Nature-based solutions to operationalize the biodiversity conservation and climate action interface

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Economic and Social Commission for Western Asia

Nature-based solutions to operationalize the biodiversity conservation and climate action interface

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Key messages

- *Nature-based solutions comprise great untapped potential for addressing the dual challenges of biodiversity loss and the impacts of climate change across the Arab region;*

- *The priority areas for which nature-based interventions would generate the greatest biodiversity and climate synergies were identified in the Atlas highlands, the western coasts of North Africa, the Nile delta, the coastal Mashreq area and the Jordan River Valley, the southern Mesopotamian floodplains and the coastal areas of the Arabian Peninsula along the Gulf of Oman.*

- *Appropriate nature-based solutions should be selected based on the biophysical characteristics, socioeconomic conditions and priority development needs of the locations identified for intervention.*

- *The impacts of nature-based solutions can exceed the mitigation objectives for which they were designed and generate considerable further adaptation benefits, including improved watershed protection, water supply and purification, coast stabilization, flood protection and enhanced resilience against sand and dust storms.*

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Background

The dual global threat of climate change and biodiversity loss, and the growing evidence on their interlinkages and co-dependence, demands a new approach to the way we perceive and address the biodiversity and climate change interface and the way we design alternative solutions to achieve potential synergies.

Biodiversity degradation is taking place at increasingly rapid rates, albeit at varying degrees of severity across the world. Without transformative structural change across economic, social, political and technological realms, current trends in biodiversity loss and ecosystem dysfunction are expected to continue until 2050 and beyond. The loss of natural resource functions and services delivered by these resources is undermining the achievement of 80 per cent of Sustainable Development Goal (SDG) targets and goals related to poverty, hunger, health, water, cities, climate, oceans and land.[1] The Arab region hosts parts of the world facing the highest deterioration in biodiversity as a result of rapid urbanization, land reclamation and encroachment on fragile natural habitats, and with levels of protected terrestrial and freshwater key biodiversity areas currently well below global averages.[2]

Biodiversity and the climate are intrinsically linked through associated processes that govern carbon fluxes across the various terrestrial, atmospheric and hydrological spheres.[3] Carbon is the building block of all living matter (plants and animal species) and the main component of greenhouse gases (methane CH4 and carbon dioxide CO2). The movement of carbon across soil, water bodies and the atmosphere is governed by processes that transform atmospheric carbon into vegetation biomass and facilitate storage into soil organic matter, and through uptake by oceans and water bodies. These processes are dynamic and respond to changes in the concentration of carbon in its various states. An equilibrium between the various forms and states of carbon is needed to support life on this planet.

To protect these biophysical interlinkages, the three Rio conventions must be effectively pursued - the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). Increased efficiency can be achieved from jointly pursuing the

1. Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019.
2. United Nations Economic and Social Commission for Western Asia (ESCWA), Arab Sustainable Development Report, 2020. (E/ESCWA/SDD/2019/2).
3. Scientists describe Earth in terms of spheres. The solid surface layer of Earth is the lithosphere. The atmosphere is the layer of air that stretches above the lithosphere. The Earth’s water—on the surface, in the ground, and in the air—makes up the hydrosphere.

conventions' objectives compared to when they are addressed in isolation.

What is the key challenge?

Until recently, biodiversity and climate change were discussed separately, with poor understanding of their interlinkages and the possible synergies and mutual benefits obtained by planning for joint biodiversity and climate goals. Commonly implemented conservation measures are centred on the identification of protected areas to preserve threatened species. The outcomes of such approaches have fallen short of optimizing nature's contribution to people and biodiversity benefits. Similarly, when climate mitigation actions are solely focused on carbon sequestration objectives, there are often risks of maladaptation, climate justice concerns and prohibitive cost of implementation. In designing response measures to halt the dual threat of biodiversity degradation and worsening climate change impacts, alternative options need to place human beings at the centre of an integrated approach that builds on synergies for nature preservation and climate action.

Possible solutions

Nature-based solutions are emerging as approaches that can be leveraged to operationalize the biodiversity climate nexus. They are fundamentally a social-ecological system, where local human communities are inseparable from the ecological elements.[4] There has been extensive debate on the best approach for setting a definitional framework for nature-based solutions, and despite some divergence among various proposals, most agree on the role of nature-based solutions in strengthening, emulating and drawing upon natural processes through the protection, sustainable management and restoration[5] of nature to harness their associated environmental, social and economic contributions towards improved resilience and to support communities in addressing societal challenges. In some definitions, the cost-effectiveness dimension is also considered.[6]

The present report aims to:

- Identify parts of the Arab region where nature-based solutions would generate the greatest biodiversity and climate synergies.
- Explore the potential of the predominant biome to generate climate and biodiversity benefits.
- Understand the full scope of generated benefits beyond the climate and biodiversity nexus and across the various ecosystem service value categories.
- Generate advice regarding recommended context-specific nature-based solutions.
- Demonstrate how the generated ecosystem services can enhance climate resilience, notably those of a hydrometeorological nature.

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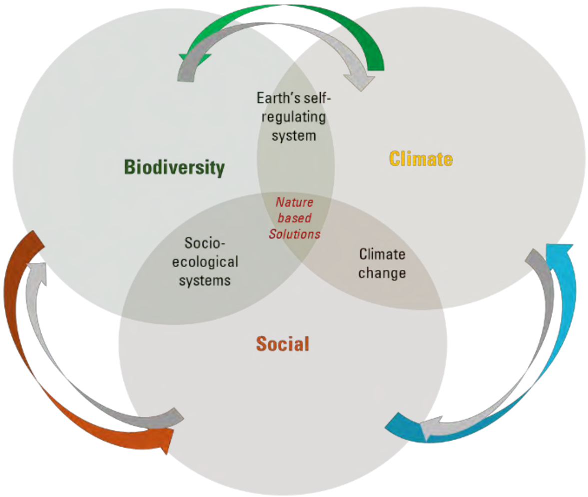
4. Turner, B. and others, the role of nature-based solutions in supporting social-ecological resilience for climate change adaptation, Annual Review of Environment and Resources, 2002.
5. Website of the International Union for Conservation of Nature. https://www.iucn.org/.
6. Website of the European Union. https://research-and-innovation.ec.europa.eu/.

Figure 1. Nature-based solutions operationalize the biodiversity/climate change interface



Source: Buckley, Y. and others (2024). The plant ecology of nature-based solutions for people, biodiversity and climate. Journal of Ecology. 2024;112:2424–2431

The interlinkages between nature-based solutions, biodiversity and the climate are illustrated in figure 1. While mechanisms can be leveraged to generate positive synergies at each of the biodiversity, social and climate interfaces, possible trade offs need to be considered for effective policymaking. Public policy measures addressing social security concerns, such as subsidies, might encourage the overexploitation of natural resources and increase carbon emissions into the atmosphere. At the climate/biodiversity interface, mitigation through afforestation using monoculture plantations of non-indigenous species can have adverse impacts on biodiversity and ecosystems. Conversely, measures to combat woodland encroachment can reduce the carbon sequestration potential of ecosystems. It is important to operationalize nature-based solutions that take into account the synergies but also possible tradeoffs among ecological, climate and social considerations to generate context-specific optimized outcomes.

The magnitude of nature-based solutions' contribution to climate action is increasing. Updates[7] on the possible contribution of nature-based pathways to climate action are increasingly showing higher values than originally estimated and could reach global reductions equivalent to 10 gigatonnes (Gt) of CO2/year,[8] which corresponds to emissions from the entire transport sector per year. This would simultaneously result in the prevention of the deforestation of 270 million hectares (ha), the restoration of 678 million ha of various ecosystems and improvement of the management of around 2.5 billion ha of lands by 2050.[9] Less talked about are the temperature benefits, estimated to reduce the peak warming by an additional 0.1 °C under a scenario consistent with a 1.5 °C rise by 2055; 0.3 °C under a scenario consistent with a 2 °C rise by 2085; and 0.3 °C under a 3 °C-by-2100 scenario.[10] Despite their potential contribution, it is important to recognize that the bulk of mitigation efforts needs to come from rapid, ambitious emission reductions in fossil fuel to match national commitments, including through national net zero strategies. Even if net zero strategies were to be achieved, nature-based

7. Griscom, B.W. and others, Natural climate solutions, 2017. Proceedings of the National Academy of Sciences; Griscom, B.W. and others, National mitigation potential from natural climate solutions in the tropics, 2020. Philosophical Transactions of the Royal Society; and Busch, J. and others, Potential for low-cost carbon dioxide removal through tropical reforestation, 2019. Nature Climate Change.
8. Girardin, C., Nature-based solutions can help cool the planet- if we act now. Nature, volume 593, 2021.
9. Girardin, C., Nature-based solutions can help cool the planet- if we act now. Nature, volume 593, 2021.
10. Girardin, C., Nature-based solutions can help cool the planet- if we act now. Nature, volume 593, 2021.

solutions would still be needed to offset additional emissions generated by natural processes under warming conditions.[11]

Synergy increasingly reflected in international fora and multilateral environmental agreements: Nature-based solutions for joint climate and biodiversity action were recognized in dedicated climate and biodiversity global fora. Both the Sharm El Sheikh Implementation Plan adopted by the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP27) as well as the Kunming-Montreal Global Biodiversity Framework adopted at COP15 of the Convention on Biological Diversity recognized the role of nature-based solutions, which further supports bridging the climate change and biodiversity agendas. This is substantiated by target 8 of the Global Biodiversity Framework, which acknowledges the role of nature-based solutions as a climate action option that can have positive impacts on biodiversity.

Convention on Biological Diversity - Target 8: *Minimize the impact of climate change .... on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while ... fostering positive impacts of climate action on biodiversity.*

Identification of geographical areas for optimized nature-based solutions outcomes

Nature-based pathways deployed for biodiversity and climate benefits on a large scale are centred on the conservation, management and restoration of natural ecosystems. While conservation seeks to prevent the permanent loss of relatively intact or the least degraded ecosystems, restoration attempts to repair the degraded, damaged or destroyed areas.[12] The intensive investment and labour needs involved in restoration projects makes them the less attractive option when deciding on the most effective solutions. The rationale behind nature preservation and conservation actions has changed in recent years. There has been a shift in the scope of pursued targets from direct conservation objectives under protected areas towards more diversified social, economic and cultural benefits alongside the conservation benefits. As such, the concept of other effective area-based conservation measures has emerged, and it considers the strategic geographic identification of intervention areas in which optimized biodiversity but also social, cultural and economic outcomes can be achieved. Other effective area-based conservation measures are increasingly being considered alongside protected areas for the achievement of global conservation objectives, such as the 30 by 30 target 3 of the Kunming–Montreal Global Biodiversity Framework which recommends the conservation of 30 per cent of areas of importance for biodiversity and ecosystems through both protected areas and other effective area-based conservation measures.

How to apply these concepts to the Arab region

There is a general consensus that the implementation of conservation and restoration measures based on an ad-hoc selection of

11. University of Oxford, The Oxford Principles for Net Zero Aligned Carbon Offsetting, 2020.
12. Higgs, E. and others, The changing role of history in restoration ecology, 2014. Frontiers in Ecology and the Environment.

intervention areas cannot be maintained in view of the critical state of the ecosystem and the environment. A judicious selection of intervention areas – as raised in the voluntary guidance of the Convention on Biological Diversity – is needed to prioritize areas of importance for various ecosystem services and functions as a first step to implementing nature-based conservation measures.[13] Early attempts at identifying priority areas of intervention consisted of overlaying maps generated from pursuing biodiversity and climate targets separately.[14] Novel approaches are based on multicriteria spatial optimization which pursues jointly identified targets from the initial planning phase for better biodiversity and climate synergies. The present report identifies areas of the greatest importance for joint climate and biodiversity outcomes based on global optimization studies.[15] The map below depicts a spatial guidance for areas of priority nature-based interventions for climate and biodiversity across the Arab region. Regional/international funding opportunities and collaborative conservation programmes need to focus on these interventions for the optimization of joint biodiversity/climate mitigation and adaptation benefits. Such analysis must be complemented with national assessments for the development of context-specific planning and implementation, considering anthropogenic pressures, land tenure, costs and opportunities. In the sections below, the type and nature of the predominant biomes characterizing the priority areas are explored, and possible contextualized nature-based interventions are highlighted. The objective is to optimize biodiversity and climate benefits by implementing nature-based pathways which also pursue co-benefits across ecological, economic and socio-cultural realms.

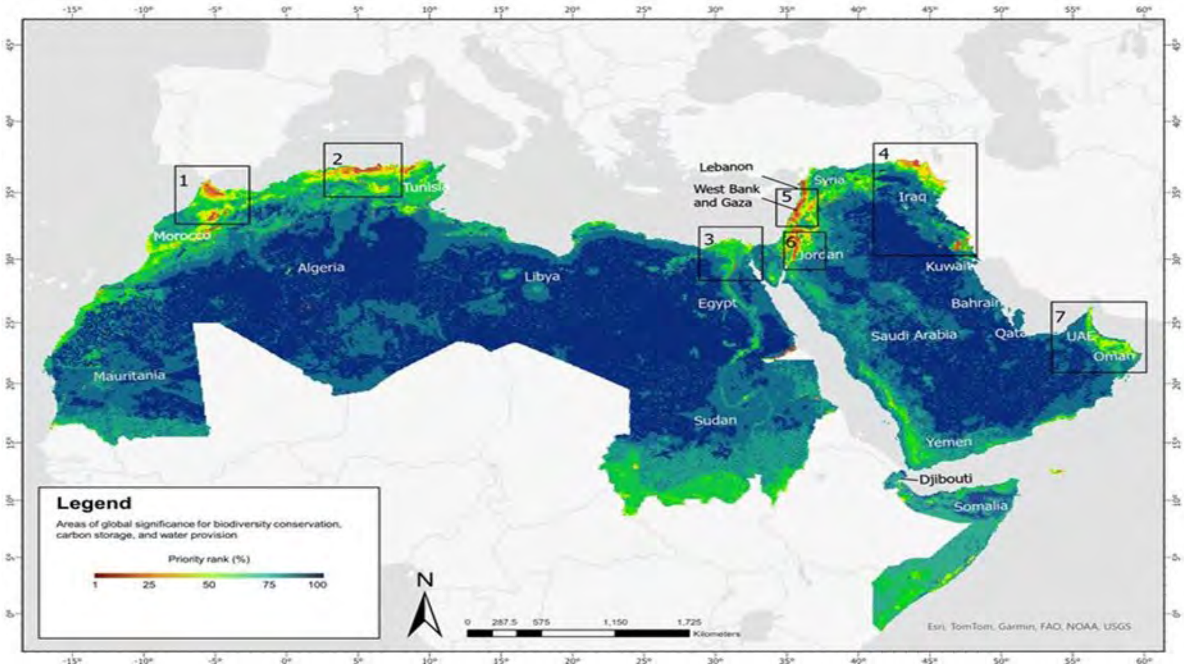
Figure 2 highlights the areas of highest priority for nature-based interventions in dark orange and red, with blue-shaded regions signifying areas of lowest priority. The globally identified areas of highest priority for nature-based interventions coincide with a multiplicity of biomes scattered across the Arab region. These include the savannah, grassland and forests of the Atlas highlands, the western coasts of North Africa, the Nile delta, the coastal Mashreq area and the Jordan River Valley, the southern Mesopotamian floodplains, and the coastal areas of the Arabian Peninsula along the Gulf of Oman. Each of the priority areas is highlighted in a square on the map and recognized as a hotspot for nature-based interventions. Focused analysis on individual hotspots is provided in the sections below.

13. Convention on Biological Diversity (CBD), Fourteenth meeting - decision adopted by the Conference of the Parties to the Convention on Biological Diversity, 2018. (CBD/COP/DEC/14/8).

14. Dinerstein, E. and others, A global deal for nature: guiding principles, milestones and targets. 2019. Science Advances 5; Soto-Navarro, C. and others, Mapping co-benefits for carbon storage and biodiversity to inform conservation policy and action, 2020. Philosophical Transactions of the Royal Society B.

15. Jung, and others, Areas of importance for conserving terrestrial biodiversity, carbon and water, 2021. Nature ecology and evolution, vol. 5, pp. 1499-1509.

Figure 2. Identified priority areas for biodiversity and climate benefits (1 is top priority and 100 is least important)



Source: Adopted from Jung and others (2021).

A. Hotspot 1: Atlas Mountains in Morocco

Figure 3. Atlas Mountains in Morocco

Source: High Atlas Mountains ©Razoran/stock.adobe.com.

The priority area for intervention in this hotspot falls under the High Atlas range, middle Atlas and Rif areas. The Atlas Mountains along the northern coast provide a shield from the desert, stretching from south-western Morocco (peaking at 4,167m) to the eastern edge of Tunisia. These regions harbour diverse ecosystem types and are rich in biodiversity, encompassing forests such as the world's largest area of holm oak and juniper. The areas include rainfed agricultural land and pastureland during the dry summer seasons. Steppe and grassland ecosystems are an important feature of the mountainous plateaus, and are rich in rare and/or endangered endemic flora species. The ecosystem services of these regions reflect their diversity and encompass the preservation of water resources, providing a habitat for biodiversity and ecotourism services, and harbouring globally significant agricultural heritage systems. The Atlas Mountains are facing soil degradation, ecological fragmentation and the risk of desertification as a result of extended periods of drought and decreased precipitation. Anthropological activities also present a considerable source of pressure, notably through grassland conversion and overgrazing.

These impacts are expected to continue as the highest temperature rise forecasted across the Arab region will be experienced in the Atlas Mountains.[16] Recent evaluations of forest cover in the High Atlas Mountains of Morocco have indicated dramatic loss in forest coverage over the past decade (2010-2020) from 11,000 to 3,300 km2.[17] Also, erosion is contributing to loss of topsoil, with the Western High Atlas found to be the most vulnerable due to prevalence of landslides.[18] The Rif mountains also undergo annual soil erosion rates at an estimated 10m3/ha.[19]

Box 1. Summary of priority area 1 characteristics

Highest socioeconomic relevance:

- Rainfed agriculture.
- Grazing.

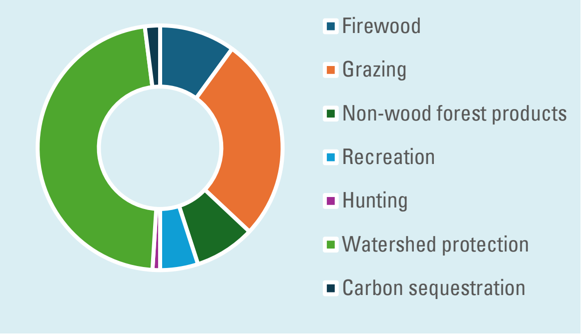
Source of pressure:

- Overgrazing.
- Grass land conversion.
- Drought and decline in precipitation.
- Water erosion.

Main threats:

- Soil degradation and erosion.
- Ecological fragmentation.
- Desertification.

Figure 4. Ecosystem service values of Mediterranean forests



Source: Authors' compilation based on Croitoru, L. (2006) and Charbel, E. and Rahal, L. (2021).

The prominent biome in this priority area is the forest biome. Nature-based solutions in this region need to focus on land-based approaches that aim to restore, preserve and better manage forests to harness climate and biodiversity benefits. It is important to acknowledge the full scope of services delivered, encompassing provisioning (benefits physically extracted from nature), regulating (natural phenomena moderation), cultural (cultural advancement and recreation) and supporting (underlying natural processes) services. Research assessing the ecosystem service values of Mediterranean forests indicates that watershed protection represents the single most valuable benefit of most forests in Arab Mediterranean countries (figure 4). Besides the generated benefits in terms of biodiversity and climate action synergies, operationalization of forest pathways in the Atlas Mountains is expected to generate highly

16. RICCAR projections for temperature.
17. Nguyen, T.T. and others, Vegetation cover dynamics in the High Atlas Mountains of Morocco. 2023. Remote Sensing 15, 1366.
18. Bou-imajjane, L. and Belfoul, M.A., Soil loss assessment in Western High Atlas of Morocco: Beni Mohand Watershed study case, 2020. Hindawi Applied and Environmental Soil Science Volume 2020, Article ID 6384176, 15 pages.
19. Croitoru, L., How much are Mediterranean forests worth?, 2006. Forest Policy and Economics 9 (2007) 536– 545.

relevant adaptation co-benefits, especially in view of the projected decreases in precipitation across the Atlas Mountains region by mid-century (2046-2065) under both moderate and high emission scenarios. Morocco has been considering nature-based pathways to address environmental and climate-related challenges. In their latest nationally determined contribution, Morocco listed the forest pathway, mainly through restoration, avoiding degradation of forests, and fixation of maritime dunes; the combined gains would contribute 4.3 per cent (17,624.4 gigagrams (Gg) CO2) of all planned emission reductions from 2020-2030. This hotspot area was selected by the Green Climate Fund for the implementation of a nature-based initiative, Argan biosphere reserve, pursued for its multiple benefits.[20] Agroforestry projects are also expanding in the identified priority area with a view to optimizing outcomes through the careful selection of tree species.[21] Traditional community practices developed to adapt to the harsh climate condition can be built upon to inform nature-based pathways. The most relevant practices consist of the oases systems based on agroecological practices and traditional water management, i.e., the khettara system that uses gravity to channel water towards the surface for irrigation purposes. Other ancient nature-based pathways include the Agdal[22].

Nature-based pathways should focus on forest management, reforestation, pasture optimization, agroforestry, dunes fixation and slope stabilization.

B. Hotspot 2: Atlas Mountains in Algeria and coastal areas

The hotspot areas highlighted as priority areas in Algeria run along the coastline and cover a variety of ecosystems, including parts of the Atlas Mountains, coastal wetlands and marshlands, as well as semi-arid inland areas with sandy dunes. The Algerian steppe of the high plateaus separate the hilly landscape to the north from the Sahara to the south. Many coastal wetlands and marshlands in this region are mentioned in the international Ramsar priority list[23] and serve as habitat for an exceptional diversity of plant and animal species, in most cases endemic and rare.[24]

Algeria is facing aridification and desertification as a result of the combined effects of overgrazing, fires and overexploitation, accompanied by increased drought episodes.

20. Green Climate Fund, Development of arganiculture orchards in degraded environment (DARED).
21. IFAD, Restoring Morocco's mountain ecosystems with reforestation, 2021.
22. The Agdal is a seasonal prohibition mechanism which forbids access to an agro-silvo-pastoral resource to allow the pastures a resting period during the most sensitive period of growth. This is a traditional approach practiced by the Yagour in the high mountain pastures of the Atlas.
23. The Ramsar priority list identifies wetlands of international significance in terms of their ecology, botany, zoology, limnology or hydrology under the Ramsar Convention (21 December 1975), which aims to halt the worldwide loss of wetlands and to conserve, through wise use and management, those that remain.
24. Hammana, C. and others, The Wetlands of Northeastern Algeria (Guelma and Souk Ahras): Stakes for the Conservation of Regional Biodiversity, 2024. Land 2024, 13, 210.

Nowadays, 60 per cent of forests[25] are estimated to be at advanced stages of degradation. Mountainous areas are facing water erosion, further exacerbating the dangers of desertification.[26] Increased desertification and land degradation correlate to higher incidence of sandstorms.[27]

The coastal marshlands in Algeria, the Ramsar site Réghaïa which constitutes the only major water body that exists near the capital Algiers,[28] are vulnerable to a multitude of anthropogenic effects resulting from the densely populated coastal areas such as natural resource exploitation (mainly for agricultural production, pastoral activities and salt mining)[29] and pollution, as well as climate change impacts, including increased flood incidence, rising sea levels and extreme weather events. The coastal areas are also vulnerable to the advancement of desertification from the Sahara Desert. Official sources have estimated that 51 to 66 per cent of biodiversity in Algeria is endangered as a result of human activities and changes in natural habitats.[30]

The prominent biomes in this hotspot area include coastal wetlands and mountainous Atlas range. In its nationally determined contribution, Algeria recognized the importance of pursuing forestry pathways for the achievement of their emission cut targets. As part of the mitigation component of its nationally determined contribution, Algeria considered the reforestation of 1.25 million ha over the period 2021-2030.[31] Nature-based pathways are being implemented on a large scale to limit the extent of desertification expanding from the desert areas towards the northern coastal areas of the country. In 1970, Algeria embarked on the construction of a massive green dam (figure 5)[32] to restore the degraded steppe ecosystem in the pre-Saharan areas extending across Algeria along a 1,500 km by 20 km belt. The project has generated multiple benefits and covered the reforestation of 30,000 ha in the Saharan Atlas, supported sand dunes fixation, contributed to preserving socioeconomic infrastructure from siltation, generated agricultural and pastoral lands, and contributed to water preservation in surface and groundwater bodies.[33] However, malpractices have undermined the achievement of the full range of benefits. These included cropping grasslands and steppe pasture lands, reforestation focusing on single species, and insufficient representation of the local

25. Bouzid, A. and others, Contribution of ecological restoration in preservation of forests ecosystems in Algeria, 2021. Acta Scientifica Naturalis 8(1):109-117
26. Saifi, M., and others, The Green Dam in Algeria as a tool to combat desertification, 2015. GRF Davos Planet@Risk, volume 3, Number 1, Special Issue on the 5th IDRC Davos 2014, March 2015.
27. Hirche, A., and others, Sandstorms as indicators of land degradation in Algeria, 2013. Geophysical Research Abstracts Vol. 15, EGU2013-6157, 2013 EGU General Assembly 2013.
28. Djitli, Y. and others, Annual cycle of water quality and macroinvertebrate composition in Algerian wetlands: a case study of lake Réghaïa (Algeria), 2021. Limnetica, 40(2): 399-415 (2021). DOI: 10.23818/limn.40.27.
29. Demnati, F. and others, Socio-Economic Stakes and Perceptions of Wetland Management in an Arid Region: A Case Study from Chott Merouane, Algeria, 2012. AMBIO 41, 504–512 (2012).
30. Toufik Bougaada, Biodiversity crisis in Algeria, 2011. Nature Middle East.
31. République Algérienne Démocratique et Populaire, Contribution Prévue Déterminée au niveau National CPDN – ALGERIE 03 septembre 2015.
32. Saifi, M. and others, The Green Dam in Algeria as a tool to combat desertification, 2015. GRF Davos Planet@Risk, volume 3, Number 1, Special Issue on the 5th IDRC Davos 2014, March 2015.
33. Ibid.

communities in decision-making and implementation. The experience from the green dam demonstrates the potential of well-designed and planned nature-based approaches to deliver green infrastructure solutions against sand and dust storms, given that endemic vegetation is used, and local populations are involved in its implementation.

Box 2. Summary of priority area 2 characteristics

Highest socioeconomic relevance:

- Rainfed agriculture.
- Grazing.

Source of pressure:

- Urbanization.
- Overgrazing.
- Grass land conversion.
- Pollution.
- Desertification.
- Water erosion.

Main threats:

- Soil degradation.
- Loss in habitat.
- Ecological fragmentation.

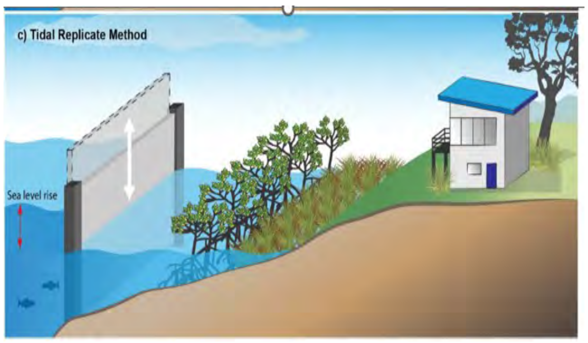
Figure 5. Location of the green dam in Algeria

Source: Saifi, 2015.

The conservation of coastal wetlands can draw upon approaches that emulate natural hydrological processes to enhance the resilience of high value coastal wetlands. These emulate tidal inundation patterns for the replenishment of sediment in intertidal wetlands to support coastal stabilization and preserve vegetation (figure 6). Such interventions are particularly valuable in regions with limited adaptability to sea level rise. The application of this approach in pilot wetland systems in Algeria proved successful in preserving and restoring wetlands and salt marshes and reestablished ecosystem services to their historical/pre-degradation levels (e.g. storm water retention, protection from tidal surge).

Nature-based applications recommended for this high priority area identified for biodiversity and climate benefits include forest pathways (management to limit wildfires, conservation and reforestation), pasture optimization (agroforestry), slope stabilization and hybrid coastal marshland conservation measures. The revival of the green dam (belt) should be considered and when properly implemented, could have important implications for limiting the occurrence of sand and dust storms that are generated from the southern areas.

Figure 6. Tidal replicate method



Source: Sadat-Noori, M., 2021. Coastal wetlands can be saved from sea level rise by recreating past tidal regimes. Nature research, 11:1196.

C. Hotspot 3: Low-lying Nile Delta in Egypt

Figure 7. Land projected to be below annual flood level due to 30 cm sea level rise (light green), Mediterranean Coast, Egypt

Source: *ESCWA,* United Nations Economic Commission for Latin America and the Caribbean (ECLAC), *2023*.

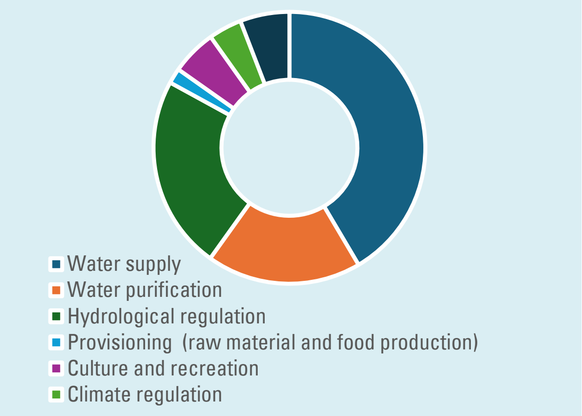
This identified hotspot area is located in the northern coastal zone of Egypt, extending along the Mediterranean coast. The dominant feature of this region is the low-lying delta of the River Nile, with its large cities, industry, agriculture and tourism. The region is also home to more than 25 per cent of the population and is considered the breadbasket of Egypt. It contributes 20 per cent of the country's gross domestic product (GDP) through agricultural, fishing and industrial activities.

The main biome characterizing these areas is the wetlands, also referred to as coastal lakes. The three most important ones are Lake Idku, Lake Burullus and Lake Manzala. The lakes are highly vulnerable to rising sea levels as they lie below the 30 cm sea inundation level forecasted to be attained between 2050 and 2060 along the Mediterranean Coast of Egypt based on the current Intergovernmental Panel on Climate Change leading consensus scenario (SSP3-7.0)[34] (figure 7). The Nile Delta region is known to be one of the most vulnerable areas to the impacts of rising sea levels in the world.[35] Projections indicate that sea level rise could reach 28 cm in the Port Said region (Lake Manzala) and 14.75 cm in Al-Burullus area by 2030 compared to the year 2000, under business-as-usual scenarios.[36] This would directly impact the size of coastal wetlands, which is directly proportional to the ecosystem services delivered. As an example,

34. ESCWA and ECLAC, Estimating the economic losses to transportation, housing and agriculture due to sea level rise: a case study in Alexandria, Egypt, 2023.
35. Dasgupta, S. and others, Sea-level rise and storm surges: a comparative analysis of impacts in developing countries, 2009. World Bank Policy Research Working Paper 4901.
36. Smith J.B. and others, Egypt's economic vulnerability to climate change, 2014. Climate Research.

Lake Burullus shrunk by 16 per cent between 1984 and 2019.[37] Economic losses from sea level rise were forecasted at current rates of degradation to reach 4.2 per cent of the total agricultural area by 2030; wheat and rice production cuts of 15 per cent and 11 per cent, respectively, will ensue by 2050 in Egypt. Sea level rise will also lead to decreases in the value of housing units and roads. Additional sources of pressure threatening the coastal lakes include excessive fishing, industrial wastewater discharge and urban encroachment.[38] The degradation of these highly valuable ecosystems will compromise climate resilience services and functions, compounding the fragility of local communities to the impacts of climate change.

Figure 8. Combined ecosystem service values in the three main deltaic coastal wetlands



Source: Abd El-Hamid, H., 2023.

Box 3. Summary of priority area 3 characteristics

Highest socioeconomic relevance:

- Agriculture/fishing.
- Industry.
- Recreation/tourism

Source of pressure:

- Expanded urbanization.
- Overgrazing.
- Grass land conversion.
- Pollution.
- Water erosion.

Main threats:

- Soil degradation.
- Loss in habitat.
- Ecological fragmentation.

An assessment of the main ecosystem services delivered by the three main deltaic lakes - Lake Idku, Lake Burullus and Lake Manzala - is depicted in figure 8.[39] The highest value generated is for water supply and purification as well as hydrological regulation (attenuating floods and drought risks). Wetlands influence local hydrological processes such as evapotranspiration, infiltration and groundwater recharge and can thus influence the water balance.[40] They can also attenuate storm surges[41] and modulate peak flows by storing runoff and slowly releasing it over time.[42] Wetlands also

37. Abd el-Sadek, E. and others, Coastal and land use changes of Burullus Lake, Egypt: A comparison using Landsat and Sentinel-2 satellite images, 2022. The Egyptian Journal of Remote Sensing and Space Science. Vol 25, issue 3, December 2022.
38. Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction, 2011.
39. Abd El-Hamid, H., Impact assessment of the land use dynamics and water pollution on ecosystem service value of the Nile Delta coastal lakes, Egypt, 2023. Journal of the Indian Society of Remote Sensing.
40. Ferreira C.S.S. and others, Wetlands as nature-based solutions for water management in different environments. Current Opinion in Environmental Science & Health. Volume 33, June 2023, 100476.
41. Eldeberky Y. and Hünicke B., Vulnerability of the Nile Delta to recent and future climate change, 2015. Conference paper presented at the 36th IAHR World Congress 28 June– 3 July, 2015, The Hague, the Netherlands.
42. Ferreira C.S.S. and others, Wetlands as nature-based solutions for water management in different environments. Current Opinion in Environmental Science & Health. Volume 33, June 2023, 100476.

contribute to water purification by locking up pollutants received from agricultural runoff, industrial discharges and sewage effluents in their sediments, soils and vegetation. The Egyptian nationally determined contribution clearly features nature-based approaches to enhance resilience and adaptation to climate change in the Delta region. These are based on sand dune stabilization through the reestablishment of local vegetation and installation of wooden barriers.

Egypt is also implementing a coastal defence hybrid infrastructure solution as an alternative approach to the conventional shore protection measure, with support from the Green Climate Fund, to enhance the resilience of local communities in the face of coastal flooding, increased storm frequency and sea level rise. The system consists of constructed dikes that emulate and draw upon the coastal landscape features, including through the establishment of vegetated sand dunes (figure 9) and reed barriers (figure 10). The current structure is implemented over a 70 km stretch along the shores of the Nile Delta and covers five governorates recognized as flooding hotspots with expected beneficiaries of around 18 million people.[43] To date, up to 70 per cent of the project has been completed, and preliminary assessments indicate encouraging outcomes for farmers and fisherpeople who were able to resume their activities in the rehabilitated coastal areas.[44] Similar initiatives have been explored for shore stabilization through the generation of natural sand dunes on the Rosetta shorelines; it was assessed that these approaches generate a more economical, efficient and environmentally friendly solution compared to the conventional structural engineering protection works used for flooding and shoreline erosion.[45] The encouraged nature-based pathways aim to conserve the main existing wetland systems, including through the restoration of sand dunes and shore stabilization.[46]

Figure 9. Vegetated sand dunes for shore stabilization

Source: El-Shinnawy, 2009.

Figure 10. Constructed reed dikes for shore protection in the Delta area

Source: United Nations Development Project website 2021. Protecting the Nile Delta: https://www.undp.org/egypt/blog/protecting-nile-delta June 13, 2021.

43. Green Climate Fund, Enhancing climate change adaptation in the North coast and Nile Delta Regions in Egypt.
44. Farouk, M.A., Egypt erects sand barriers as rising sea swallows the Nile Delta, 2022. Thomson Reuters Foundation.
45. Masria, A. and Abdelaziz, K., Environmentally-friendly proposals for coastal stability at Rosetta Promontory, Nile Delta, 2017. J Marine Sci Res Dev 2017, 7:3 DOI: 10.4172/2155-9910.1000227.
46. El-Shinnawy, I.A., Vulnerability assessment and adaptation policies for CC Impacts on the Nile delta coastal zones.

D. Hotspot 4: Iraq Mesopotamian floodplain and Zagros Mountains

This hotspot highlights areas located in the Mesopotamian floodplain in southern Iraq and the Zagros Mountains located in the northeastern part of the country.

Mountain range located in the northeastern part of Iraq: The Zagros Mountains located in the northeastern parts of Iraq consist of diversified steppe woodlands that are a biodiversity hotspot and a hub of endemic species. This priority area is characterized by dry, loose soil and sparse vegetation under dry climate conditions. The steep sloping topography of these mountain ranges, in the absence of adequate slope grading interventions, contributes to soil cover loss and degradation of the vegetation cover which increases risks of land degradation and soil erosion (figure 11).

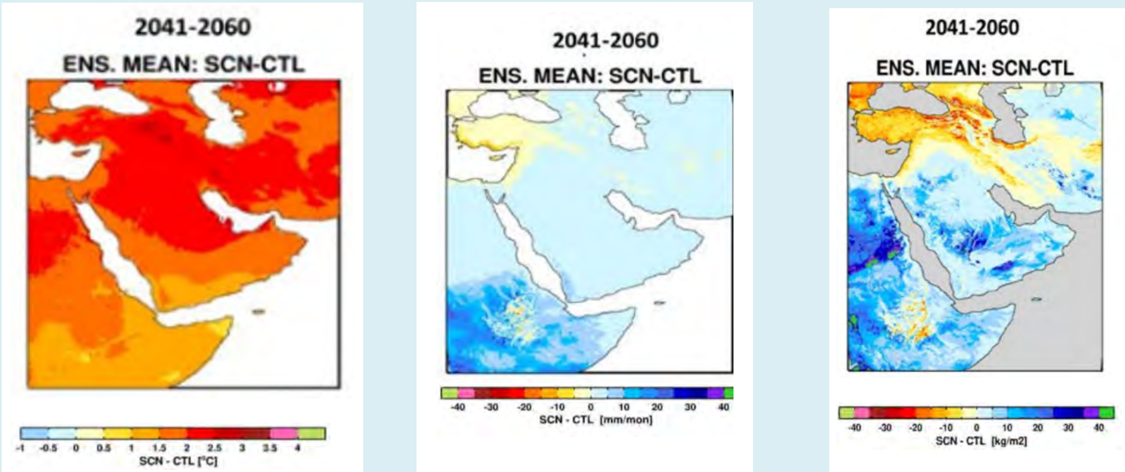
Demographic expansion and associated agricultural and pastoral activities,[47] and climate and environmental conditions are further exacerbating the risk of water pollution. Climate projections conducted for this area have also flagged its vulnerability to the highest temperature changes expected by 2050 across the Mashreq region, a decrease in forecasted volumes of precipitation, and loss of soil moisture, as projected by Regional Initiative for the Assessment of Climate Change Impacts on Water Resources and Socioeconomic Vulnerability in the Arab Region (RICCAR) outcomes under climate scenarios SSP5-8.5 socioeconomic pathways (figure 12). This complicates the natural regeneration processes for the conservation of biodiversity, soil and water resources. In addition, extreme weather indicators have shown that this area is vulnerable to the risks of extreme hydrometeorological events, including droughts and loss of soil moisture.[48]

Figure 11. Erbil, Duhok and Suleimaniya landscape scenic views

Source: Adobe stock images.

47. Iraq key socio-economic indicators for Baghdad, Basrah, and Sulaymaniyah - Country of origin information report, November 2021. European Asylum Support Office, 2021.
48. Swedish Meteorological and Hydrological Institute (SMHI) and ESCWA, Future Climate Projections for the Mashreq Region: Summary Outcomes - RICCAR Technical Report, Beirut, 2021. E/ESCWA/CL1.CCS/2021/RICCAR/TECHNICAL REPORT.7/REV.1.

Figure 12. RICCAR climate projections for the Mashreq subregion highlighting highest changes in hotspot area



Mean temperature (deg C) change compared to baseline period

Mean precipitation change mm/mo compared to baseline period

Mean soil moisture change (mm/mo) compared to the baseline period

Source: Swedish Meteorological and Hydrological Institute (SMHI) and United Nations Economic and Social Commission for Western Asia (ESCWA). 2021. Future Climate Projections for the Mashreq Region: Summary Outcomes. RICCAR Technical Report, Beirut. E/ESCWA/CL1.CCS/2021/RICCAR/TECHNICAL REPORT.7/REV.1.

Box 4. Summary of priority area 4 characteristics

Highest socioeconomic relevance:

- Agricultural production.
- Fisheries.
- Tourism.
- Marshland culture.

Source of pressure:

- Desertification.
- Expanding urbanization.
- Drainage of wetlands/land reclamation.
- Climate change impacts.

Main threats:

- Loss of soil cover.
- Sand and dust storms.
- Encroachment.

Recommended priority nature-based interventions for the conservation of this area are focused on land grading through, for example, terracing or contouring. These measures aim to stabilize and reduce the slope gradient and control runoff velocity and hence its eroding potential. These would contribute to the conservation of topsoil and moisture content. In addition, vegetating terraces (forest pathways) and establishing green belts along the contours would generate additional climate and biodiversity benefits.

Mesopotamian floodplain in the southern part of Iraq: The main ecosystem feature in the south of Iraq highlighted on the map corresponds to the Mesopotamian alluvial plain, which is an extensive marshy river delta containing the largest wetland complexes in the Arab region. It provides habitat for aquatic and semi-aquatic species in arid and desert environment. These marshes historically served as the most important wintering and resting area for migratory birds across the region. They are also considered as a global hotspot for species evolution, speciation and endemism.

The traditional interactions between the local community and this ecosystem go beyond indigenous ecosystem management to represent a particular marshland culture characterized by traditional human settlement, land-use or sea-use interactions.[49] This area supports substantive ecosystem functions that serve as a source of livelihood for the local inhabitants, from native water buffalos, fishing and bird hunting as well as drawing upon the rich aquatic vegetation. Revenues generated from provisioning services alone (trading of fish, water buffalo milk and fodder, and harvested plants) were estimated at 3 million United States dollars every six months.[50] This does not include additional services that are not assigned economic values, such as for example, serving as an important bird area for 22 species of birds.

In the early 1990s, the marsh system of Iraq underwent a major drainage of its waters, drastically disrupting its hydrological regime. By 2000, around 90 per cent of permanent and seasonal marshes were completely lost. Although reflooding was initiated by local inhabitants and maintained over a number of subsequent years, the outcomes fell short of recovering the marshes in their integrity, particularly with regards to re-establishing hydrological connectivity and sedimentation dynamics. Land degradation and desertification, as well as substantial sand dune accumulations in the east of Al-Daur and southwest of Tuz counties, ensued.[51] In addition, land reclamation for crop production is thought to increase vulnerability to desertification, particularly during the dry post-harvest seasons. The nature of the soil presents an important source of silt and clay which are the typical soil types carried by dust storms.

The southern Mesopotamian region in Iraq is the part of the Arab region where the highest global/regional temperature increases are expected. This is corroborated by RICCAR temperature rise forecasts which reach a +2.4°C to +2.7°C increase by end-century in the projections for the Mashreq region. This poses additional water stress on the land and native species and increases their vulnerability to environmental, climate and anthropogenic impacts.

The lower Mesopotamia area was also identified as a source of sand and dust storms estimated to impact 40 million people in Bahrain, Iraq, Kuwait, Qatar, Saudi Arabia and the United Arab Emirates. Some nature-based pathways have been pursued in this area to halt land degradation and desertification and hence mitigate the risk of sand and dust storms.

Figure 13 shows that areas identified as high priority for conservation and restoration to achieve optimal climate and biodiversity

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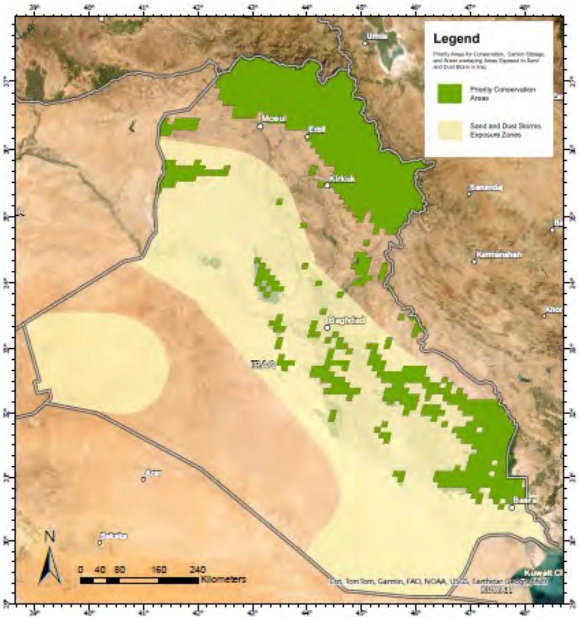
49. Garstecki, T. and Amr, Z., Biodiversity and Ecosystem Management in the Iraqi Marshlands Screening Study on Potential World Heritage Nomination,2011. IUCN ROWA, Jordan.
50. Fazaa, N.A. and others, Evaluation of the ecosystem services of the central marshes in southern Iraq, 2018. Baghdad Science Journal.
51. Al-Quraishi A.M.F., Land Degradation Detection Using Geo-Information Technology for Some Sites in Iraq, 2009.

benefits fall within the region where most sand and dust storms originate. This map was generated by overlaying sand and dust storm hotspots (yellow areas) over the areas of high priority for climate and biodiversity synergies.

Other local assessments and analysis took place and have resulted in cross border cooperation for the implementation of a four-year project led by Kuwait Institute for Scientific Research, which aims to limit desertification through two nature-based pathways. The main premise of this initiative relies on the control of soil cover loss through the establishment of green belts and wind beaks using native drought resistant vegetation together with vegetated sand dunes for improved stabilization. Previous similar attempts had been initiated by the Iraqi Government for the construction of green belts in 2006, but they had failed to achieve the intended results mainly due to the lack of finances and official commitment.[52] In March 2023, governmental authorities in Iraq initiated a programme aiming to plant 5 million trees across the country amidst doubts surrounding the possibilities of maintaining such forests long enough to generate erosion control and desertification benefits, particularly under the expected increases in temperature.[53]

The recommended nature-based interventions in the Mesopotamian floodplain include reforestation through establishing green dams and covering of sand dunes for improved stabilization to avoid increasing desertification due to projected climate change impacts.

Figure 13. Areas of priority for biodiversity and climate change which are prone to sand and dust storms



Source: Adobe stock images.

E. Hotspot 5: Coastal areas of the eastern Mediterranean

This hotspot area covers the Mount Lebanon range, which consists of middle-and high-elevation zones, representing the second highest peaks in the Arab region. Forest areas of Lebanon constitute 13 per cent of the country’s total area. The mountain range is home to the highest densities of floral diversity in the Mediterranean region, one of the most biologically diverse regions in the world.

The major sources of threat to the forests in Lebanon include rapid population growth,

52. The Arab Weekly, Iraq 'green belt' stands as failure in faltering climate fight, 2022.

53. Earth.org, Iraq launches tree planting initiative to fight desertification and climate change, 2023.

urbanization and land conversion, overexploitation of forests and rangelands resources, biological invasions, intensification of agriculture, and desertification. These have contributed to forest degradation and habitat fragmentation.[54] Trees play a vital role in maintaining ecological balance, and their degradation can lead to soil erosion, disrupted water cycles and reduced biodiversity. This results in losses of their ecosystem service values. Studies assessing the values of selected ecosystem services in the forests of Lebanon corroborate findings generated from similar assessments implemented across forests of the Mediterranean region. In addition to the climate and air regulation functions, provisioning value generated from honey production and tourism alone generate around 70 million United States dollars per year in Lebanon.[55]

The mitigation interventions listed in the nationally determined contribution of Lebanon foresee actions in the forestry sector towards the achievement of envisaged emission cuts. Similarly, the adaptation component lists land-based pathways as priority intervention measures, mainly through reforestation, afforestation and land restoration to enhance forest cover.[56] The nature-based pathways proposed for the mountains of Lebanon need to prioritize reforestation, improved forest management, and agroforestry and avoid the conversion of grassland into cropped areas. Forest pathways would not only enhance carbon sequestration, but also support provisioning services, notably honey, pine seeds and wood of high economic value, and enhance resilience against hydrometeorological hazards, including droughts and erosion by runoff and floods. Forests in this area have also considerable cultural and touristic value that represents a major source of livelihoods for local inhabitants.

This high priority area covers the Jordan River drift valley and the high plateau located to the east of the river valley. This area comprises a diversified biome landscape, which includes alluvial plains, swamps and lakes as well as Mediterranean and steppe shrublands and forests. Vegetation includes drought resistant shrubs, reeds, date palms and willows. Animal species most often encountered are those that can withstand dry climates such as desert rodents and reptiles, birds, vultures and waterfowl.

Box 5. Summary of priority area 5 characteristics

Highest socioeconomic relevance:

- Agricultural production.
- Pastoral activities.
- Wood and non-wood forest products
- Tourism.
- Culture.

Source of pressure:

- Desertification.
- Expanding urbanization.
- Land conversion.
- Agriculture intensification
- Climate change impacts.

Main threats:

- Forest degradation.
- Loss in agricultural productivity.
- Loss in habitat.

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54. Ministry of Agriculture, Lebanon National Forest Program 2015-2025. GIZ/Regional Project- Silva Mediterranea- CPMF Adapting Forest Policy to Climate Change in the MENA Region.
55. Charbel, E. and Rahal, L., Mapping and valuing forest ecosystem services in Lebanon, 2021. Study completed under the USAID-funded Livelihoods in Forestry Project. Lebanon Reforestation Initiative (LRI), Beirut.
56. Lebanon nationally determined contribution updated 2020 version.

F. Hotspot 6: Jordan River Valley

Box 6. Summary of priority area 6 characteristics

Highest socioeconomic relevance:

- Agricultural production.
- Pastoral activities.
- Tourism.
- Culture.

Source of pressure:

- Desertification.
- Expanding urbanization.
- Grazing
- Agriculture intensification
- Drainage of wetlands/land reclamation.
- Climate change impacts.

Main threats:

- Rangeland degradation.
- Loss in agricultural productivity.
- Loss in habitat.

The main pressure on this ecosystem results from the paucity of productive land. The majority of Jordanian land consists of desert (90 per cent) with scarce water resources, which leads to intensified agriculture production and grazing activities in the Jordan River drift valley and the highland regions. The combined impacts of climate change and associated drought episodes as well as rapidly increasing rates of urban encroachment have resulted in a concerning degradation of agricultural and range lands as well as water resources. The use of heavy machinery for ploughing slopes has accelerated soil erosion and loss in land productivity. The nationally determined contribution of Jordan explicitly calls for expanding the scope of nature-based solution implementation for the preservation of biodiversity ecosystem services and agricultural productivity. Nature-based measures are explicitly referred to in the National Adaptation Plan[57] as an avenue for enhancing climate resilience.

Figure 14. Jordan Valley

Source: Jordan Valley from stock photos.

Figure 15. Revival of the Hima practice

Source: Abraham, C., Ecologist Special Report: The Al Hima Revival, 2017.

57. Government of Jordan, The National Climate Change Adaptation Plan of Jordan 2021, 2021.

Jordan has a long history of applying nature-based solutions, notably the "Hima" approach which consists of setting land aside to allow for its natural regeneration through participative governance approaches. The concept was implemented in the Zarqa river basin[58] as part of the National Rangeland Strategy of Jordan (2014), and generated a broad range of ecological and societal benefits, including through carbon sequestration in a cost-effective manner.

The proposed measures for Jordan need to focus on enhancing pastureland management.

G. Hotspot 7: Southeastern parts of the Arabian Peninsula

The hotspot area identified in the southeastern coastal part of the Arabian Peninsula covers a large part of Oman and the northeastern parts of the United Arab Emirates. The mitigation component of the Omani nationally determined contribution has identified the agriculture, forestry and other land use sector as an avenue for emission reduction, accounting for 4 per cent of the total sequestration planned by 2023. Similarly, the nationally determined contribution of the United Arab Emirates lists mangroves as an important avenue for carbon storage and sequestration.

In Oman, the hotspot area overlaps with the northern Hajar inland mountain range in addition to the coastal areas. The vegetation on the mountains varies with elevation, changing from shrublands and dry grasslands at lower elevations, passing through semi-evergreen woodlands to reach open woodlands of juniper when above 2,300 meters elevation. These forests are valuable in terms of the diverse array of plant species, with 78 species endemic to the region and 11 plant species currently considered to be endangered or critically endangered. The coastal area's ecosystem is predominantly represented by the mangrove biome. The mangroves' root system is encroached in saltwater environments with regular exposure to the tides, existing at the boundary of two environments. They have adapted to the highly muddy, shifting, saline environment and play a crucial role for shoreline protection as they serve as natural barriers dissipating wave energy, hence reducing the impacts of hurricanes, cyclones, tsunamis and storm surges. Mangrove forests also support fisheries by providing nursery, breeding, spawning and hatching habitats. Mangroves are also among the most efficient carbon sinks at the global level. In Oman, the carbon sequestration rates of mangroves are thought to be the highest (38.9 kg $CO2/m2$)[59] reported rates in mangrove forests across the Arab region.[60]

An extensive global review[61] was drawn upon to shed light on the relative contribution of mangroves across various ecosystem functions and services. The values differ greatly based on

58. Myint, M. and Westerberg, V., An economic valuation of a large-scale rangeland restoration project through the Hima system in Jordan - A case study in Jordan, 2015. IUCN.
59. Al-Nadabi, A. and Sulaiman, H., Carbon sink potential of Avicennia marina in the Al-Qurm Nature Reserve, Muscat, Oman, 2018. IOP Conf. Ser.: Earth Environ. Sci. 151 012003.
60. Afefe, A. and others, Tree biomass and soil carbon stocks of a mangrove ecosystem on the Egyptian-African Red Sea coast, 2020. Fund. Appl. Limnol., 193: 239 251; Cusack, M. and others, Organic carbon sequestration and storage in vegetated coastal habitats along the western coast of the Arabian Gulf, 2018. Environ. Res. Lett., 13(7): 1–10; Eid E.M. and Shaltout K.H., Distribution of soil organic carbon in the mangrove Avicennia marina (Forssk.) Vierh. along the Egyptian Red Sea Coast, 2016.
61. Himes-Cornell A., and others, Mangrove Ecosystem Service Values and Methodological Approaches to Valuation: Where Do We Stand?, 2018. Front. Mar. Sci. 5:376. doi: 10.3389/fmars.2018.00376.

the assessment methodology used and the corresponding geographic location. Figure 16 depicts the assessment outcomes and shows that the main contribution is centred on climate regulation through mainly carbon sequestration. The following categories of services centre on provisioning services (raw material and food production), recreation and tourism, and water treatment.

Box 7. Summary of priority area 7 characteristics

Highest socioeconomic relevance:

- Agricultural.
- Grazing.
- Fisheries.
- Culture and tourism.

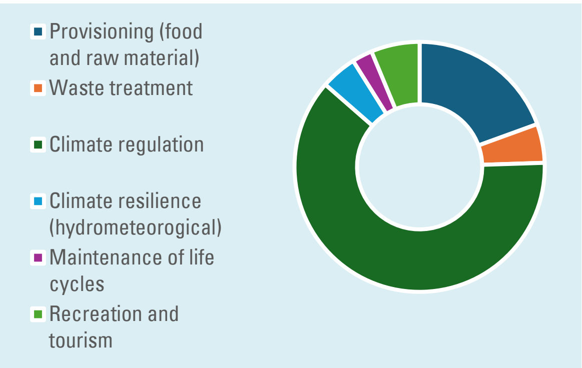
Source of pressure:

- Overgrazing.
- Expanding urbanization.
- Climate change impacts.

Main threats:

- Loss of forest productivity.
- Loss in agricultural and pastureland productivity.
- Shoreline erosion.

Figure 16. Ecosystem service values of mangroves as a percentage of total ecosystem service value



Source: Himes-Cornell A., Grose SO and Pendleton L., 2018.

The main threats to biodiversity in Oman include overgrazing, loss of habitat, overuse of and damage to coastal and marine ecosystems, invasive species, and population growth and the use of modern technology. Since the early 1970s in Abu Dhabi, massive restoration and conservation initiatives have resulted in enhanced blue carbon ecosystems (mangroves, salt marshes and seagrass beds) in contrast to global trends of loss in mangrove forests. Blue carbon ecosystems were calculated to have stored over an estimated 41 million tons of carbon dioxide equivalent (CO2 equivalent) in Abu Dhabi, more than the Emirate's annual emissions from the oil and gas (26.4 million tons) or water and electricity (30.9 million tons) sectors.[62]

It is estimated that the existing blue carbon ecosystems in Abu Dhabi can provide services worth hundreds of millions of United States dollars annually through shoreline stabilization, support to fisheries, direct recreational use, and water quality maintenance.[63] Additional services include support to biodiversity, as well as cultural, spiritual and aesthetic values. The main nature-based intervention in this area should focus on mangrove forest conservation and restoration and optimization of grazing. This could assist the United Arab Emirates in achieving its net-zero emission target alongside other mitigation measures in other sectors.

The value of the proposed nature-based solutions in the identified hotspots across the various categories of ecosystem service delivery and their relevance to enhancing socioeconomic conditions are depicted in the table. The conservation and restoration of forests would

62. Statistical Yearbook of Abu Dhabi 2013.
63. AGEDI 2013, Blue Carbon in Abu Dhabi – Protecting our Coastal Heritage: The Abu Dhabi Blue Carbon Demonstration Project.

not only improve carbon sequestration and enhance biodiversity but would also protect watersheds, which support the climate resilience of the agricultural sector, a main source of livelihoods in the area. Similarly, the conservation of coastal wetlands not only benefits biodiversity richness and carbon regulation but would also substantially support the water bodies' hydrological properties in terms of water purification and hydrological regulation. Policy implications should focus on the need for intersectoral coordination at the design stages of nature-based solution planning and implementation.

Socioeconomic and climate consideration with proposed nature-based approaches and their benefits in identified hotspot areas

Identified priority areas in the Arab region	Socioeconomic importance	Threats and hazards	Proposed nature-based solutions	Generated benefits from nature-based solutions
Hotspot 1: Atlas Mountains in Morocco	• Rainfed agriculture. • Grazing.	• Soil degradation and erosion. • Ecological fragmentation. • Desertification.	• Forest management and conservation. • Reforestation. • Pasture optimization. • Agroforestry. • Slope stabilization.	• Water shed protection. • Pastureland. • Firewood. • Non wood forest products. • Climate regulation.
Hotspot 2: Atlas Mountains in Algeria and coastal areas	• Rainfed agriculture. • Grazing.	• Soil degradation. • Loss of habitat. • Ecological fragmentation.	• Forest management and conservation. • Pasture optimization. • Agroforestry. • Coastal marshland conservation. • Slope stabilization. • Green dams.	• Water shed protection. • Pastureland. • Firewood. • Non-wood forest products. • Climate regulation. • Enhanced resilience against sand and dust storms.
Hotspot 3: Nile Delta in Egypt	• Highly urbanized. • Agriculture/ fishing. • Industry. • Recreation/ tourism.	• Sea level rise. • Storm surges. • Fish stock depletion. • Pollution from waste discharge. • Urban encroachment.	• Sand dunes stabilization. • Green belts.	• Water supply. • Hydrological regulation. • Water purification. • Habitat provision. • Culture and recreation.

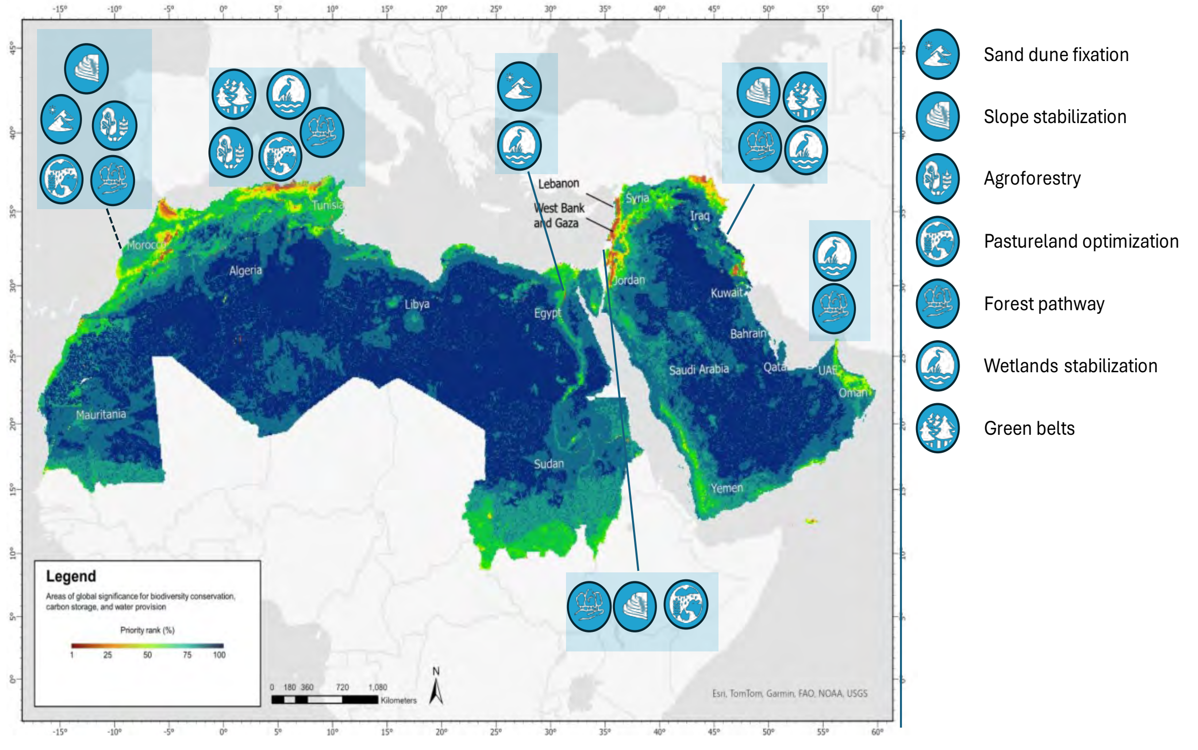
Identified priority areas in the Arab region	Socioeconomic importance	Threats and hazards	Proposed nature-based solutions	Generated benefits from nature-based solutions
				• Climate regulation. • Provisioning services.
Hotspot 4: Iraq Mesopotamian floodplain and Zagros Mountains	**Mountains:** • Agriculture. • Grazing. • Urban centres. **Mesopotamian plain:** • Migratory routes. • Agriculture/fishin g/grazing. • Marshland culture.	**Mountains:** • Soil cover loss. • Degradation of vegetation cover. • Water pollution. • High temperature increases. **Mesopotamian plain:** • Wetland draining. • Desertification. • Sand and dust storms. • High temperature increases.	**Mountains:** • Green belts. • Land grading. • Vegetated terraces. **Mesopotamian plain:** • Reforestation. • Green belts. • Dune stabilization and vegetation.	**Mountains:** • Water shed protection. • Pastureland. • Firewood. • Non-wood forest products. • Climate regulation. **Mesopotamian plain:** • Enhanced resilience against sand and dust storms.
Hotspot 5: Eastern Mediterranean Mountains	• Agricultural and pastoral activities. • Wood and non-wood forest products. • Tourism. • Culture.	• Forest degradation. • Habitat fragmentation. • Loss in agricultural productivity. • Loss in rangelands.	• Reforestation. • Agroforestry. • Forest preservation. • Preventing grassland conversion.	• Water shed protection. • Pastureland. • Firewood. • Non-wood forest products. • Climate regulation.
Hotspot 6: Jordan Valley	• Agricultural production. • Fisheries. • Tourism. • Culture and tourism.	• Forest degradation. • Habitat fragmentation. • Loss in agricultural productivity. • Loss in rangelands. • Sand and dust storms.	• Forest and pastureland management. • Agroforestry. • Preventing grassland conversion.	• Water shed protection. • Pastureland. • Firewood. • Non-wood forest products. • Climate regulation.

Identified priority areas in the Arab region	Socioeconomic importance	Threats and hazards	Proposed nature-based solutions	Generated benefits from nature-based solutions
Hotspot 7: Arabian Peninsula	• Agriculture. • Grazing. • Fisheries. • Culture and tourism.	• Loss in agricultural productivity. • Loss in rangelands.	• Forest conservation. • Grazing optimization.	• Climate regulation. • Provisioning. • Recreation and tourism. • Waste treatment. • Hydrometeorolog ical resilience. • Life cycle maintenance.

Conclusion

The present report is an attempt to regionalize global assessment outcomes on the optimization of biodiversity and climate interventions in the Arab region. Analysis builds on a global research that identified areas where the greatest benefits for joint climate action and biodiversity goals can be achieved. Priority areas were analysed in great depth to consider the particularities of the designated areas in terms of climate change impacts, ecological status and socioeconomic conditions.

Figure 17. Recommended nature-based interventions for high priority joint biodiversity and climate change benefits



Source: ESCWA.

Recommendations:

- Localize available data and analysis and adapt global approaches and methodologies to the local context to generate region-specific nature-based solutions that are technically and economically feasible.
- Utilize and replicate the expertise explored from the identified priority areas and associated nature-based interventions when formulating national development plans, environmental policies and climate mitigation and adaptation action plans.
- Enhance national and local collaboration platforms and mechanisms to support integrated cross-sectoral nature-based solutions and related actions.
- Apply nature-based solutions to mitigate the impacts of the increasing frequency of sand and dust storms in hotspots areas using predominantly mechanical and biological approaches.
- Systematically consolidate experiences and lessons learned from the implementation of nature-based solutions across the Arab region into an openly accessible online regional platform to facilitate exchange of knowledge among countries in the region.

  Promote the use of modern technologies, particularly geospatial analysis tools such as remote sensing analysis and geographic information systems tools to facilitate the generation of comprehensive assessments and analysis for enhanced nature-based interventions.

The dual threat of biodiversity degradation and climate change is increasingly being felt across the Arab region. Efforts implemented by countries are failing to meet national commitments to international climate and biodiversity agreements. This report argues that nature-based pathways can complement countries' conventional approaches towards the achievement of optimized biodiversity and climate synergies.

The report builds its analysis on global studies that have identified priority hotspot areas where nature conservation and restoration would generate optimal outcomes for joint climate and biodiversity objectives. Thorough examination of the hotspot areas in the Arab region is provided, identifying associated threats and challenges and taking into consideration socioeconomic conditions to generate location–specific nature-based solutions for each of the selected areas. The proposed solutions include reforestation, agroforestry and pasture optimization, sand dunes stabilization, and the establishment of green belts.

The report can guide regional and international funding opportunities and collaborative conservation programmes for optimized biodiversity, climate mitigation and adaptation benefits. It also calls for further national assessments, particularly in relation to the value of ecosystem services needed to devise context-specific nature-based solutions.

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