MULTI-STAKEHOLDER PLATFORM FOR PROTECTING BIODIVERSITY

Renewable Energy and Biodiversity

Background

Conserving biodiversity in the Arab region requires collaborative efforts involving various stakeholders operating across different sectors and scales. A common regional platform offers diverse stakeholder groups the opportunity to come together to exchange knowledge and lessons learned, build consensus on regional priorities, and identify pathways to address common priorities.

This multi-stakeholder platform for protecting biodiversity in the Arab region launched by the United Nations Economic and Social Commission for Western Asia (ESCWA) with the support of the Government of Sweden fosters regional engagement for the preparation of projects for mobilizing finance for biodiversity conservation efforts within the context of strengthening climate resilience in the Arab region.

Objectives

- Facilitate collaboration and coordination between stakeholders involved in biodiversity conservation in the Arab region.
- Enhance understanding, exchange and action on regional challenges affecting biodiversity in the Arab region.
- Foster the development of bankable projects to mobilize finance for the implementation of priority actions in biodiversity conservation, for enhancing climate resilience.

Working Group

This technical note informs the discussions of the Working Group on Renewable Energy and Biodiversity. The working group aims to formulate opportunities to advance renewable energy applications while protecting biodiversity and contributing to climate change adaptation and mitigation for enhanced climate resilience in the Arab region.

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A. Introduction

The Arab region is home to a diverse range of ecosystems and is a hotspot of biodiversity. Similar to global trends, the region is also facing several threats to its biodiversity from ecosystem degradation due to multiple pressures from pollution, climate change, urbanization, and increasing land use changes, leading to habitat destruction and invasive species. The just and inclusive transition to sustainable energy is therefore essential for addressing the climate change pressures that affect biodiversity and renewable energy is one of the important measures to support this transition.

With only 5.1% of renewable energy (RE) share in the total final energy consumption, the Arab region lags behind the global average in deployment of RE technologies. Progress is slow and the installed RE capacity in the Arab region has roughly doubled over the past decade, reaching a little over 22 gigawatts (GW) in 2021. Notwithstanding, some Arab countries have shown ambition to become net zero greenhouse gas (GHG) emitters by 2050 (United Arab Emirates, Oman) and 2060 (Saudi Arabia, Bahrain, Kuwait). Several large utility-scale solar PV projects are set to come online in the coming years including the 2.06 GW Al Shuaibah plant, the 1.5 GW Sudair plant in Saudi Arabia, and the 2.0 GW Al Dhafra plant in the United Arab Emirates. Countries have also committed to rapidly increasing RE investments in the region which could see capacity increase by 33 GW between 2022 and 2026, with around 26 GW as utility-scale and distributed solar[1].

Modern RE solutions such as sustainably sourced modern biofuels, wind (both onshore and offshore), floating solar PV and agrovoltaics, which have a low impact on biodiversity, are emerging contenders to close the gap in RE penetration rates between the Arab region and elsewhere. While direct land use for power plants is lower for fossil fuel plants, land use of RE technologies, when calculated using life cycle assessment, are comparable (Table 1).

Table 1. Comparison of land use of electricity generation technologies based on life cycle assessment[2]

		Land use per MWh of electricity produced (m^2-annum / MWh)		
RE source	**Type**	**Min**	**Median**	**Max**
Wind onshore	Project site area	8.4	99	247
Hydropower	<360 MW	25	33	41
CSP	Tower	13	22	56
Coal	With CCS	11	21	34
Solar PV (Si)	Ground mounted	12	19	37
Coal	Plant	9	15	24
Hydropower	>660 MW	10	14	19
Solar PV (Si)	Roof mounted	2	3	5
Gas plant	With CCS	1	1.3	4
Gas	Plant	0.5	1.0	4
Wind onshore	Turbine area	0.4	0.4	0.4
Nuclear	Thermal reactor	0.3	0.3	0.3

*This includes the land footprint of the energy plant and land used for mining of minerals for construction, fuel, decommissioning and waste handling.

*Onshore wind project site area is dependent on spacing of turbines and can be used for grazing/farming and is highly variable.

*Onshore wind turbine area only includes the area directly impacted by the excavation and installation of wind turbines and not the area between turbines.

Management, protection, restoration and sustainable use of natural resources and ecosystems are essential for the preservation of unique biodiversity and decreasing the risk of biodiversity loss. On the other hand, the enhanced deployment of RE is key to the sustainable energy transition.

Hence, achieving both these objectives in tandem, by minimizing the trade-offs and maximizing the synergies, is paramount for the sustainable development of the Arab region.

B. 2030 Agenda & MEA Linkages

There are several international agreements for biodiversity protection and global pacts promoting sustainable energy transition with many complementarities between them. These formal and informal arrangements provide an effective framework for cooperation between countries.

Major global treaties on the protection of biodiversity include the Ramsar Convention on Wetlands, 1971 which aims to conserve flora and fauna in wetlands; the UN Convention on Biological Diversity (CBD), 1992 which aims to conserve biodiversity; the United Nations Convention to Combat Desertification (UNCCD), 1994 which aims to address the problem of desertification by protecting and restoring lands; the Aichi Biodiversity Targets, 2011 (established by CBD) which aims to address and mitigate global biodiversity loss; and the Kunming-Montreal Global Biodiversity Framework (GBF), 2022 which aims to protect at least 30% of the world's land, water, coastal, and marine areas.

International climate agreements, such as: the United Nations Framework Convention on Climate Change (UNFCCC), 1992 which aims to stabilize GHG concentrations in the atmosphere; the Paris Climate Agreement, 2015 which aims to limit global warming to well below 2 degrees Celsius above pre-industrial levels (and pursue efforts to limit it to 1.5 degrees Celsius); and Nationally Determined Contributions (NDCs), which include targets for RE deployment, are drivers for transitioning to a sustainable energy future. The adoption of the 2030 Agenda for Sustainable Development, which includes Sustainable Development Goal (SDG) 7 and 15, also complements these initiatives.

C. Current Status

SDG 7 is considered essential for sustainable energy transition and there are positive trends on development of affordable and clean energy, with several countries in the region on track to achieve SDG 7[3]. While access to electricity and clean cooking is high, the Arab region has a low share of RE (Table 2), which suggests that there is a sizeable opportunity for scaling up the deployment of RE technologies such as solar PV and wind energy, considering the high solar irradiation[4] and considerable wind resources[5].

Table 2. Selected SDG 7 targets and their progress in the Arab region as compared to the global average[6]

Target	Arab Region	Global Average
7.1.1 Proportion of population with access to electricity	90.8% (2021)	91.4% (2021)
7.1.2 Proportion of population with primary reliance on clean fuels and technology	87.6% (2021)	71% (2021)
7.2.1 Renewable energy share in the total final energy consumption	5.1% (2020)	19.1% (2020)
7.b.1 Installed renewable energy-generating capacity in developing countries (in watts per capita)	48.7 watts (2021)	268.1 watts (2021)

SDG 15, with its 12 targets and 14 indicators, is paramount for protecting life on land. There are mixed trends for 2022 in the Arab region, with majority countries showing moderate improvement while some countries show decreasing performance[7].

The Arab region has a much smaller forest area which is depleting at a faster rate compared to the world and lags behind in management of forest area (Table 3), which calls for focused action.

Table 3. Selected SDG 15 targets and comparison of progress in the Arab region as compared to the global average[8]

Target	Arab Region	Global Average
15.1.1 Forest area as proportion of land area	2.8% (2020)	31.2% (2020)
15.2.1 Forest area net change rate	-2 % since 2010 -0.63% (2020)	0.73 % since 2010 -0.12 % (2020)
15.2.1 Proportion of forest area within legally established protected areas	18.1% (2020)	17.8% (2020)
15.2.1 Proportion of forest area with a long-term management plan	33.4% (2020)	58.3% (2020)
15.4.2 Mountain Green Cover Index	29.5% (2020)	73.2% (2020)

Mitigating climate change through the sustainable energy transition and addressing biodiversity loss are interlinked issues, as climate change can have significant impacts on biodiversity and biodiversity loss can exacerbate climate change. Similarly, there are many synergies between the sustainable energy transition and biodiversity conservation as both:

- Promote sustainable development
- Involve several stakeholders and agencies
- Recognize the importance of involving local communities
- Acknowledge the adoption of different approaches to scale up solutions from local to national to regional levels.

RE has several synergies with biodiversity enhancement and growth in RE can contribute to conservation and protection of biodiversity.

- Deployment of RE technologies replaces fossil fuel use and helps mitigate climate change, which is a major threat to biodiversity.
- Power generated from RE eliminates air and water pollution and thus has a lower impact on biodiversity, compared to conventional fossil fuels.
- RE projects can create opportunities for habitat protection and restoration of ecosystem services.
- Solar panels provide shade and when installed over water bodies can reduce evapotranspiration.
- Wind farms and solar installations can be developed on degraded lands, reducing the pressure on pristine natural habitats and avoid the conversion of ecologically sensitive areas for energy infrastructure, thereby supporting the conservation of biodiversity-rich habitats.
- Well planned RE projects which involve local communities and integrate biodiversity considerations into project planning can promote sustainable development, while minimizing negative impacts on ecosystems.

Therefore, an integrated climate mitigation and RE deployment policy where strategies for biodiversity protection are inbuilt into sectoral and cross-sectoral policies, plans, and programs, promises to deliver bigger impacts. Hence, integrated and coordinated actions can lead to more effective and efficient solutions that benefit both people and the planet. While the co-benefits of conventional RE technologies for biodiversity are proven, for example, the creation of new habitats for flora and fauna around wind farms and regeneration of degraded ecosystems, newer forms of RE deployment are even more promising.

Box 1. Case study on offshore wind farm

Application: Use of GIS mapping for identifying offshore wind farms sites which do not impinge on marine protected areas. (Full study: Link)

Location: Offshore Abu Dhabi Emirate, United Arab Emirates

Conflict resolution: Offshore wind farm, marine biodiversity

Brief Description: The study assessed the viability of establishing offshore wind farms by using Geographic Information Systems (GIS) procedures and algorithms. A set of suitability criteria which included environmental parameters listed by the Environmental Agency of Abu Dhabi (EAD), including, bird conservation sites, environmentally protected areas, and seabed topography, was used for excluding areas for potential offshore windfarm sites. GIS layers were created, and a weighted overlay GIS model based on the criteria was built to identify suitable sites for new offshore wind energy farm.

Results showed that most of Abu Dhabi's offshore areas were unsuitable. The presence of restricted zones such as marine protected areas represented the bulk of the constrained offshore areas, followed by offshore oil and gas extraction platforms. However, there were many suitable sites, especially around Delma Island, North of Jabal Barakah, and areas close to the western region shoreline which extended more than 50 kilometres which could serve as potential sites for windfarm plantation.

Sea grass/macro-algae beds which act as a nursery and feeding grounds for many marine species were found to be distributed in zones that were unsuitable for wind energy, while coral reefs were located away from potential areas identified for wind farms. Therefore, these marine ecological systems were not expected to be disturbed by offshore wind farms.

Agrovoltaics – which implies co-developing the same land area for both solar PV and agriculture – can have several benefits including habitat restoration, higher electricity production, water conservation, improved animal welfare, increased food production, higher carbon uptake among plants, local economic development opportunities and boosting public support for ground-mounted solar farms while avoiding conflicts[9]. This approach has been tested in Jordan.

On the other hand, floating solar installations avoid biodiversity impacts on land and reduce productive land use conflicts. Floating PV may reduce algae blooms, which can have negative impacts on water quality and fisheries. Lower algae growth reduces the likelihood of developing toxic species and release of their toxins[10]. Offshore wind farms also help to create de-facto marine protected areas which allow these zones to recover from the impact of industrial fishing[11].

To demonstrate the best practices and the process for planning RE deployment while promoting minimal impact on biodiversity, a case study on offshore wind farms has been summarized in box 1. Further details on the methodology, guidelines and results can be obtained from the links provided in the full study.

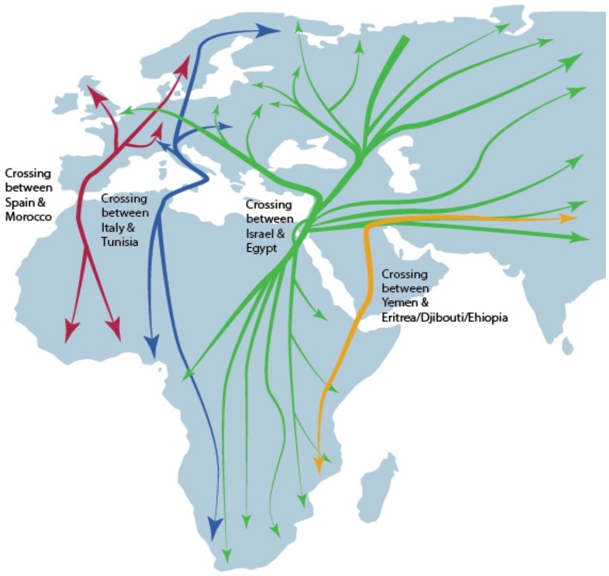
D. Major Challenges

RE systems also have trade-offs due to their potential impacts on biodiversity. Many of the trade-offs are not inherent to RE alone but arise from poor planning, site selection, and implementation. It is possible to minimize the trade-offs and ensure integration of RE deployment and biodiversity conservation by assessing potential impacts, incorporating biodiversity considerations into project design, and implementing mitigation measures.

The trade-offs can be categorized into land and biodiversity habitat loss from deployment of energy infrastructure including installation of electricity transmission lines, raw materials extraction for RE technologies and waste disposal from manufacturing and recycling RE components, vis-à-vis their impacts on ecosystems.

RE deployment has impacts on biodiversity across its whole lifecycle: from the manufacturing of solar panels to the operation of hydroelectric power plants, to the eventual decommissioning of wind turbines[12]. Studies have identified the risk of mortality of endangered bird species from wind farms; ingress of solar and wind farms[13] into protected areas (PAs), key biodiversity areas (KBAs) and earth's remaining wilderness[14]; and the increasing threat of overlap of PAs with mining sites which mine critical minerals for clean energy technologies[15].

Fig. 1. Map of Bird Migration Routes through the Arab Region[16]



For example, the Arab region, located at the juncture of three continents, Europe, Asia and Africa, is the only overland bridge and acts as a giant natural funnel and a "bottle neck" for the migration of birds. More than 500 million birds pass over the region twice a year, in the autumn and spring migration.

There are several important bird migration routes as shown in Figure 1 and deployment of wind farms in the vicinity of these routes can pose a serious hazard to bird life and the patterns of migration. This may lead to a trade-off between objectives of higher deployment of RE and biodiversity conservation.

Studies show that RE installations have very different biodiversity impacts and the extent of risks is highly dependent on the type of RE, the geographical region, and project implementation[17]. A recent study used ecological foot printing to evaluate the potential trade-offs between biodiversity and land required for different energy sources including solar PV, concentrated solar power, wind, hydropower, and biomass. It concluded that, while for most of the world regions, overlap between renewables and biodiversity was either lower than or as expected, there is higher than expected overlap between solar expansion and biodiversity areas in the Middle East region[18].

Another concern is the environmental impact of the disposal of components used in RE technologies during their decommissioning and their recycling/up-cycling (e.g., solar PV panels, lithium-ion batteries, wind turbine blades). Improper handling of materials during recycling can harm biodiversity. For example, solar panels contain lead, cadmium, and other toxic chemicals that can leach into the soil and water. Improper disposal in landfills can also disrupt ecosystems and lead to habitat destruction. Recycling lithium-ion batteries can release toxic chemicals into the air and water if done in an uncontrolled environment and can expose wildlife to toxic chemicals. To minimize these impacts, regulations and standards for sustainable disposal and recycling of RE technologies must be implemented strictly.

One of the complex biodiversity conservation challenges is to integrate consideration of sustainable use of biological resources into national decision-making. Considering the trade-offs involved in scaling up RE infrastructure and protection of biodiversity, a practical approach must be adopted. Since biodiversity protection must be mainstreamed across all sectors of the national economy and policy-making framework, a mapping exercise exploring all the challenges and enablers for RE, biodiversity and their interlinkages must be initiated. While conflicts between RE infrastructure development and biodiversity protection may occur in certain areas, such conflicts can be minimized if appropriate policy and regulatory controls are implemented.

Guidelines for RE project developers to mitigate biodiversity impacts

Standards for RE development and ensuring that RE projects are designed and implemented in a way that is compatible with biodiversity conservation can be useful. Inclusion of biodiversity protection guidelines can help ensure that RE sites promote the conservation of ecosystems and habitats and minimize the impact on wildlife and biodiversity. Coordinated planning of RE expansion and biodiversity conservation with clear guidelines throughout the project development cycle, could avoid conflicts that compromise objectives at a later stage.

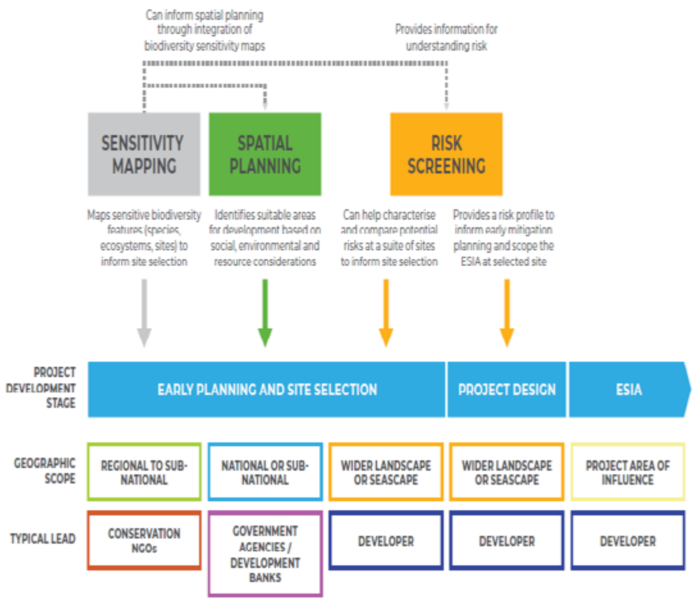
The International Union for Conservation of Nature (IUCN) has developed detailed guidelines for solar and wind developers to effectively manage risks and improve the overall outcomes related to ecosystem services[19]. These guidelines offer practical steps which can be applied across the whole project development cycle, from early planning to decommissioning, using a mitigation hierarchy. Early project planning measures include spatial planning and strategic environmental assessment; sensitivity mapping; risk screening; and environmental and social impact assessment (ESIA). Mitigation measures include avoidance and minimization during project design, construction, operation, and end of life phase. The main considerations for project developers have been summarized below.

Early project planning and site selection

Careful siting and project planning can avoid and minimize biodiversity impacts. Wind and solar projects can maintain, restore, and even generate positive biodiversity impacts, but it may be difficult to mitigate the impacts of large-scale hydropower as it is often constrained by geographical location.

Early infrastructure siting and operational planning is the most effective mitigation measure available to RE developers. Project risks can be reduced by avoiding siting of RE projects in areas of high biodiversity, considering impacts to ecosystem services, and only proceeding after obtaining free prior and informed consent of the affected communities.

Fig. 2. Sensitivity mapping, spatial planning and risk screening in RE planning



Site selection can be informed by existing spatial plans. In the absence of specific guidance from policy makers, biodiversity sensitivity maps can help identify sites which should be avoided. Early risk screening can provide an effective tool to compare potential sites. As a part of project design, it also helps to identify early mitigation options at the selected site. Environmental and Social Impacts Assessment (ESIA) is important to avoid undermining biodiversity conservation goal (Figure 2).

RE development within protected areas

Large-scale RE inside protected areas should in all circumstances be considered a 'no go'. Intermediate scale RE serving local needs should be approved subject to demonstration of effective mitigation of impacts, and a comprehensive monitoring and evaluation plan. Small and micro-scale sites, serving local needs should be assessed on a case-by-case basis through rigorous ESIA, and consideration of alternate sites. Micro-scale solar PV installations to meet the energy needs such as powering electric fencing, water pumps etc. may be acceptable inside protected areas. In all cases, developers must work closely with national, local and other relevant authorities to assess the legality and feasibility of operating within or close to a protected area.

Working with stakeholders and indigenous peoples

A structured approach to engage with identified stakeholders including indigenous people, is vital to identify and effectively manage biodiversity risks. Communication and effective engagement should continue throughout the project lifecycle. Early disclosure and regular reporting help stakeholders understand the RE project risks and jointly enables appropriate solutions.

E. Opportunities for Action

Integrated Policies

Governments need to rachet up their national ambition on RE deployment and biodiversity conservation by ensuring that all necessary resources are mobilized, while simultaneously strengthening enabling environments. Scaling up of a range of transitions in the domain of land and forests, freshwater, oceans, agriculture, food systems and infrastructure by making use of biodiversity through 'nature-based solutions' is also required in every aspect of people's interface with nature[20].

Biodiversity protection must be mainstreamed across all sectors of the national economy and policy-making framework and should be explicitly factored into integrated government policies, including those for RE deployment. It is imperative to fully integrate biodiversity considerations in Environmental and Social Impact Assessments (ESIA) while undertaking strategic RE planning such that RE development enhances biodiversity protection.

Formulation of a clear strategic orientation and policy guidelines for the RE sector will also result in reducing the need for costly mitigation efforts in the later stages. It is also important to address biodiversity protection challenges in future planning and integrate these objectives into RE planning at the national, sub-national and local levels.

National Action Plans

International agreements, such as the CBD, promote focused action and timely planning for protecting biodiversity. In accordance with Article 6 of the CBD, Arab countries have developed National Biodiversity Strategies and Action Plans (NBSAPs) and links to these plans for selected countries are provided in Table 4.

Table 4. NBSAPs of selected Arab countries

Country	NBSAP
Algeria	The National Biodiversity Strategy and Action Plan (2016-2030)
Bahrain	The National Biodiversity Strategy and Action Plan
Egypt	Egyptian biodiversity strategy and action plan (2015 – 2030)
Iraq	Iraq's National Biodiversity Strategy and Action Plan (2015-2020)
Jordan	The national biodiversity strategy and action plan 2015 - 2020
UAE	National Biodiversity Strategy and Action Plan (2014-2021)

Subsequent to COP15 (15th meeting of the Conference of the Parties to the CBD), revised and updated NBSAPs, including national targets, aligned with the Kunming-Montreal Global Biodiversity Framework are to be submitted by all countries by COP16[21].

Updated national plans with mechanisms for monitoring, reporting, and reviewing could include different measures which are compatible with increased RE deployment. This will enhance the integrity of actions and the credibility of countries. Other policy instruments for enhancing biodiversity can also be examined to support these plans[22].

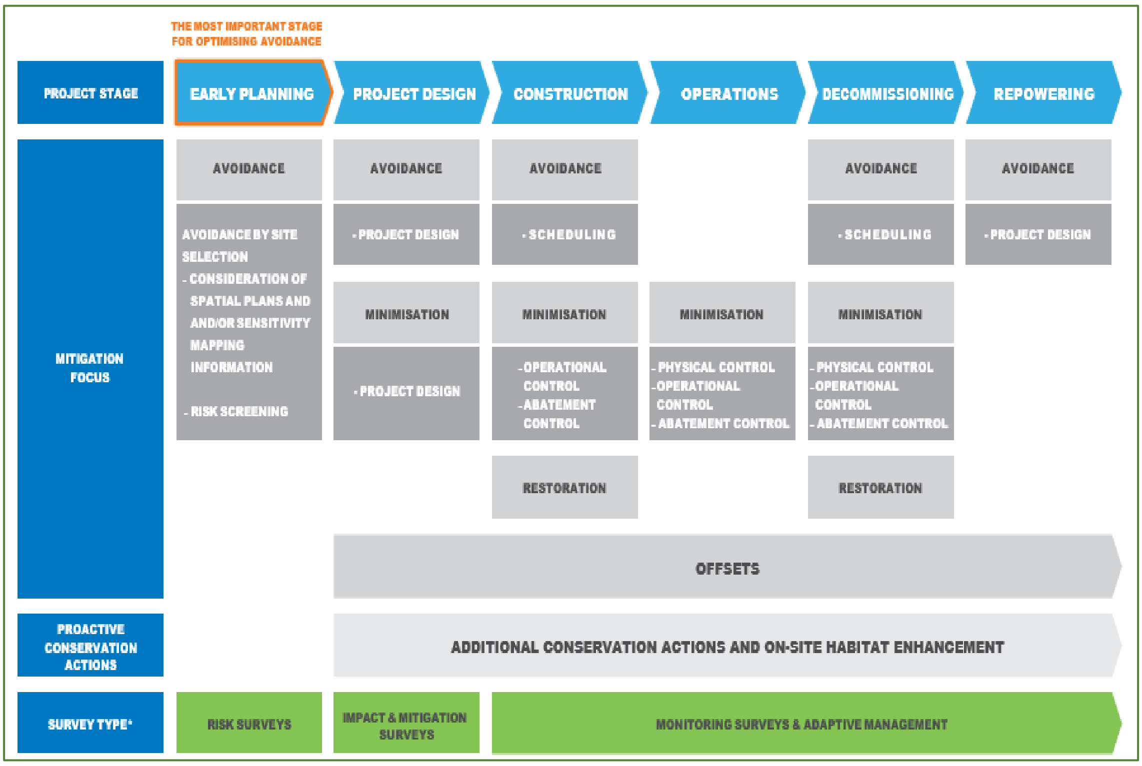
Adopting a mitigation hierarchy

The mitigation hierarchy provides RE developers with a logical framework to address biodiversity impacts. The four sequential actions are Avoidance, Minimization, Restoration and Offsets, of which the first two prevent or reduce impacts, while the latter remediate impacts.

Implementing the mitigation hierarchy is an iterative process involving feedback and adaptive management. As shown in Figure 3, measures to minimize impacts can be applied throughout the project cycle, from early planning, project design, construction, operations, decommissioning and repowering. Effective avoidance can occur through site selection, project design and scheduling which ensures that the timing of project activities is favorable for biodiversity.

Restoration measures aim to repair specific ecosystem services damaged by project impacts that could not be completely avoided or minimized. It is typically undertaken either during construction (to address impacts from temporary facilities such as laydown areas or roads), or towards the end of a project as part of decommissioning and/or repowering.

Fig. 3. Application of mitigation hierarchy at different project stages with relevant mitigation components.



Offsets are measures taken to compensate for significant adverse residual impacts that cannot be avoided, minimized, or restored. Offsets should only be considered as a last resort to address residual impacts on biodiversity, and only after all avoidance, minimization and restoration options have been exhausted. Some project activities and their potential impacts are shown in Table 5.

Table 5. Activities and their potential impacts.

Activities	Potential impacts
Poor siting of projects, access roads, powerlines	Loss of natural habitat, habitat fragmentation, barriers for wildlife movement
Water demand for cleaning solar plants	Strain on local water resources, ecological change
Poorly designed electricity transmission lines	Higher fatality rates due to electrocution
Land based wind turbines	Higher collision risk for bats and birds
Offshore wind turbine installation	High noise during construction impacting marine life. Higher risk of collision of marine mammals with vessels. Habitat alteration can affect seafloor species.

Table 6 shows the mitigation hierarchy and approaches to minimize biodiversity impacts during different project phases for installing RE.

Table 6. Mitigation hierarchy (in italics) and approaches to minimize biodiversity impacts during different project phases

Phase: Project Design

Avoidance and minimisation:

- Micro-siting: changing the layout to avoid sensitive areas
- Re-routing, marking or burying powerlines to avoid collision risks
- Changing the timing of survey activities during site characterisation to avoid sensitive periods (henceforth referred to as Scheduling)

Selecting or designing project components to avoid or reduce impacts

Phase: Construction

Avoidance and minimisation:

- Scheduling activities
- Abatement controls to reduce emissions and pollutants (noise, erosion, waste) created during construction Operational controls: exclusion fencing around sensitive areas, designated machinery and lay-down areas, controlling construction vehicle movements, reduced lighting

- Minimise noise impacts by implementing strict construction protocols that include acoustic monitoring, soft starts and acoustic deterrent devices during offshore activities
- Construction of safe distribution lines that include insulation and spacing of conductors

Restoration and rehabilitation:

- Revegetation of temporary use areas, using topsoil and indigenous plants from the site (on land)
- Restoring coastal intertidal habitats disturbed during export cable installation (offshore)

Phase: Operational

Minimisation:

Physical controls

- Modifications to technology, implementing dry or hybrid cooling systems, acoustic deterrents for wind turbines
- shutdown of wind turbines during specific times
- installation of bird flight diverters on transmission lines

Abatement controls –

- Restricting vehicle and vessel movements when sensitive species are present

Phase: End-of-life

Avoidance and minimisation:

- Scheduling activities
- Abatement controls to reduce emissions and pollutants (e.g., noise, erosion, waste) created during decommissioning
- Operational controls to manage and regulate contractor activity (e.g., exclusion fencing around sensitive areas, designated machinery and lay-down areas, vessel speeds)

Restoration and rehabilitation:

- Reinstatement of original vegetation, as far as feasible, following decommissioning
- Leaving infrastructure in place if there is a biodiversity /ecosystem services benefit such as the reef effect associated with foundation

Application of overarching principles and good mitigation practices

IUCN guidelines recommend the setting of appropriate biodiversity goals prior to the commencement of a project. Full application of the mitigation hierarchy implies a measurable goal of at least "no net loss", but preferably a "net gain" of targeted biodiversity.

For example, International Finance Corporation's (IFC) Performance Standard 6, requires a "no net loss" to natural habitat and a "net gain" for projects operating in areas with critical habitat.

IUCN proposes four overarching principles to facilitate renewable energy expansion, while ensuring that biodiversity and ecosystem service risks are identified, accounted for, and effectively managed. Good mitigation practices for biodiversity protection in RE projects are mentioned along with the respective principles.

1- <u>Consider biodiversity risks at the earliest stage of project planning</u>
   - Conduct strategic-level planning to identify RE development sites in areas of low biodiversity sensitivity
   - Undertake screening for early identification of risks to biodiversity
   - Identify potential project impacts (direct, indirect, cumulative) at ecologically coherent scales

2- <u>Rigorous application of mitigation hierarchy</u>
   - Prioritize prevention over remediation
   - Apply mitigation hierarchy iteratively to minimize residual impacts
   - Create additional biodiversity benefits, through on-site habitat enhancement and other proactive conservation actions (PCAs)

3- <u>Recognize peoples' rights and needs in planning biodiversity mitigation</u>
   - Consider environmental and social issues for enhanced benefit to local communities
   - Livelihoods and well-being of indigenous peoples should not be negatively impacted
   - Projects must result in just outcomes
   - RE projects may need to provide alternative livelihood opportunities or compensation

4- <u>Carry out field surveys to understand risks</u>
   - Field surveys must validate desk-based findings and identify additional risks
   - Conduct comprehensive surveys to assess biodiversity and social risk (including offsets), plan mitigation and monitor the effectiveness of mitigation measures
   - Scoping of field surveys must consider appropriate geographic and temporal scales

To further minimize biodiversity risks, RE project developers should avoid areas of high environmental significance such as PAs and KBAs. Other measures include technological advancements e.g., temporarily shutting down wind turbines to protect birds at particularly active times, or when they are detected in the vicinity by field observers or image-based detection.

Biodiversity offsets, raising local awareness and creating wildflower meadows on private land at solar PV sites, undertaking impact assessment, monitoring studies and evaluation, sustainable sourcing of material, minimizing supply chain impacts, recycling material by recovering and remanufacturing and implementation of circular economy are other best practices, which need to be implemented in a RE project.

Financing

Investments and financing are critical for sustainable business models that protect biodiversity and ecosystem services. There is increased interest from investors, financial institutions, and issuers globally for 'biodiversity financing' and RE projects could be eligible for these investments. Guidance documents such as 'Biodiversity finance reference guide' can help in defining project eligibility criteria and labelling of RE projects that protect, maintain, or enhance biodiversity[23].

Other guidance documents include recommendations on how investors can implement the Kunming Montreal Global Biodiversity Framework[24] and the use of economic instruments for enhancing biodiversity[25].

Endnotes

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