in the Mediterranean over the Last 900 Years" (2016) 121 *Journal of Geophysical Research: Atmospheres* 5, 2060.

¹³ Mehmet Ishak Yuce and Musa Esit, "Drought Monitoring in Ceyhan Basin, Turkey" (2021) 9 *Journal of Applied Water Engineering and Research* 4, 1.

¹⁴ Kira Walker, "MENA's Biodiversity Shrinking under Pressure of Climate Change" (Nature Middle East, December 2022) www.natureasia.com/en/nmiddleeast/article/10.1038/nmiddleeast.2022.79 accessed January 27, 2024.

influenced by climate change. These elements contribute to soil salinization and erosion, effectively transforming once fertile land into unproductive terrain.¹⁵

Sea level rise also puts low-lying coastal regions in Kuwait, Qatar, Libya, Tunisia, and the United Arab Emirates at risk of flooding, as well as the northern coast of Egypt, such as in Alexandria, Egypt's second-largest city after Cairo.¹⁶ Yemen's 2008 flood cost the nation US\$1.6 billion (6 percent of Yemen's gross domestic product),¹⁷ and the Djibouti flood of 2004 harmed 100,000 people, claimed 230 lives, and caused extensive damage.¹⁸ Additionally, according to vulnerability severity levels, the low-vulnerable category is predicted to experience floods much more frequently as a result of climate change, and due to inadequate citywide drainage systems, minimal structural protection, and informal urbanization of watershed areas, floods also frequently damage landcover in the MENA region.¹⁹ The necessity for measures to maintain biodiversity and the unfavorable effects of climate change are consistent. Although the causes of these changes are undoubtedly complex, there is some indication that the worst effects could be mitigated if habitat degradation could be stopped, notably in semi-arid grasslands and the rainforests of equatorial regions.

According to the UN State Habitats of the World's Cities 2008–2009, by 2070 coastal cities such as Alexandria (Egypt), Algiers (Algeria), Casablanca (Morocco), Djibouti (Djibouti), and Tunis (Tunisia) might be badly impacted by increasing sea levels. A few member nations of the medium and highly vulnerable classes, including Saudi Arabia, have acquired foreign arable lands in Africa and elsewhere after realizing the unreliability of water resources in order to produce food grains and satisfy their rapidly expanding population's rising food demand, further altering the landscape.²⁰

5.2.2 Socio-economic Factors

Population growth and rapid urbanization are intrinsic to economic diversification. As cities expand, they often encroach upon natural landscapes. The conversion of rural areas into urban centers, including the development of residential and commercial zones, can significantly alter land use and lead to increased infrastructure

¹⁵ World Bank, *Sustainable Land Management and Restoration in the Middle East and North Africa Region: Issues, Challenges, and Recommendations* (World Bank 2019).

¹⁶ R. Zaaboul, "Climate Change Impacts on the Agricultural Sector in the Arab Region" (2020) 176 *Desalination and Water Treatment* 436.

¹⁷ World Bank, "Water in the Arab World: From Droughts to Flood, Building Resilience against Extremes" (March 21, 2014) www.worldbank.org/en/news/feature/2014/03/20/floods-and-droughts-in-mena accessed January 27, 2024.

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Brian Wright and Carlo Cafiero, "Grain Reserves and Food Security in the Middle East and North Africa" (2011) 3 *Food Security* 51, 61.

needs.²¹ Approximately 60 percent of the one billion people who reside in the MENA region's cities are urban dwellers.²² A significant population increase is predicted until the 2060s to 2070s, after which there will be a decline until the year 2100. More than 90 percent of the people in the MENA region are anticipated to live in cities by the end of the century as urbanization is predicted to continue.²³

Over the past century, the MENA area has the greatest pace of population growth worldwide.

The MENA region's economically underdeveloped regions are where urbanization and population increases are occurring at the fastest rates. Fourteen out of twenty MENA countries' urban environments are under extreme pressure due to the rapid rate of urbanization. Furthermore, according to UN estimates, 430 million people will live in the MENA region by 2020, with 280 million of them predicted to reside in urban areas. Similarly, in seven of the low- and middle-income countries, over 90 percent of the population will live in cities by 2030, resulting in the loss of significant land areas to urbanization and other types of land closing.²⁴

Furthermore, MENA countries, traditionally reliant on oil and gas revenues, have recognized the need to reduce their dependence on a single income source. Mega-projects play a pivotal role in this diversification strategy by catalyzing investments across various sectors, including tourism, hospitality, real estate, and transportation. These projects create new economic opportunities, stimulate job growth, and enhance global competitiveness, which are essential for long-term sustainability.²⁵ The MENA region has witnessed a significant surge in mega-projects and construction endeavors in recent years. These projects, ranging from massive infrastructure developments to sports stadiums for global events such as the FIFA World Cup, have been strategically employed by MENA countries to diversify their economies. However, this economic diversification through mega-projects often comes at the cost of extensive landscape alterations, which raise concerns about its impact on landscape and biodiversity.²⁶ The boom in mega-projects has led to extensive landscape alterations across the MENA region. Vast tracts of land are

²¹ Damilola Olawuyi, "Construction and Town Planning" in D. S. Olawuyi (ed), *Environmental Law in Arab States* (Oxford University Press 2022) 138.

²² "MENA Countries: Urbanization in 2021" (May 2023) www.statista.com/statistics/804824/urbanization-in-the-mena-countries/ accessed February 2, 2024; also Karim Elgendy and Natasha Abaza, "Urbanization in the MENA Region: A Benefit or a Curse?" (February 10, 2020) <https://mena.fes.de/press/e/urbanization-in-the-mena-region-a-benefit-or-a-curse> accessed January 27, 2024.

²³ George Zittis et al., "Business-as-Usual Will Lead to Super and Ultra-Extreme Heatwaves in the Middle East and North Africa" (2021) 4 *Climate and Atmospheric Science* 1.

²⁴ Hakan Tropp and Anders Jagerskog, "Stockholm International Water Institute" *Water Scarcity Challenges in the Middle East and North Africa (MENA)* (United Nations Development Programme 2006) <https://hdr.undp.org/content/water-scarcity-challenges-middle-east-and-north-africa-mena> accessed January 27, 2024.

²⁵ A. Rizzo, "Rapid Urban Development and National Master Planning in Arab Gulf Countries: Qatar as a Case Study" (2014) 39 *Cities* 50.

²⁶ Olawuyi (n 21).

repurposed to accommodate these projects, resulting in substantial changes to natural environments with profound environmental consequences.

Greater demand for an affluent consumer-oriented lifestyle, partly as a result of rising income levels in the region, is another factor. This frequently denotes luxurious residences near reliable, convenient transportation in masterplanned neighborhoods, which raises the demand for urban land and housing.²⁷ Economic downturns and the unemployment rate are additional factors impacting urban growth that may cause a loss of people in an urban core or deteriorating suburbs, which would result in urban degradation.²⁸ As a result, economic downturns can significantly influence how landscapes are altered, thereby impacting biodiversity.

In pursuit of agricultural diversification, some MENA countries have sought to expand their agricultural sectors. This expansion often involves converting natural landscapes, such as deserts or semi-arid regions, into arable land. Intensive irrigation and farming practices can lead to soil degradation and alterations in the natural topography.²⁹ Resettlement is another issue that has resulted in the vast alterations in landscape, such as the relocation of populations to new locations due to the movement of people from rural areas to cities, as well as from other countries.³⁰ This population increase has resulted in the conversion of grazing and woodland areas to agricultural land and thus it is claimed that economic growth and population render land use alterations almost inevitable. Urbanization in the MENA region has failed to deliver the expected benefits of economic, social, and environmental development. Instead, it has worsened the existing problems of resource scarcity, service provision, and inequality.³¹

5.2.3 *Environmental Factors*

The most significant environmental factor in the MENA region flows from habitat clearing and modification, with a significant amount of it being done for extractives and urban and infrastructure development projects. Deforestation for the lumber industry, oil and mineral extraction, construction of mega-projects such as airports and sporting infrastructure, and the cultivation of cash crops are a few examples of activities that have contributed to the increased habitat destruction in the MENA

²⁷ Janina Kleemann et al., “Peri-Urban Land Use Pattern and Its Relation to Land Use Planning in Ghana, West Africa” (2017) 165 *Landscape and Urban Planning* 280.

²⁸ Luca Salvati, “Urban Dispersion and Economic Crisis: Empirical Evidence from a Mediterranean Region” (2018) 62 *Journal of Environmental Planning and Management* 7, 1205.

²⁹ Statista, “Organic and In-Conversion Agricultural Land Area in the Middle East and North Africa Region in 2018, by Country” (Statista 2019) www.statista.com/statistics/990370/middle-east-and-north-africa-organic-and-in-conversion-agricultural-land-area-by-country/ accessed January 27, 2024.

³⁰ Anne Schneibel et al., “Assessment of Spatio-Temporal Changes of Smallholder Cultivation Patterns in the Angolan Miombo Belt Using Segmentation of Landsat Time Series” (2017) 195 *Remote Sensing of Environment* 118.

³¹ Elgendy and Abaza (n 22).

region.³² In several MENA countries, land degradation worsens biodiversity and ecosystems, lowers productivity, exacerbates water scarcity, and causes a decline in arable land (just 5 percent of the region's total land area, except Israel and Turkey, is arable land). Presently, irrigation is required to make 40 percent of arable land fit for cultivation.³³ While overgrazing in Jordan is thought to have diminished the supporting capacity, the landscapes making up approximately 80 percent of the nation's total area are largely arid and semi-arid lands. Iraq is predicted to lose about 250 square kilometers of arable land annually due to continuous desertification processes. This tendency jeopardizes MENA regions' landscape and biodiversity security, which further jeopardizes their socio-economic stability.³⁴ The expansion of industrial activities often involves land clearing and the construction of factories, warehouses, and transportation infrastructure. These alterations fragment natural habitats and disrupt ecological corridors, making it difficult for wildlife to move freely. Fragmentation can lead to isolated populations, reducing genetic diversity and increasing the vulnerability of species to environmental changes and diseases.³⁵

5.2.4 Cultural Factors

The practices, ways of life, and values that define a society make up the cultural components of the environment; socio-cultural variables include things such as language, norms and values, language use, and attitudes toward social duties.³⁶ These factors have an impact on how the landscape changes or how certain societal groups influence it. People frequently make major land use decisions under the impact of cultural, economic, and political factors.

Additionally, a cultural shift has taken place in the region, from the less intensely employed cultural anthropogenesis of hunter-gatherers and early farmers to the intensive, larger-scale agrarian and industrial societies. The global extent of intensive anthropogenic activities have been steadily expanding for the majority of the last 12,000 years. Significant sustenance was provided to previous and present cultures through wild animal and plant hunting and gathering, whether in defined areas or

³² Shemsu Ahmed, "Traditional Beliefs and Institutions for the Conservation of Biodiversity in Ethiopia: A Review from a Conservation Perspective" (2022) 7 *International Journal of Natural Resource Ecology and Management* 1, 1.

³³ Organisation for Economic Co-operation and Development (OECD)/FAO, "OECD-FAO Agricultural Outlook 2018–2027," OCDE editions, Paris/FAO edns, Rome (July 3, 2018) www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2018-2027_agr_outlook-2018-en accessed January 27, 2024.

³⁴ Ibid.

³⁵ Steven Brandt, Book Review of Marijke Van Der Veen (ed), *The Exploitation of Plant Resources in Ancient Africa* (Kluwer Academic/Plenum Publishers 1999), in (2002) 67 *American Antiquity* 4, 781.

³⁶ E. Engobo, "Social Responsibility in Practice in the Oil Producing Niger Delta: Assessing Corporations and Government's Actions" (2009) 11 *Journal of Sustainable Development in Africa* 2, 113.

opportunistically in regions used for other land uses.³⁷ Land alterations and degradation in the MENA region stems from the culture of conventional tillage, monocropping, and increased pressure from human populations. The culture of conservation agriculture to protect biodiversity is poorly developed in the MENA region.³⁸

The adoption of plows and draft animals to facilitate larger-scale crop cultivation and surplus output in support of larger and more unequal nonagricultural populations in cities by agrarian societies is also a contributing factor.³⁹ On the one hand, cultural issues may also limit the growth of agriculture into protected areas such as forests.⁴⁰ Final land use decisions are often made by users influenced by cultural, economic, and political considerations. Such cultural factors include the utilization of natural environments (such as forests) as retreats, where people in the community travel to worship. Natural habitat protection has resulted from the sacredness of natural habitats.⁴¹

5.2.5 *Technological Factors*

Mechanization and other commercial technologies used in industrial land systems to manufacture products for big urban populations have a negative influence on biodiversity and land use. In the MENA region, preindustrial colonial plantations may have opened the way for industrial land systems by introducing land use regimes that were largely focused on fulfilling the needs of urban populations through increasingly globalized mechanical networks.⁴² The expansion of industrial land systems often necessitates land conversion, especially in peri-urban areas. Greenfields, once natural landscapes, are converted into industrial zones, contributing to the loss of valuable ecosystems.⁴³ This process results in reduced biodiversity and the disruption of local food chains and ecological services.

In some cases, mechanization and commercial technologies have driven agricultural intensification. This involves the conversion of natural landscapes into high-yield agricultural fields, often through practices such as monocropping. These agricultural systems are efficient for food production but can deplete soil nutrients,

³⁷ Van Der Veen (n 37) 781.

³⁸ M. Devkota, Y. Singh, Y. A. Yigezu, I. Bashour, R. Mussadek, and R. Mrabet, "Conservation Agriculture in the Drylands of the Middle East and North Africa (MENA) Region: Past Trend, Current Opportunities, Challenges and Future Outlook" in Donald L. Sparks (ed), *Advances in Agronomy* (Elsevier 2022) 253–305.

³⁹ Ibid.

⁴⁰ United Nations, Department of Economic and Social Affairs, "World Population Prospects" Population Division (UN DESA 2022) <https://population.un.org/wpp/> accessed January 27, 2024.

⁴¹ Gezahegn Woldemariam et al., "Spatial Modeling of Soil Erosion Risk and Its Implication for Conservation Planning: The Case of the Gobeles Watershed, East Hararghe Zone, Ethiopia" (2018) 7 *Land* 1, 25.

⁴² L. Charfeddine and Z. Mrabet, "The Impact of Economic Development and Social-Political Factors on Ecological Footprint: A Panel Data Analysis for 15 MENA Countries" (2017) 76 *Renewable and Sustainable Energy Reviews* 138.

⁴³ Ibid.

increase pesticide and herbicide use, and lead to the loss of natural vegetation, negatively impacting biodiversity. A growing amount of physical infrastructure, such as railroads, highways, apartment complexes, factories, is being constructed in the MENA region by urban populations that are also influencing landscapes.⁴⁴ Demands for land use in support of recreation, and a variety of other land uses, have expanded as a result of urbanized lifeways, leading to an increase in what are known as multifunctional landscapes, or landscapes maintained for multiple functions.⁴⁵ Mechanization has facilitated the production of goods and services, contributing to urbanization and the expansion of urban areas. Urban sprawl often encroaches upon nearby natural areas, leading to the conversion of green spaces into built environments. This process fragments ecosystems and exacerbates the loss of biodiversity in urbanized regions. The availability of new technologies and the ease with which they can be applied to the land significantly affect land use and biodiversity. Mountainous locations, for instance, are difficult to mechanize, which limits the kinds of land use changes that might occur there.⁴⁶ The likelihood of some type of land use change depends on how quickly and easily land managers adopt new technologies. In a larger sense, the knowledge resources that land managers have access to or possess (e.g. traditional knowledge) have a significant impact on land use decisions.

5.2.6 Political/Institutional Factors

These aspects refer to a number of legislative, administrative, and operational initiatives on broad urban land use concerns and procedures that enable urban development objectives. This results in the formulation of the overall spatial framework of cities, including land use and land cover. Policies for urban and land use policies are a broad category of government initiatives that aim to affect how people use land and regulate who owns it.⁴⁷

Numerous factors work against the effective implementation of biodiversity policies in the MENA region. However, the scarcity of accurate information about the state of biodiversity continues to be a major problem.⁴⁸ There are different types of policy tools that influence resource utilization and land use. Legislation, executive rules and regulations, financial instruments, public projects and programs, environmental policy, and demography and health policy are only a few examples. The Convention

⁴⁴ Marina Alberti et al., "The Complexity of Urban Eco-Evolutionary Dynamics" (2020) 70 *BioScience* 9, 772.

⁴⁵ Stewart Maginnis, William Jackson, and Nigel Dudley, *Conservation Landscapes: Whose Landscapes? Whose Trade-Offs? Getting Biodiversity Projects to Work* (Columbia University Press 2004).

⁴⁶ Helen Briassoulis, "Combating Land Degradation and Desertification: The Land-Use Planning Quandary" (2019) 8 *Land* 2, 27.

⁴⁷ Zaaboul (n 16).

⁴⁸ Andrew Allan et al., "Driving Forces behind Land Use and Land Cover Change: A Systematic and Bibliometric Review" (2022) 11 *Land* 8, 1222.

on Biological Diversity (CBD) mandates that its member states provide regular reports on the state of biodiversity in their nations and carry out conservation measures and policies to preserve healthy populations of species under their control.⁴⁹

The lack of multisectoral resource planning has been a major problem in the MENA region.⁵⁰ Negative externalities may result from the interaction of one sector policy adversely influencing the outcome in another sector when sector planning is disjointed. Weak land tenure and ineffective resource management,⁵¹ particularly in communally managed regions such as grasslands and dry forests, are major factors that contribute to landscape alteration. Through traditional agreements and procedures, such as the coordination of the harvesting of forest and rangeland goods and the enactment of laws to prohibit malpractice, these areas have historically benefited from robust governance. These institutions are frequently deteriorating because of newly emerging state capabilities that challenge traditional authority but fall short of offering a workable substitute.

Another important factor is the operation of real estate agencies, private businesses, and developers who contribute to the long-term growth of the city through land market, financing, investment, design, and construction of large-scale developments and infrastructure.⁵² These initiatives have significantly changed the spatial organization of cities by promoting urban renewal, infrastructure development, and industrial growth. The secondary aspect of regulations is a further important factor such as centralized norms imposed through official plans and/or directly by governmental entities. Effective regulation aspects in the development of urban areas, for instance, include municipal ordinances that apply various types of land acquisition and property impact taxes, land use ordinances, and ordinances governing urban planning.⁵³

Additionally, armed conflicts, political instability, and violent crises in the region have led to significant and widespread migration within these nations as well as within and outside of the region.⁵⁴ The frequency of armed conflicts in the region remains one of the important triggers of the alteration of landscapes and habitats. Since the fall of the Ottoman Empire in 1922, the Middle East has been a flashpoint for practically constant political and military instability, especially in the region encompassing Israel, Palestine, and Yemen.⁵⁵ Political crises

⁴⁹ The Convention on Biological Diversity of June 5, 1992 (1760 U.N.T.S. 69).

⁵⁰ Olawuyi (n 3).

⁵¹ Ali Akbar Barati, Hossein Azadi, and Jürgen Scheffran, "Agricultural Land Fragmentation in Iran: Application of Game Theory" (2021) 100 *Land Use Policy* 105049.

⁵² Ahmed K. Nassar, G. Alan Blackburn, and J. Duncan Whyatt, "Developing the Desert: The Pace and Process of Urban Growth in Dubai" (2014) 45 *Computers, Environment and Urban Systems* 50.

⁵³ Alice Colsaet, Yann Laurans, and Harold Levrel, "What Drives Land Take and Urban Land Expansion? A Systematic Review" (2018) 79 *Land Use Policy* 339.

⁵⁴ Hadi Beygi Heidarlou, Abbas Banj Shafiei, Mahdi Erfanian, Amin Tayyebi, and Ahmad Alijanpour, "Armed Conflict and Land-Use Changes: Insights from Iraq-Iran War in Zagros Forests" (2020) 118 *Forest Policy and Economics* 102246.

⁵⁵ Beatriz DeQuero-Navarro et al., "From Conflict to Cooperation: A Macromarketing View of Sustainable and Inclusive Development in Lebanon and the Middle East" (2020) 66 *Environmental Management* 2, 232.

exacerbate the loss of biodiversity and the modification of land cover.⁵⁶ Conflict has various effects on how land cover is converted. First, the tragedy of the commons compels each disputing party to exploit available resources before the competing side does the same. Further, increasing settlements speed up the process of changing the land's cover, which reduces ecosystem scale and causes biodiversity to decline.

It is apparent that the needs of the almost eight billion people living in today's increasingly affluent and globalized society must now be met through land usage, with billions more predicted in the ensuing decades. The current decline in biodiversity as represented in the foregoing is the replacement of indigenous and traditional low-intensity land use practices – which have supported biodiversity for millennia – with biologically homogeneous and large-scale industrial landscapes. However, exploiting landscapes to concurrently meet numerous wants is not a panacea and will always include trade-offs and compromises between conflicting objectives, interests, and views, particularly between intensive agriculture and biodiversity. Without addressing these concerns, competing needs may result in undesirable consequences, such as the destruction of landscapes and the replication of structural inequality and social inequities in the design and management of landscapes. To steer these regions toward better land and biodiversity conservation, it will take everything they have learned over the previous 12,000 years, including their profound cultural links to the land, nature, and one another. Concerted efforts toward greater sustainability are now taking place throughout the region in protecting landscapes. Key legal barriers to change, as well as priority actions to address them, are explored in Section 5.3.

5.3 LANDSCAPE ALTERATIONS AND BIODIVERSITY LOSS IN THE MENA REGION: SURVEY OF LEGAL AND INSTITUTIONAL BARRIERS

Existing legislation in the MENA region has significant shortcomings that undermine efforts to address landscape modification and biodiversity loss. These gaps are frequently the result of fragmented or weak legislative frameworks that fail to appropriately address rising biodiversity challenges.

5.3.1 *Lack of Comprehensive Unified Regional Policy Framework on Landscape Alterations*

To address the issues of landscape alterations across the region, comprehensive regional policy on land use and management is required. Many of the MENA region's current environmental regulations are deficient in terms of providing

⁵⁶ Heidarlou et al. (n 55).

comprehensive regional safeguards for vital habitats that support diverse and rare flora and fauna. The Arab Strategy for Housing and Sustainable Urban Development 2030 aims to provide a framework for joint Arab action for sustainable urban development while also addressing landscape alteration caused by the rapid and unplanned urbanization in the Arab region.⁵⁷ Despite the rise of regional efforts such as this strategy, which highlight the need for land management and collaborative strategies aimed at conserving biodiversity, ecologically sensitive places remain susceptible to landscape changes such as urbanization, agriculture, and infrastructure development, which result in habitat degradation and biodiversity loss.⁵⁸ While the strategy recognizes the importance of sustainable land use, it may need to incorporate stronger guidelines to address the prevention of extensive landscape alteration, especially in ecologically sensitive areas. Furthermore, the strategy does not provide comprehensive guidance on how to integrate landscape values into urban planning and design processes. This deficiency affects the consideration of unique landscape qualities when planning development activities.

Recognizing the interplay between climate change, landscape alteration, and biodiversity loss, several MENA countries are integrating ecosystem restoration into their climate adaptation strategies. The United Arab Emirates' Greening the Desert initiative focuses on restoring arid landscapes and protecting biodiversity through afforestation and habitat restoration.⁵⁹ Some MENA countries are also developing or enhancing legal frameworks to regulate land use more sustainably. These strategies, which encompasses forest landscape restoration, sustainable land management, and ecosystem approaches with a focus on land use planning, are gaining implementation in areas spanning Morocco, Tunisia, and the mountainous terrains of Oman and Yemen. Morocco, for instance, has implemented land use planning and zoning regulations to control urban sprawl and promote sustainable land management, thereby reducing the impacts of landscape alteration.⁶⁰ These endeavors are evident in the nationally determined contributions (NDC) reports, illustrating the region's resolute commitment to combat the challenges to landscape and biodiversity preservation. In 75 percent of these countries, NDCs emphasize the significance of agriculture, while 56 percent incorporate afforestation. Furthermore, 69 percent of the reports outline clear targets and actions for mitigation, with 25 percent focusing on the crucial domain of land management. An additional 13 percent prioritize the management of grazing lands.⁶¹ In the same vein, Qatar has a structured goal for biodiversity

⁵⁷ Olawuyi (n 21).

⁵⁸ Ibid.

⁵⁹ M. Alam and I. A. N. Azalie, "Greening the Desert: Sustainability Challenges and Environmental Initiatives in the GCC States" in A. Alshawi and S. Alshawi (eds), *Social Change in the Gulf Region: Multidisciplinary Perspectives* (Springer Nature 2023) 493–510.

⁶⁰ F. Ziadat, E. De Pauw, F. Nachtergaele, and T. Fetsi, "A Land Resources Planning Toolbox to Promote Sustainable Land Management" (2021) 10 *Sustainable Agriculture Research* 73.

⁶¹ FAO, *Near East and North Africa Regional Overview of Food Insecurity 2016* (FAO 2016).

conversation to protect and sustainably manage the region's unique ecosystems and encourage regional cooperation on biodiversity conservation.

Nonetheless, while these initiatives are commendable, challenges persist. Individual countries struggle to address this global challenge effectively without a united regional legal framework. The MENA region's diverse political, economic, and environmental contexts can sometimes hinder the alignment of common goals among nations. This lack of regional collaboration impedes efforts to create and implement collective strategies for adapting to changing conditions and maintaining ecosystems sensitive to climate impacts and threats to biodiversity. The extensive reorganization required to accomplish integrated environmental management in the MENA countries would necessitate institutional and regulatory reforms, long-term investment, effective governance, regional cooperation for coordinated efforts, and the participation of all stakeholders.⁶²

5.3.2 Weak Enforcement Mechanisms

All MENA countries have legislation that identifies the need for mandatory environmental impact assessments prior to the commencement of a project, as a tool to spot and prevent landscape alteration and habitat destruction.⁶³ Other examples of legal frameworks and sanctions for environmental crimes include Egypt's Environment Law No. 4 of 1994, which governs the preservation and protection of natural resources, biodiversity, and landscapes and imposes fines and jail time for degradation or destruction.⁶⁴ The goal of Jordan's Environmental Protection Law No. 6 of 2017 is to protect the environment and all of its elements, such as ecosystems and biodiversity.⁶⁵ Principles and procedures for environmental management and protection, including biodiversity conservation, are established under Morocco's Law on Environmental Assessment No. 49-17 of 2020.⁶⁶ The Saudi Arabia Royal Decree No. M/165 of 2020 set forth sanctions for various environmental infractions,⁶⁷ and Saudi Arabia's Basic Law of Governance No. A/90 of

⁶² Mohamed Zahour, "Food Security in Morocco: Risk Factors and Governance" in *Emerging Challenges to Food Production and Security in Asia, Middle East, and Africa* (Springer International Publishing 2021).

⁶³ Olawuyi (n 3).

⁶⁴ Republic of Egypt, "Law No. 4 of 1994 on Environment" FAOLEX Database (February 3, 1994) www.fao.org/faolex/results/details/en/c/LEX-FAOC004984/ accessed January 27, 2024.

⁶⁵ Hashemite Kingdom of Jordan, "Environmental Protection Law No. 6 of 2017" FAOLEX Database (March 19, 2017) www.fao.org/faolex/results/details/en/c/LEX-FAOC173241 accessed January 27, 2024.

⁶⁶ Law on Environmental Assessment No. 49-17, in UNECE, "Morocco Environmental Performance Reviews: Second Review" ECE/CEP/191 (Geneva 2022) xxv and xxvi https://unece.org/sites/default/files/2023-01/ECE_CEP_191_E.pdf accessed January 27, 2024.

⁶⁷ Kingdom of Saudi Arabia, "Saudi Arabia Royal Decree No. M/165 of 2020 issuing the Environment Law" (July 10, 2020) www.fao.org/faolex/results/details/en/c/LEX-FAOC201014 accessed January 27, 2024.

1992 underlines the state's obligation to protect the environment and its natural resources.⁶⁸

However, even when environmental regulations are in place, their application and impact are hampered by ineffective enforcement measures.⁶⁹ The majority of the momentum has been around defining goals and targets without necessarily connecting them to the rules and laws required to achieve them. Implementation is similarly vital and, if not proactively enforced, can allow ecologically degrading actions to continue without major consequences or adequate fines, allowing individuals and companies to engage in them with little fear of consequences. This may result in widespread noncompliance, which would worsen landscape changes and biodiversity loss. Although many of them have sound legislation in place to safeguard biodiversity, policy enforcement in the MENA region appears lax given that ongoing land use changes are jeopardizing the existence of many plant and animal species that depend on these habitats.⁷⁰ Addressing issues with regional landscape changes requires strengthening enforcement mechanisms for environmental law and policy in the MENA area. In addition, the severity of the punishments for environmental legislation violations may not be commensurate with them in some of the MENA countries.⁷¹ The legal and administrative punishments in the Forest Law and the Land Hunting Law, for example, are too light and insufficient. Weak deterrents might encourage illicit activities such as poaching, illegal logging, and habitat destruction, resulting in greater landscape changes and biodiversity loss.⁷²

5.3.3 *Fragmented Policy Framework at All Levels*

The MENA region is made up of several countries, each with its own legal system and regulations. This fragmented approach leads to variations in environmental rules, making it difficult to coordinate regional efforts and solve cross-border challenges such as transboundary wildlife protection or shared ecosystem management.⁷³ The MENA area is distinguished by numerous legal systems that make it difficult to coordinate efforts to address landscape changes and biodiversity loss. Inconsistent policies and regulations leave gaps in the system that can be exploited by individuals looking

⁶⁸ Kingdom of Saudi Arabia, "Basic Law of Governance No. A/90 of 1992" (February 4, 1992) www.fao.org/faolex/results/details/en/c/LEX-FAOC127539/ accessed January 27, 2024.

⁶⁹ Ibid., also Olawuyi (n 3).

⁷⁰ L. Mansour et al., "Mainstreaming the Water-Energy-Food Security Nexus into Policies and Institutions in the MENA Region: National Guidelines on Mainstreaming the Water Energy-Food (WEF) Security Nexus into Policies and Institutions in Egypt and Jordan" (2017) GIZ Report.

⁷¹ Devkota et al. (n 40).

⁷² Abdulaziz S. Alatawi, "Conservation Action in Saudi Arabia: Challenges and Opportunities" (2022) 29 *Saudi Journal of Biological Sciences* 5, 3466.

⁷³ Raffaella Bertini and Abdallah Zouache, "Agricultural Land Issues in the Middle East and North Africa" (2021) 80 *American Journal of Economics and Sociology* 2, 549.

to benefit from environmentally destructive activities. Furthermore, transboundary conservation initiatives are hampered by a lack of established norms and international cooperation.⁷⁴ Addressing fragmentation at the domestic level is essential for effectively tackling the challenges related to landscape alteration and biodiversity conservation in MENA countries. This practical issue arises when different entities with similar mandates undertake parallel initiatives without effective coordination.⁷⁵ Resources and expertise may be spread thinly across these duplicated efforts, reducing their overall impact on preserving landscapes and biodiversity. Fragmentation at the domestic level often translates into limited coordination among relevant stakeholders, hampering the development and implementation of holistic conservation strategies. Furthermore, the presence of multiple institutions and agencies responsible for conservation efforts within a single country can result in role duplication, confusion, inefficiency, and even corruption in land management services.⁷⁶ This existence of competing and conflicting priorities raises intricate questions regarding the feasibility of developing and executing integrated solutions across various sectors.⁷⁷

5.3.4 *Inadequate Policies on Integration of Traditional Knowledge*

Local communities with strong conservation strategies and abilities are essential to the protection of biodiversity. The preservation of biodiversity and the management of sustainable landscapes can both benefit greatly from the use of local communities' traditional knowledge and practices.⁷⁸ The marginalization of indigenous and local populations in conservation efforts may result from the inadequacy of current laws to integrate or recognize the importance of such knowledge. So, maximizing conservation efforts could be significantly enhanced by understanding local customs and traditions. But the spread of globalization poses a serious danger to indigenous and local knowledge of managing natural resources. For instance, one of the goals of the Intergovernmental Platform on Biodiversity and Ecosystem Services is to guarantee that the finest indigenous and local knowledge is included into national or international

⁷⁴ R. Diab, "Land Legislation in the Middle East and the Need for Modernization Serving the Needs of Lebanon and other Middle Eastern Countries" (Webinar Towards a Post Graduate Program in Land Governance, Beirut, 2020) 34–39.

⁷⁵ UNECE, "Reconciling Resource Uses in Transboundary Basins: Assessment of the Water-Food-Energy-Ecosystems Nexus" (UNECE 2015) https://unece.org/DAM/env/water/publications/WAT_46_Nexus/ece_mp.wat_46_eng.pdf accessed January 27, 2024.

⁷⁶ A. Corsi and H. Selod, "Legal, Institutional, and Governance Challenges Facing Land Use in MENA Countries" in H. Selod, S. V. Lall, and N. Lozano-Gracia (eds), *Land Matters: Can Better Governance and Management of Scarcity Prevent a Looming Crisis in the Middle East and North Africa?* (World Bank 2023).

⁷⁷ Damilola S. Olawuyi, "Sustainable Development and the Water–Energy–Food Nexus: Legal Challenges and Emerging Solutions" (2020) 103 *Environmental Science & Policy* 1.

⁷⁸ I. S. Selemani, "Indigenous Knowledge and Rangelands' Biodiversity Conservation in Tanzania: Success and Failure" (2020) 29 *Biodiversity and Conservation* 14, 3863.

frameworks for biodiversity conservation.⁷⁹ Strengthening landscape preservation in the MENA region depends on filling these legal gaps. To support efficient landscape management and biodiversity conservation, policymakers should prioritize updating and harmonizing environmental laws, improving enforcement mechanisms, encouraging public participation, and incorporating traditional knowledge. Regional cooperation and collaboration can also aid in addressing international issues and advancing a common strategy for environmental conservation in the MENA area.

5.3.5 *Absence of Explicit Policy Mechanisms to Promote Educational Awareness*

Public education and awareness of land management and environmental protection is essential in order to promote conservation practices at local levels.⁸⁰ Despite the urgent environmental issues of landscape change and biodiversity destruction in the MENA area, there remains a substantial gap in promoting enhanced awareness.⁸¹ This crucial gap is caused by the lack of explicit provisions and robust mechanisms to raise public knowledge about the negative threats that contribute to these concerns. It is critical to raise knowledge about the factors that have contributed to the problem of landscape change and biodiversity loss. The importance of incorporating environmental education into school curricula at all levels is more often overlooked by regulatory frameworks in the MENA area. These variables may contribute to a low degree of environmental awareness, interest, involvement, and support. The necessity for enhanced public knowledge and participation has received substantial attention. It has been discussed among local scientists in the region and has been cited in national papers on biological diversity law and policy in the region. As a result, it is critical to adopt clear measures and robust policies to raise public awareness of landscape alteration and biodiversity erosion in the MENA area as part of a comprehensive approach to addressing the region's environmental concerns.

Section 5.4 discusses innovative approaches to addressing gaps in integrated land alteration prevention and management in the MENA region.

5.4 ADVANCING LANDSCAPE AND BIODIVERSITY CONSERVATION IN THE MENA REGION: LEGAL AND INSTITUTIONAL RECOMMENDATIONS

In the diverse landscapes of the MENA region, the need for effective landscape and biodiversity conservation is paramount. A unified legal framework, streamlined

⁷⁹ UNESCO (2019) "Linking Indigenous and Scientific Knowledge to Counter Biodiversity Erosion" <https://en.unesco.org/news/linking-indigenous-and-scientific-knowledge-counter-biodiversity-erosion> accessed September 10, 2024.

⁸⁰ Hilary Bell, "Tackling the Legally Disruptive Problem of Climate Change with Disruptive Legal Education" in Damilola S. Olawuyi (ed), *Climate Change Law and Policy in the MENA Region* (Routledge 2022) 251–265.

⁸¹ Alatawi (n 68).

governance, and robust enforcement mechanisms are fundamental to preserving these natural treasures. Some recommendations are hereby provided based on the foregoing. These recommendations aim to enhance the legal and institutional framework for landscape and biodiversity conservation in the region and to ensure the long-term preservation of the region's unique natural landscapes and diverse ecosystems.

5.4.1 Comprehensive Regional Policy Framework

Establishing a comprehensive regional policy framework for landscape change and policy integration can enhance regional knowledge sharing and coordination on landscape and biodiversity conservation in the MENA region. The creation of frameworks by national and regional governments to support integrated planning across functional territories are critical in this regard. Better integration and coordination of policies are essential if a wider range of policy tools are to be used to drive landscape management, as is suggested in this study. The region may not be able to successfully influence landscape management through the coordination of a larger range of policies without more effective coordination tactics. This might include frequent regional gatherings where industry experts and policy officials debate common concerns and potential solutions. This framework should combine sustainable land management approaches while taking into account the political, social, and economic concerns outlined and described earlier in this chapter.

5.4.2 Establish Strategic Action Plans for Environmental Education and Communication

In this context, the development of national strategies and action plans for environmental education and communication plays an important role as a catalyst for raising awareness about landscape transformation and biodiversity preservation. Governments can actively stimulate the adoption of dynamic educational techniques that resonate with contemporary culture by integrating innovative policy measures. This implies incentivizing the development of interactive learning systems in order to keep educational outreach engaging and impactful. Policy instruments can incentivize collaborative partnerships among governmental agencies, nongovernmental organizations, and private firms, creating a broader and more effective reach. Furthermore, incorporating environmental modules into the formal educational curriculum through legislative requirements can ensure a long-term and systemic approach to cultivating ecological consciousness. Countries across the MENA region may leverage the potential of education to achieve revolutionary change in order to protect landscapes and biodiversity for future generations by carefully incorporating innovative policy measures into national policies.

Furthermore, the use of citizen science should be encouraged as a mechanism to bridge the gaps in biodiversity knowledge, such as landscape preservation, distribution, and biodiversity conservation. Planning conservation initiatives requires comprehensive and reliable biodiversity data. Citizen science involves engaging the public, including local communities and volunteers, in scientific research and data collection efforts. By involving citizens in data collection, observation, and reporting, this approach can help bridge knowledge gaps and generate valuable information.

5.4.3 *Strengthening Enforcement Mechanisms*

The goals set forth in each policy can only be achieved when it is effectively and coherently implemented. Despite this, inefficient policy and strategy execution remains a major obstacle. More policies and strategies need to be developed or existing ones need to be modified. This is crucial for ensuring that laws governing landscape modification and biodiversity preservation are followed effectively. One strategy entails the creation of severe fines and penalties for noncompliance, which serve as a deterrent against actions that endanger the environment. Businesses and individuals should adopt more responsible practices by putting in place a tiered system of punishments that are proportionate to how serious the offense was. The ability of regulatory bodies to monitor and respond to violations can also be improved by giving them more power and resources through policy reforms. Legal frameworks could encourage collaborative agreements between MENA countries, allowing for information sharing and cross-border enforcement actions. Furthermore, through regulatory mandates, emerging technology such as satellite photography and remote sensing can be integrated into enforcement methods, boosting monitoring capacities. Finally, including protections for informants in legal frameworks might encourage people to expose infractions without fear of retaliation, resulting in a more alert enforcement environment. By combining these policy and legal instruments, the MENA region can create a strong enforcement ecosystem that protects landscapes and biodiversity for the benefit of society and the environment as a whole.

5.4.4 *Regional Governance and Cooperation in the MENA for Landscape and Biodiversity*

To address the problems faced by the varied legal systems and policies across the MENA area, a coordinated effort is required to build an integrated and coherent policy framework for landscape and biodiversity preservation. The existing fragmented approach results in discrepancies in environmental regulations, preventing regional activities from being coordinated and cross-border concerns from being effectively resolved. The establishment of a dedicated MENA Environmental Cooperation Council, backed by strong policies, would be a critical solution. Through this they

can facilitate policy alignment and establish common standards that bridge the gaps between different countries' legal frameworks. By mandating information exchange, regulations can encourage a culture of collaboration, allowing nations to share successful techniques and collaboratively handle shared difficulties. Furthermore, the implementation of cooperative research endeavors and capacity-building projects, supported by policy commitments, would enable nations to compete on a level playing field, regardless of their development status. The incorporation of regular regional conferences, guided by policies, would showcase progress and innovations, thus fostering mutual inspiration and competition. In this way, strategic policy integration can yield a unified approach to landscape and biodiversity preservation, transcending legal disparities and promoting a harmonious environmental agenda throughout the MENA region.

5.4.5 Incorporation of Traditional Knowledge into Decision-Making Processes

Enacting legislation that recognizes the value of traditional knowledge and its contribution to sustainable practices can be a starting point. Legal frameworks should require the assimilation of traditional knowledge into decision-making processes, ensuring its inclusion alongside scientific findings. To protect indigenous communities' intellectual property rights, legislative procedures can be put in place to ensure that traditional knowledge is used with informed permission and equitable benefit-sharing. Creating channels for intergenerational knowledge transmission, such as through legal requirements for mentorship programs or cultural heritage projects, can aid in the preservation and perpetuation of traditional learning. Furthermore, legislations that fosters collaboration between governmental agencies and indigenous groups in the construction of landscape and biodiversity management plans could necessitate the incorporation of traditional knowledge. Legal frameworks can help to encourage collaborative research projects, co-management agreements, and participatory consultations, thereby confirming the importance of traditional knowledge in directing conservation efforts. It is also critical to put in place legal measures to avoid the misuse of traditional knowledge, such as through biopiracy. This could include legislative provisions requiring fair and equitable benefit-sharing when commercial interests arise from the use of indigenous knowledge.

5.4.6 Improve Education, Awareness, and Cooperation on Biodiversity and Landscape Conservation

In addition to the aforementioned recommendations addressing the identified legal and institutional barriers, there is a need to improve education and awareness on biodiversity and landscape conservation. First, there is a need to leverage citizen science as a mechanism to bridge in the gaps in biodiversity knowledge, such as

landscape preservation, distribution, and biodiversity conservation. Planning conservation initiatives require comprehensive and reliable biodiversity data. Additionally, these programs encourage participants to engage in active environmental responsibility and stewardship.

Second, intensifying collaboration among environmental historians, geographers, land and conservation scientists could make significant strides toward improving societal understanding of past land use patterns and their ecological effects. Neglecting these considerations can lead to erroneous and unfair outcomes when using landscapes to balance out conflicting demands, particularly between intensive agriculture and nature preservation.

Third, to accelerate training and capacity development, increased resource allocation for funding landscape and biodiversity initiatives is essential. MENA countries should increase and dedicate public funds to supporting and enforcing national biodiversity conservation laws and policies, as well as other landscape and biodiversity conservation measures. Furthermore, regional and international cooperation on capacity development and education is required to improve the conservation of species and ecosystems that cross international borders.

5.4.7 *Enhancing Landscape Monitoring for Sustainable Landscape and Biodiversity Management*

To ensure sustainable landscape use and biodiversity preservation in the MENA region, enhancing landscape monitoring is crucial. There is a need to utilize standardized performance indicators, collaboratively refined, to accurately reflect conservation objectives. An integrated monitoring framework should be established across relevant institutions, harmonizing methods and sharing findings for a unified approach. Leveraging modern technologies is also imperative for real-time monitoring, such as remote sensing through satellite imagery and drones, enabling proactive responses to threats. Capacity building is vital via training programs that empower personnel to interpret data effectively, and involving local communities in data collection fosters engagement and broadens monitoring efforts. Furthermore, implementing an adaptive management system informed by monitoring data, allowing the swift adaptation to emerging challenges in land use alterations, is essential. As an example, the impact of infrastructure construction must be strictly monitored. We may anticipate an expansion of infrastructure in the region; however, before beginning such infrastructure initiatives, it is vital to evaluate the impact of infrastructure on biodiversity. For many species, for instance, restricted border areas are frequently their last remaining habitats. Therefore, to ensure that there is enough area left to support such biodiversity, road construction and other infrastructure development should be curtailed in these areas. There must also be transparency in data collection and reporting which ensures accountability and supports informed decision-making for sustainable landscape use. By implementing

this interconnected strategy, the MENA region can establish a robust monitoring system that empowers decision-makers, conservators, and communities to actively preserve landscapes and biodiversity.

5.5 CONCLUSION

The rapid alteration of landscapes, due to urbanization, climate change impacts, construction, and economic activities, is a significant threat to biodiversity in the MENA region. Commercialization and capitalism as well as globalization have also eroded entrenched cultural land management practices and knowledge systems, leading to the present situation where indigenous knowledge on environmental preservation and biodiversity is gradually fading. There is a need to preserve the cultural practices of land and biodiversity conservation in the MENA region.

This chapter provided insight on the factors of landscape alterations and biodiversity loss in the MENA region. As the global population increases, meeting the demands of an increasingly affluent and interconnected world necessitates reconciling competing land uses. The shift from traditional, biodiversity-friendly practices to large-scale industrial landscapes has led to alarming biodiversity decline. However, optimizing land for multiple purposes is complex and inherently involves trade-offs between conflicting objectives, interests, and values, particularly between intensive agriculture and conservation. Failing to address these tensions risks exacerbating landscape degradation, entrenching social inequalities, and perpetuating structural injustices in land design and management.

Effective conservation demands a holistic approach, incorporating the traditional knowledge, cultural heritage, and social cohesion that define this region. The results indicate that natural, socio-economic, cultural, and technological factors have directly influenced the structure of landscape in the MENA region. Concerted efforts toward greater sustainability are now taking place throughout the region in protecting their landscapes. Priority actions that include, but are not limited to, establishing a comprehensive unified regional policy framework, strengthening enforcement mechanisms, reducing the impact of infrastructure construction, and enhancing landscape monitoring mechanisms are urgently required.