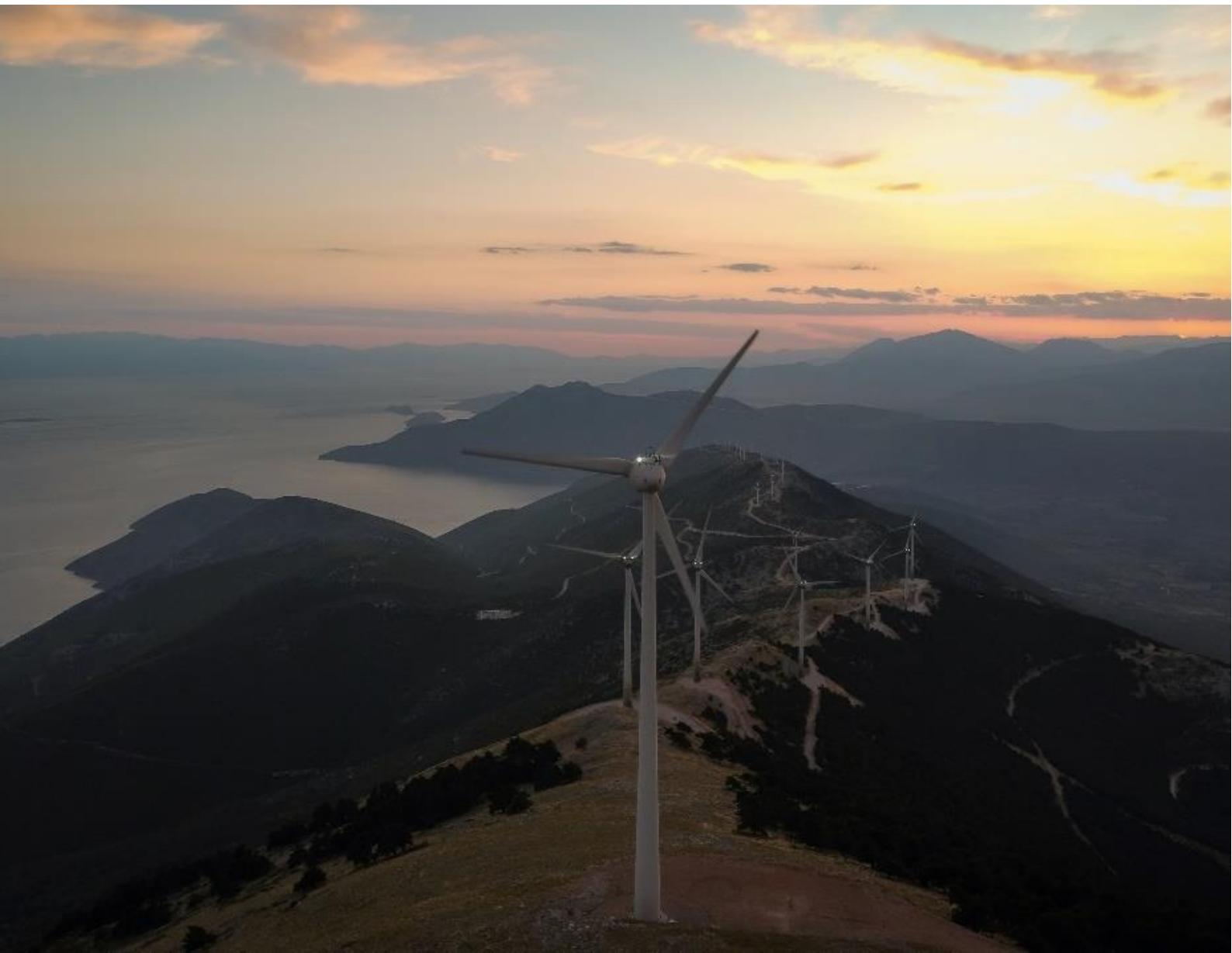
POLICY PAPER

THE MEDITERRANEAN'S WIND ENERGY TRANSITION:
TOWARDS A CONSENSUS BUILDING TO ACHIEVE BOTH CLIMATE NEUTRALITY AND BIODIVERSITY OBJECTIVES



This policy paper has been formulated with the support of the EU LIFE Programme (Operating Grant of MIO-ECSDE for 2021). The content only reflects the authors' views. The Climate, Infrastructure and Environment Executive Agency (CINEA) it not responsible for any use that may be made of the information it contains.

This document may be cited as follows:

MIO-ECSDE (2022). The Mediterranean's Wind Energy Transition: towards a consensus building to achieve both climate neutrality and biodiversity objectives, Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE), Athens.

Cover photo credits: Unsplash, Dimitris Pallas

Contents

Preamble

Curbing climate change and reversing biodiversity decline are two of the greatest challenges modern societies face, and both are closely linked to the future energy system scenarios. Protected areas[1] are the cornerstones of biodiversity protection and management, as well as for the preservation of ecosystem services such as climate regulation. In parallel, transitioning from fossil fuels to renewable energy sources (RES) can substantially mitigate climate change impacts, while it is increasingly considered as the safest pathway to decarbonization. However, meeting climate goals without incurring biodiversity loss connected to reduction of critical terrestrial and marine spaces is pinpointed as one of the key global challenges and may entail both opportunities and risks for the policy response.

The Mediterranean region is known for its significantly high potential for RES and development of renewable energy installation projects (such as wind farms, hydropower and photovoltaic power plants), albeit with considerable differences between the northern and the southern shores. Of all the RES, **the present paper focuses on wind energy, one of the most developed renewable energy types, both at global and regional level, yet also controversial, regarding its impact on biodiversity and specifically on avifauna**. The complex geomorphology of the region, comprising of small-scale systems with varying landscape features, is different from other parts of Europe and the world and hosts a high level of biodiversity and endemism. To avoid irreversible cost to nature, society and economic sectors, careful planning and managing of a truly sustainable and just wind energy transition is imperative.

As Mediterranean countries move towards expanding wind farms over larger areas, conservation actions should at the same time claim larger tracts of land and ocean in order for nations to fulfill the 30% coverage target of the post-2020 Global Biodiversity Framework. In fact, the number of renewable energy installation projects that are in and around protected areas and natural and cultural heritage sites of the region, is currently rising, placing a threat for biodiversity that we need to abate. Consequently, the *"green vs green"* dilemma, i.e., on the one hand maintaining biodiversity, or restoring it, and achieving climate goals on the other, poses considerable challenges for the conservation, management and maintenance of these biotopes, as well as their aesthetic and fiscal value. At the same time, communities are still largely excluded from real participation in both planning and ownership, resulting in very high level of opposition to the permitting processes as they are implemented in the majority of RES projects. It demands coordinated and integrated approaches including examination and balancing of a series of technical, economic, environmental and social dimensions, while accounting for other competing renewables at the same time.

Political and economic developments are shaping the context of energy and climate cooperation in the Mediterranean, notably the European Green Deal, which has a strong external dimension and is expected to significantly impact the southern shore of the Mediterranean as well. In order to achieve the commonly agreed UN 2030 Agenda for Sustainable Development, Mediterranean countries will need to significantly scale up the installed capacity of renewables (mainly wind and solar) and safeguard endangered biodiversity. This will entail significant changes in land use as well as an increased need of materials to manufacture the turbines and other assets needed for the transition, most of them found outside Europe or the Mediterranean.

With this Policy Paper, MIO-ECSDE intends to frame how the transition to wind energy and nature conservation can be addressed "wisely" and in a participatory way, in pursuit of finding the maximum consensus for sustainable solutions. MIO-ECSDE aims to assist its members and the other networks of stakeholders it facilitates (Members of Parliament, Journalists, Educators) in their advocacy, policy formulation, awareness raising and implementation efforts at regional, national and local levels. The document concludes with some recommendations to ensure that the aggregated effects of wind energy development are sufficiently considered, so as not to negatively impact ecosystems, or disrupt the components of a just and equitable energy transition.

[1] This paper mainly focuses on onshore renewable wind energy in ecologically sensitive, valuable habitats and areas under protection (e.g., schemes such as Biosphere Reserves, Ramsar sites, other effective area-based conservation measures (OECMs), Natura 2000 network, etc.). However, the main messages outlined also apply to offshore renewable wind energy and Marine Protected Areas (MPAs). In addition, we primarily refer to protected areas as defined by the IUCN (2008): *"A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values."*

The present policy paper has been drafted during a period when Europe is facing a complex cluster of multiple energy/power/geostrategic crises which is accelerating a reckoning over gas — and foreshadowing what other parts of the world will face as they make their energy transitions. In July 2022, the European Commission welcomed the result on the Complementary Delegated Act to the EU Taxonomy which would see nuclear power and certain fossil gas eligible for sustainable finance to facilitate the transition towards a renewable based future. This decision may jeopardize the EU's aim to reach climate neutrality by 2050 and will be particularly significant for gas-rich Mediterranean countries that have not fully exploited their deposits till now.

Furthermore, the recent war in Ukraine has brought to the forefront Europe's massive dependency on Russian fossil fuel imports as highlighted by the recently announced REPowerEU plan. The direct and indirect impacts of this war on energy systems and security within and outside the EU, the Mediterranean and beyond, may strongly affect and differentiate energy policies and planning with immediate, medium or long-term priorities on climate change policies and relevant investments. We observe parallel mobilization for speeding-up exploitation of gas from offshore Mediterranean deposits, exploitation of new transfer pipelines and electric power lines as well as fast-tracking of RES projects with nature protection aspects apparently neglected in the process. The urgency for "transition" solutions (i.e. natural gas and its role as a transition fuel in decarbonization) should not disorient the EU and global priorities from moving fast towards more clean, safe and equitable energy sources.

1. The Mediterranean Climate-Biodiversity Nexus

1.1 The Mediterranean: a biodiversity hotspot under change

The Mediterranean basin's semi-enclosed nature, temperate climate, exceptional variety of natural ecosystems and landscapes, as well as its unparalleled cultural heritage, make it a place where the effects of the climatic and biodiversity crises are already important and visible. It is a biodiversity hotspot, holding the highest rate of endemism at a global level (20-30% of species are endemic) (UNEP/MAP and Plan Bleu 2020) and it is characterized as a climate change vulnerability hotspot, warming 20% faster than the global average (MedECC 2020).

As the Mediterranean is more subject to global warming, the region needs renewable energy supply for both environmental and long-term socio-economic reasons. Without policy change and governance mechanisms to ensure continuous progress, the Mediterranean region will be 2.2°C warmer by 2040 than it is today, with severe consequences to its biodiversity, according to the First Mediterranean Assessment Report (MAR1).

There are **5 major ways** in which climate change and biodiversity issues are interlinked:

1. Climate change is one of the main drivers of biodiversity loss.
2. Biodiversity and natural ecosystems are essential to climate change mitigation and adaptation.
3. Climate change and biodiversity loss frequently have common root causes.
4. Some climate mitigation solutions can damage biodiversity at an irreversible loss[2].
5. Excessive restrictions that apply concerning installation of RES infrastructures might compromise the ability to timely reach net-zero emissions.

One of the recently released IPCC reports (2022) adds yet another alarm to the ones already raised: climate change is already impacting nature and people more intensely, more frequently and over a wider geographical area than previously thought. A greater surface of land is being burnt by wildfires, while sandstorms are more intense and frequent. Around half of the species studied have shifted their habitats towards the poles or to higher altitudes, while climate change is already undermining our food and water security. All these findings are particularly relevant for the Mediterranean and reinforce the need for the region to prepare for the inevitable impacts of the climate crisis.

1.2 The Mediterranean is gradually embarking on the energy transition path

Together with the dual climate-biodiversity crisis, the region faces significant energy related challenges: an unevenly (between the North and the South) increasing population of over 500 million inhabitants with growing energy demands[3]; intensive industrialization putting pressure on available energy and natural resources; being the world's leading tourism destination, the Mediterranean receives around 30% of international tourists according to the UN World Tourism Organization.

While still negligible until the early 2000s, RE technologies have shown a rapid acceleration of integration in the Mediterranean energy systems, particularly during the last ten years, opening new and promising markets. This picture is a result of profound changes at several levels: enabling policy framework, market transformation, technological innovation, system integration strategies, progressive electrification of the energy system, and financial risk management tools (Antonelli et al. 2021). Today, renewables account for almost 11% of the Mediterranean energy mix, with considerable differences between the north and the south (OME 2021). Although fossil fuels are currently expected to remain the dominant component of the energy mix until 2040, renewables, mainly solar and wind, will become the second most used energy source in the Mediterranean and are expected

[2] Biodiversity and ecosystem services have limited capacity to adapt to increasing global warming levels, which will make climate-resilient development progressively harder to achieve beyond 1.5°C warming.
[3] Current trends will likely lead to a 37% increase in the region's overall energy demand by 2050 (OME 2021).

to triple their contribution until 2040 (around 27%) (OME 2020).

While the northern Mediterranean countries advance in gradually diversifying their energy mix due to the enabling regulatory framework, improving energy efficiency and increasing the fraction of renewable energy sources, the eastern and southern Mediterranean countries (i.e., Algeria, Egypt, Lebanon, Libya, Syria and Tunisia), despite their larger potential for renewable energy, solar in particular, still lag behind in these developments (Bianchi 2020). Stronger financial support, technology transfer, capacity building and awareness raising is required to secure an environmentally safe energy transition under fragile socio-economic conditions.

1.3 Wind Energy

Wind expansion is anticipated to provide one quarter to one third of global electricity demand by 2050 (IRENA and ILO 2021). Wind and solar energy are two of the most cost-efficient, sustainable forms of renewable energy which are less affected by geopolitical crises, requiring less time for project development and together they constitute Mediterranean's safest bet to soon achieve energy independence.

Out of all other renewables, wind energy is globally viewed as the least polluting form (air, water and soil) and has negligible water demand for power generation. It pays back the energy it uses during its life cycle in less than a year and returns 30 to 40 times more energy back to society than it consumes over its lifetime[4]. The considerable cost reductions of wind installations in the last years have resulted in the rapid growth of the sector.

In 2021, new wind installations in Europe amounted to 17.4 GW (14 GW onshore and 3.4 GW offshore) as permitting bottlenecks and global supply chain issues continue to delay the commissioning of new wind farms (WindEurope 2022). While 2021 stands as a record year for installations and employment in the wind energy sector, this is not even half of what the EU should be building (116 GW are expected to be installed over the period from 2022-2026) to be on track to deliver its 2030 Climate and Energy goals.

In 2019, more than 75 GW of cumulative wind power capacity were available in the Mediterranean, or about 11% of total wind capacity at world level. This share is higher than the total average for renewables, thus showing a positive dynamic for this technology in the Mediterranean region compared to other renewable (and also conventional) energy sources. However, the market size for wind is still well below the available potential.

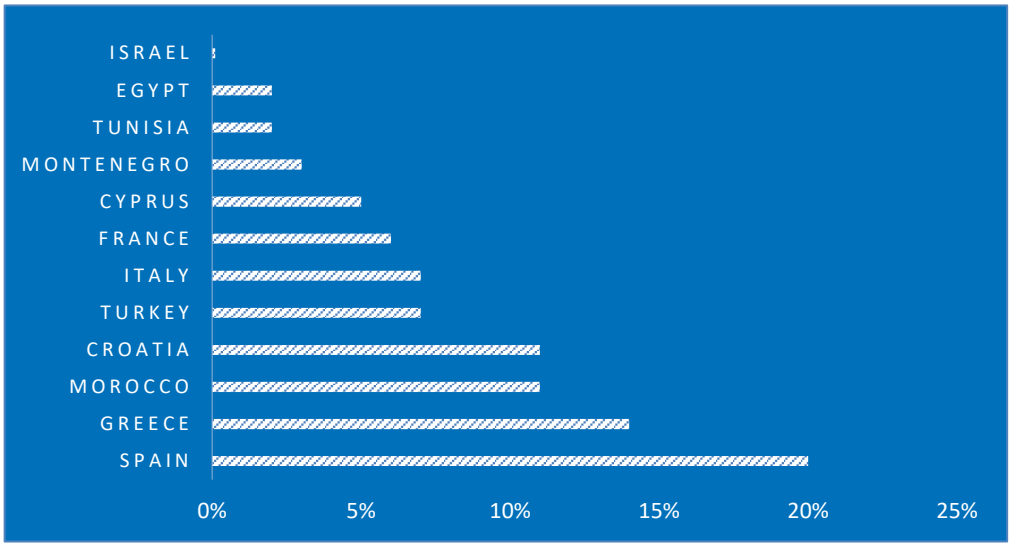


Figure 1. Share of electricity from wind in Mediterranean countries in 2019. Source: BP Statistical Review of World Energy, BP (2019).

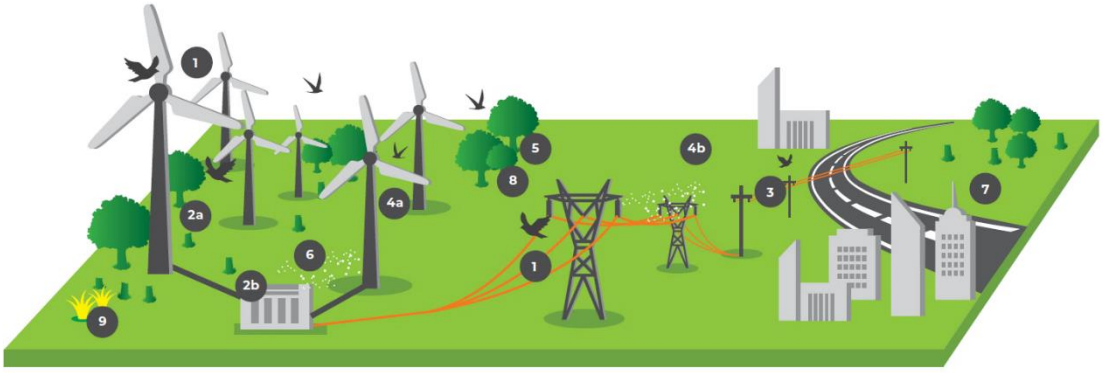
Over the Mediterranean region, larger wind potentials are found in the northwestern part (the Gulf of Lions), the Sahara Desert, the Alboran Sea and the Aegean Sea, as indicated by satellite datasets and regional climate modeling (Rusu and Rusu 2019). In Europe, in general, winds have been declining for several decades, a more general phenomenon called *"global terrestrial wind stilling"* (Vautard et al. 2010). The strength of the wind blowing across northern Europe has fallen by as much as 15% on average in places in 2021. In the Mediterranean region this trend is less clear, with less impact on the amount of electricity that can be generated by the majority of wind farms.

[4] This equals to a 6-12-month energy payback time depending mainly on-site conditions and turbine type (WindEurope 2017).

2. Conflicts between wind energy and biodiversity

There is growing concern of the adverse impacts of windfarms on biodiversity, particularly for avifauna[5] and the many migratory bird routes in the region and the environment of fragile small island ecosystems. Indeed, studies on biodiversity impacts of onshore windfarms have focused mainly on birds and bats (while offshore windfarm impact studies focus on marine mammals) with limited understanding of impacts to other non-flying taxa. Only few examples exist linking the operation of wind farms to direct impacts on terrestrial species. Such impacts are mostly location and species specific (Ferrão da Costa et al. 2018). However, barrier effect, noise, vibration, shadow flicker, electromagnetic field generation, and increased fire risk (due to increased anthropogenic activity) have been identified as potentially important risks to terrestrial species (Lovich & Ennen 2013).

A large concentration of wind farms, in combination with other developments, can increase habitat fragmentation, create barriers for species movement and potentially cause significant cumulative negative impacts to habitats, microhabitats and species populations. Usually, protected areas are isolated from existing energy grids. The associated power generation and transmission infrastructure (access roads, construction and maintenance, etc.) may need to cover large distances to deliver energy to substations. This results in significant pressures to ecosystems. If not carefully managed, such developments can change the supply of, or limit access to, ecosystem services, including provisioning services (such as food and water) as well as cultural (such as a sense of place and belonging) and other non-material benefits. In turn, this can impact the livelihoods and well-being of local people (UNEP 2021).



1. Bird and bat collisions with turbines blades and / or transmission lines, as well as possibly barotrauma
2. Habitat loss through clearance or displacement of land for construction of, (a) wind turbines and (b) associated facilities
3. Bird and bat mortality through electrocution on distribution lines
4. Barrier effects to to animal movement from, (a) closely-spaced turbines, (b) roads, and transmission lines.
5. Trophic cascade effects affect predator-prey dynamics and ecosystem function
6. Pollution (e.g. dust, light, noise and vibration, solid/liquid waste)
7. Indirect impacts from displaced land-uses, induced access or increased economic activity
8. Associated ecosystem service impacts
9. Introduction of invasive alien species

Figure 2. Potential impacts of onshore wind developments on biodiversity and associated ecosystem services. Source: IUCN and TBC (2021).

Another critical issue when assessing the likely significant effects of wind energy developments, is to bear in mind that such effects may arise from the entire project ecological footprint, i.e. not just from the wind turbines themselves but also from associated infrastructure, as well as decommissioning. As reported in IRENA's 2021 "Critical Materials for The Energy Transition" report, keeping the world in a 1.5°C pathway in compliance with the Paris Agreement will inevitably increase the area needed for mining to source the constituent materials that are frequently in sites far outside the protected areas - even outside the Mediterranean or Europe - therefore further impacting the environment. This calls for the enhancement of the circular economy approach and principles in the sector, for efficient recycling systems and material security for mineral resources, and strategic planning to avoid impacts on local biodiversity (Sonter et al. 2020).

Considering the recent growth of the industry and that the identification of likely significant effects is always case-specific, **the real effect of a wind energy development project on protected species and habitats is highly variable, complex and uncertain.** This becomes evident if we consider the heterogeneity of the Mediterranean landscape (high mountains, deserts, rocky beaches, etc.) and climatic conditions compared to low-altitude or less heterogenous ecosystems. Even with existing uncertainties, in particular in the context of innovative technologies

[5] This is also closely linked to long-distance or soaring migratory birds which have long generation times and relatively small populations, thus increasing the potential for population-level effects from any fatalities (Thaxter et al. 2017).

and the efficiency of proposed mitigation measures, experience is growing rapidly, often thanks to an increased monitoring. Nonetheless, despite the accumulating knowledge and expertise of environmental impact assessments, the unclear definition of what constitutes *"significant biodiversity impacts"* for wind energy projects is a crucial drawback in properly addressing the related issues.

It is worth mentioning that there are potential win-wins for renewables and biodiversity, particularly for offshore wind farms, if appropriately sited outside of sensitive areas (Degraer et al. 2020). The ongoing operation of the turbines can provide protection of fish stocks from over-harvesting through exclusion of fisheries and trawler fishing within the wind-farm boundaries or can facilitate the creation of artificial reefs, offering a new habitat for ocean life. For onshore wind farms their potentially positive impact on local vegetation and pollinators remains to be further investigated.

2.1 Land-use change impacts of wind farms

According to the latest Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), land use change has been identified as the top threat for biodiversity decline worldwide, with strong interplay between biodiversity, land use and climate. Although windfarms are less land intensive than other renewables (in terms of power produced per square meter), they still have a substantial land-take footprint, requiring up to ten times more land area than fossil fuel thermal facilities to produce equivalent amounts of energy (UNCCD 2018).

Recent studies indicate that a significant amount of additional land (about 6%) is needed to achieve a climate neutral EU by 2050 (Potrč et al. 2021). Moreover, renewable energy resources of the Mediterranean might turn out to be essential for the more densely populated EU to fulfil its own ambitious emission reduction targets in view of land availability, lower cost of producing wind and solar energy, Not-in-My-Backyard context and limits to electrification which are emerging in the EU (Antonelli et al. 2021). While this is not yet perceived as a pressing issue because the share of renewable energy in the EU energy mix is still relatively modest, it is quite possible that as decarbonisation deepens, ending the EU's dependence on Russian fossil fuels will not have enough available land to install the necessary renewable energy capacity and simultaneously conserve 30% of its land and ocean.

Proactive early land-use planning that meets best practice mitigation hierarchy standards[6] will be imperative to avoid biodiversity loss from wind energy infrastructure expansion in conservation areas. Such planning is particularly important and more difficult in densely populated regions such as Europe, where most overlaps between wind energy facilities and conservation areas occur (Fig. 3) and still remains unclear what the effects of a much more expansive renewable energy development would be. The problem is serious considering that many Mediterranean countries lack strong land-use planning policies, making the conservation assets they present there particularly vulnerable to land-use changes due to industrial activity. This is specially demonstrated in Africa and the Middle-East where studies show that 38% and 33% respectively of the operational renewable energy facilities are located within important conservation areas (Rehbein et al. 2020).

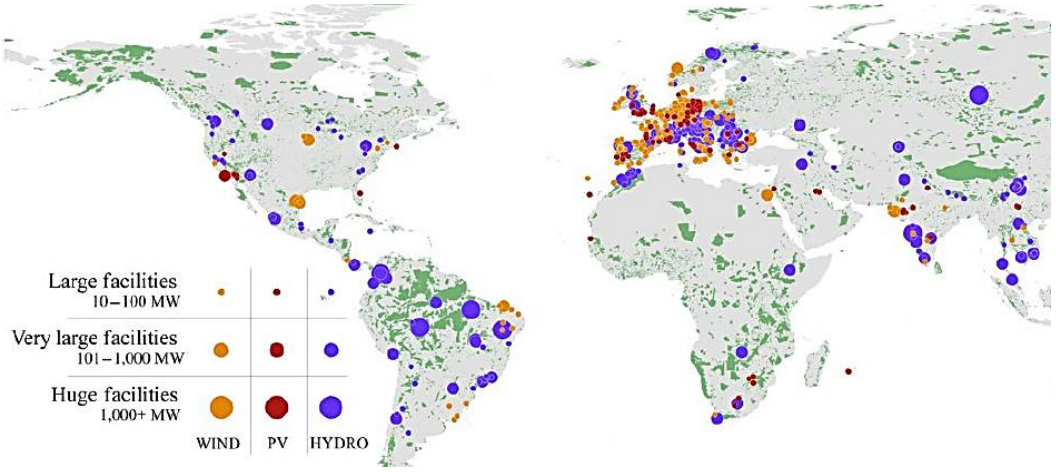


Figure 3. Overlap between operational renewable energy facilities and protected areas. Source: Rehbein et al. (2020).

[6] The mitigation hierarchy (Avoid – Reduce – Compensate - Offset) focuses first on avoiding negative impacts and only then minimising harm, remediating damage and, if these efforts are insufficient, damage at the focal site can be offset through biodiversity improvements in another site.

As the EU tries to break away from using Russian fossil fuels[7] and looks at renewables, it also envisions a hydrogen fuel share in the energy mix of the Mediterranean where natural gas resources exist. However, hydrogen energy is in the early phase of research and advancement demands more tracks of land and ocean for installation of necessary infrastructures and may increase competition with the wind energy community.

3. Renewable Energy policy settings affecting the Mediterranean

3.1 The EU context

The EU has contributed significantly to the worldwide demonstration and commercialization of wind power following the implementation of significant policy support instruments since 2005 (ETC/CME 2020). Wishing to be a world leader in climate neutrality by 2050 with the European Green Deal facilitating the transition towards a sustainable economy, the EU aims to double the share of renewables in the energy mix compared to 2020 so as to reach at least 40% of RES by 2030 under the recently revised Renewable Energy Directive (REDII). This in turn requires significantly higher shares of renewable energy sources[8] in an integrated energy system and wind harnessing is among the key technologies for reaching the capacity increase needed according to the Climate Target Plan (CTP). Meanwhile, in response to Russia's military aggression on Ukraine, EU leaders have finally decided to accelerate the energy transition through the REPowerEU Strategy which will fast-track renewable permits in 'go-to' areas that will be exclusively defined by Member States. Such areas will not require Environmental Impact Assessments neither public participation while their compliance with environmental legislation still remains vague.

Overall, 550,810 wind turbines are expected to be installed in the EU over the next 30 years, which means that 57% of renewable electricity demand is expected to be met by wind energy (Potrč et al. 2021). However, the bold wind energy commitment have not yet assessed the land-take footprint of the forthcoming RES investments, with regards to the milestone of "no net land-take by 2050" nor followed a thorough analysis of its synergies and trade-offs with biodiversity commitments.

New accompanying measures that foster the renewable energy expansion exist within the Energy System Integration, the EU External Energy Strategy, the Biomethane Action Plan, the Hydrogen, the Offshore Renewable Energy, the Biodiversity Strategy, and the latest instalment of the European Green Deal to align a wide range of EU policies with the EU's 55% net emissions reduction target for 2030, 'Fit for 55'. Compliance with such measures will be challenging, since several Member States will struggle to meet the climate neutrality goals to fully decarbonize their economies. Therefore, they may need to rely on neighboring partners and allies. The war in Ukraine has added a series of extra parameters and factors in this difficult equation.

At the same time, the EU Biodiversity Strategy to 2030 commits to expanding the network of effectively managed protected areas to 30% of EU lands and seas and initiates the concept of strict protection within them (target: 10%), as well as new binding nature restoration targets. The new Nature Restoration Law provides that the EU countries restore their nature, but the enforceability of the law remains under discussion[9]. The restoration target must be clear, quantified and set for 2030 so that it truly represents one of the few opportunities to improve the condition of key habitats and increase the amount of carbon sequestered and stored by them.

Policy decisions that depart from the successful conservation and restoration of protected areas would damage the EU's credibility as a global leader on biodiversity policy. According to the European Commission's Evaluation Study to support the Fitness Check of the Birds and Habitats Directives in the EU (Milieu, IEEP and ICF 2016), the energy policy areas that raise the greatest concern with respect to the risks posed to nature and biodiversity, are

[7] According to the latest figures provided by the European Commission in the REPowerEU Communication of 8 March 2022, imports from Russia account for 40% of gas, 46% of coal, 27% of oil used in the EU.
[8] This means that the additional renewables generation capacity installed annually needs to increase from around 30-35 GW to around 45-65 GW per year in the period from 2020 to 2030.
[9] The New Restoration Law was proposed on the 22nd of June after delays by the EC due to food security concerns in the context of the war in Ukraine.

the Trans-European Networks for energy, renewable energy policy (particularly the use of biofuels and the development of wind farms), the extraction of unconventional hydrocarbons such as shale gas and the extraction of coal.

3.2 The situation in the Mediterranean

While the EU pushes ahead with the deployment of RES and wind energy expansion, in the Middle East and North Africa area, despite a ten-fold increase in wind capacities in the past decade, the RES policy penetration and their interconnection with the biodiversity agenda are far below potential. This potential is founded both on physical wind dynamic and geomorphological conditions and on the fact that Mediterranean countries have pledged to address the interlinked climatic and biodiversity challenges in the framework of international agreements. The latter include those under the Convention on Biological Diversity (CBD) and the UNFCCC (United Nations Framework Convention on Climate Change). National Energy Efficiency Action Plans (NEEAP) and Renewable Energy Action Plans (NREAP), as well as published Nationally Determined Contributions (NDCs) under the Paris Agreement show a large potential for RE development in the Mediterranean region.

With the Communication "Renewed partnership with the Southern Neighbourhood - A new Agenda for the Mediterranean" in early 2021, the EU has reiterated that a strengthened Mediterranean partnership remains crucial for the energy transition of both EU and non-EU Mediterranean countries. However, the renewed partnership missed the opportunity to elevate climate change and environmental policies, including biodiversity loss, to the "defining" issue of its relations with the Southern Mediterranean, specifically in the next decade in terms of policy-making. The Green Transition (dealing with climate resilience, energy and the environment) and climate change are only two of the key directions and policy areas in the New Agenda (Antonelli et al. 2021).

Nonetheless, the year 2021 was marked by ambitious political commitments of many Mediterranean countries to step up efforts for a clean energy pathway and tackle the multiple environmental challenges the region faces. Regional cooperation to mainstream biodiversity into national agendas and sectoral policies, while reinforcing the renewable energy development, has found new impetus through the Union for Mediterranean Declarations on Clean Energy Transition and Environment and Climate Action (the "2030GreenerMed" Agenda - Towards 2030: Agenda for a Greener Med "Contributing to Achieving the Environmental SDGs in the Mediterranean will support its implementation), the Antalya Ministerial Declaration adopted at COP22 of the Barcelona Convention, as well as the Athens Declaration on climate change and the environment in the Mediterranean during the 8th Summit of the Southern Countries of the European Union.

Although there is no doubt that significant progress has been achieved, despite the difficulties that the Mediterranean region faces at many levels, policy alignment between North and South of the region as well as between the biodiversity and energy agendas is still lacking.

4. Reflections on securing nature protection while fostering Mediterranean energy independence

In the previous sections, the main potential environmental impacts and the policy context of the wind energy needed to achieve climate neutrality in the Mediterranean have been described**. The message is very clear: it is imperative that fossil fuels are replaced; however, it is undeniable that this transition should be both socially just and not detrimental to habitats and their capacity to act as important carbon sinks, mitigate climate change and effectively support biodiversity.** To effectively achieve the Mediterranean's wind energy optimum while fostering nature conservation objectives, some actions needed to accelerate wind energy deployment in a nature-positive way are discussed in this section.

LOCATION IS KEY TO ENSURE LOW COST TO BIODIVERSITY CONSERVATION

As a first principle, wind energy project development should be avoided within or close to ecologically valuable areas for sensitive species and habitats (e.g., mountainous areas, wetlands, sand dunes and shallow sand banks, bird migration corridors and routes, sensitive breeding areas) and priority should be given to already occupied land with high wind capacity.

In the Mediterranean, multi-objective land-use planning that accounts for biodiversity conservation is still rare in the wind energy sector. **Siting of such infrastructures is often dependent on wind capacity, local legislation, socio-economic constraints and interest of the wind energy sector.** In the process, unfortunately, ecological limits are often neglected by policy provisions. How much wind power is really necessary for the Mediterranean transition to zero emissions and to what extent the transition can be accomplished through RES already in place and through new production located on already occupied lands, are all pending, yet critical questions.

Spatial planning of onshore wind farms in the Mediterranean should take full consideration of existing sensitivity maps and biological knowledge to ensure low cost to local biodiversity. In this, there is a role of the research and conservation community and civil society organisations so that ultimately site selection doesn't interfere with biodiversity conservation objectives.

BIODIVERSITY PROTECTION CONCERNS AND MEASURES SHOULD BE REFLECTED IN ALL MEDITERRANEAN RENEWABLE ENERGY POLICIES, STRATEGIES AND DEVELOPMENT PLANS TO ENSURE CROSS-SECTORAL INTEGRATION

The global and regional policy frameworks of the biodiversity conservation and renewable energy agendas, albeit complementary, are designed and function almost always separately, leaving solutions to be developed by individual nations or *ad hoc*, on a case-by-case basis. At the national policy level, institutional and administrative fragmentation and policy incoherence are often a reality for many Mediterranean countries. Despite effort to avoid conflict with local communities, both agendas often target the same sites and by co-locating without coordinated planning they reduce the effectiveness and momentum of both efforts (Gasparatos et al. 2017; Gibson et al. 2017).

The first-ever collaboration between the intergovernmental science-policy bodies of IPCC and IPBES in 2020[10] to examine the synergies and trade-offs between biodiversity protection and climate change mitigation and adaptation has been a great starting point on facilitating knowledge syntheses that are both RES and biodiversity positive. There is thus a golden opportunity to enable policy provisions that actively seek to reconcile renewable energy expansion and biodiversity conservation goals. However, this requires (i) higher visibility of the renewable energy sector and land-take minimization in the CBD, (ii) a stronger focus on biodiversity conservation in the climate regime, and (iii) a more integrated and coordinated interaction between relevant multilateral

[10] The IPBES-IPCC co-sponsored workshop report on biodiversity and climate change is available here: https://www.ipbes.net/events/ipbes-ipcc-co-sponsored-workshop-report-biodiversity-and-climate-change

environmental agreements to explore potential constraints and synergies (Gasparatos et al. 2021). Having adopted more ambitious renewable energy and biodiversity targets than most of its counterparts, the EU is an important testing-ground for conflicts between energy and biodiversity policies. More specifically, both the European Commission and Member States should step up their efforts and better implement already existing guidance documents on wind energy development within the Natura 2000 network and other protected area schemes (EC 2020). This would help in conciliating the achievement of climate, energy and biodiversity targets at national and EU-level. Good practices can and should be shared with the non-EU Mediterranean countries in implementing their domestic energy and nature conservation policies.

TRANSITION TO RENEWABLE ENERGY MUST BE ACCELERATED IN THE MEDITERRANEAN AT THE LEAST ENVIRONMENTAL COST FOR PROTECTED AREAS

The nature and magnitude of current and future impacts of climate and environmental change in the Mediterranean region, the small scale and transboundary nature of many systems, the need to control the growing demand and security for energy, water, food and ecosystems (WEFE) and the associated vulnerability of people, are imperative to accelerate the energy transition in all countries of this region and enable them to secure a sustainable and inclusive development trajectory. As a whole, nature and biodiversity have been neglected in the stimulus packages post-COVID-19. Where green stimulus measures have been introduced in the Mediterranean, they have largely focused on reducing carbon emissions, with limited focus on preserving and enhancing nature (Danilina 2020) and security of WEFE.

The development of renewable energies in the Mediterranean has benefited from an enabling regulatory framework, particularly in the EU Mediterranean countries boosted by the EU Green Deal. If policies and measures consistent with the European Green Deal and its international dimensions are implemented, fossil fuels in the Mediterranean energy mix will decrease by more than two thirds in 2050, and 2 billion tons of CO_2 emissions will be avoided (OME 2020). Climate change mitigation policies have also pushed forward the implementation of renewable energy programmes in several South and East Mediterranean countries that do not have mineral resources to adopt national renewable energy plans for different time horizons. Strengthening energy efficiency and optimizing renewable power generation and distribution/transfer networks to deliver reliable and continuous supply for the Mediterranean, as renewable energy deployment is taking place, is fundamental to succeed in this energy transition. This will require the integration of a geographically and operationally diverse range of supply sources that are adapted to local specificities and have the minimum environmental cost.

More ambitious climate targets under the UN framework that address biodiversity loss and climate change in a truly integrated way, will give regulatory and financial impetus to the South to promote the wind energy expansion with stronger nature conservation provisions and safeguards.

REINFORCE AN INCLUSIVE AND PARTICIPATORY GOVERNANCE FOR SUSTAINABLE ENERGY DEVELOPMENT

Local communities' perceptions on the impacts of wind farms are usually not discussed and remain poorly studied, particularly in potential conflict hotspots for wind energy development, such as Mediterranean protected areas (Vlami et al. 2020; Scoullos et al. 2021). RE transition of all types remains a rather top-down process, supported by the highest governance institutions. A common source of public opposition to wind developments is the visual impact they can have to the landscape and people. Development of such projects should pay attention to the local community interests with a focus on protecting the environment and livelihoods, preserving culture, as well as enhancing greater social acceptance and effectively address misunderstandings, resistance and even conflicts.

Stakeholder engagement processes, albeit difficult, can guide a developer in identifying biodiversity risks, provide the opportunity for concerns to be raised and local knowledge to be shared. In addition, the economic and operational participation and ownership by citizens or members of a community in a renewable energy project can create local socio-economic value while it allows communities to achieve greater autonomy through direct control over financial and energy resources (IRENA Coalition for Action, 2020). Community–led projects

should be given priority and local financial schemes should be promoted in order to enable easier fundraising in the communities for earmarked wind projects. Civil society organisations are strategic stakeholders in this process by raising citizen support and participation for the energy transition.

AT PRESENT, THE LONG-TERM EFFECTS OF WIND ENERGY DEVELOPMENTS ON ECOSYSTEMS ARE NOT FULLY UNDERSTOOD – MORE RESEARCH AND STANDARDISED APPROACHES ARE NEEDED IN THIS AREA

The recent rapid upscaling of wind development means our understanding of the biodiversity impacts is often lagging. Gaps remain, both across technology types (e.g. wind uptake, grid optimization, manufacturing facility upgrades) and species groups, and for both impacts and the effectiveness of mitigation. Further testing and ongoing data collection are needed to help identify sensitive areas and improve the evidence base for emerging mitigation approaches. While this is an issue that crosses national borders, data sharing between Mediterranean countries and establishing common monitoring systems can inform the well-planned expansion of wind renewables while protecting nature.

The wind industry has contributed to the creation of a significant body of knowledge on wind turbine impacts on wildlife and must continue its efforts to understand, document, disseminate and reduce its impacts on the environment.

Evaluating the potential for biodiversity impacts from wind energy portfolios across multiple scales, ecosystem services, species groups, and jurisdictions, complements local and regional environmental assessments for individual energy projects, and can act as an important filter to inform strategic decisions for land allocation and regional energy policies (Popescu et al. 2020). While many studies have focused on identifying optimal sites of wind energy resources based on physical attributes of their target area and technical specifications of a particular technology, only few attempted to expand the optimization criteria to ecosystem services, economic, or social factors. What is more, advancing technical tools and methods to reduce impacts of already existing wind farms is also important as evidence of fostering the concerns of the local community.

Lastly, mining required to build future renewable energy infrastructure carries additional ecological impact and will pose great challenges on local communities, particularly indigenous people. The circularity of RES infrastructure needs to be further investigated and sufficiently addressed as the energy transition is taking place. To tackle these impacts, making the best use of energy and material efficiency and sufficiency policies to reduce the amount of needed deployment of wind farms to a minimum is fundamental, as is ensuring that the remaining primary materials needed after applying such policies are sourced in a sustainable way.

5. Key Recommendations

MIO-ECSDE strongly supports an acceleration in the deployment of renewable energy production to decarbonize Mediterranean economies by 2040, however stressing that this should come at a minimum cost to protected ecosystems and local communities. This position has been based on literature and policy review, interviews with experts and wide consultation with member organizations and other stakeholders, as well as on the insights of MIO-ECSDE's experience in leading a group of experts on a feasibility study (Scoullos et al. 2021) aiming to examine to what extent the area of Kafireas/South Evia Island, an area of high density of wind turbines in Greece, is suitable and could meet the criteria to be designated as a Biosphere Reserve of the MAB/UNESCO Programme.

The following **key recommendations** should be taken into consideration in our collective efforts to preserve what we have while trying to prevent further damage:

Create clear exclusion zones. Precise and early planning is key in guiding wind energy investments to protect ecologically sensible areas. To facilitate permitting procedures for wind energy projects without harming protected ecosystems and biodiversity, clear "windfarm-free" zones need to be established by the relevant national permitting authorities. Adopting a horizontal rule would mean they would not waste time, effort and money applying for wind turbines in areas protected by nature conservation network, or in roadless and less fragmented areas. Instead of a case-by-case appraisal of applications, as proposed by wind power companies, planning that considers entire ecosystems, and other factors, is better suited to address cumulative impacts which are often underestimated if each wind farm is assessed independently. Apart from strictly protected areas this should include potentially sensitive ones, bird migration routes, corridors connecting protected areas, as well as areas subject to nature restoration measures, and include "no disruption" criteria to ecosystems and biodiversity. Creation of potential investment zones for wind farms may be an option for areas where their deployment has socioeconomic benefit with minimum environmental cost.

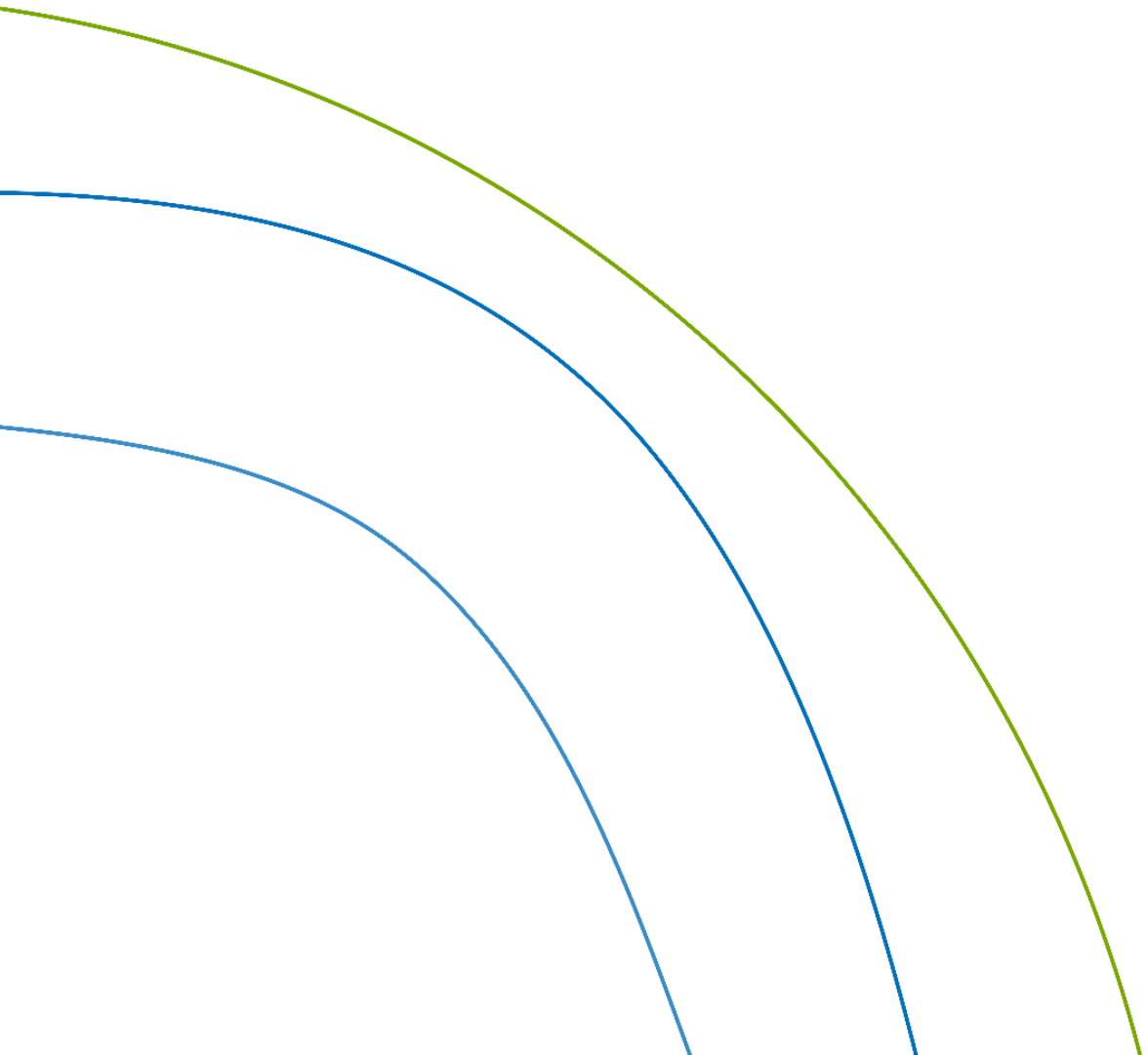
Minimize risks to vulnerable taxa and avifauna during wind project operation. While onshore wind turbines pose a threat mainly to some bird and bat species, collisions that cannot be avoided by careful siting may be reduced by operational adjustments. New mitigation approaches and technological innovations offer opportunities to minimize collision risks and light/noise pollution while operating wind projects. These include increasing visibility of turbine blades, application of acoustic deterrents and procedures to shut down specific turbines based on real-time observations of bird activity using either field observers, image-based detection and radar technology. Such measures are showing promising results but require further testing.

Increase wind turbine material sustainability. Permitting processes must include provisions to ensure that only sustainably sourced materials are used in the construction of new wind power plants and compensate projects that incorporate recycled materials or best end of life practices to improve material efficiency. In addition, the circularity of RES infrastructure needs to be further investigated and sufficiently addressed as the energy transition is taking place. Circular economy measures such as eco-design, right to repair, extended producer responsibility, substitutability, etc. including the massive upscaling of urban mining to recuperate secondary materials would greatly reduce the need for raw material demand and will ensure that the remaining primary materials needed, after applying such policies, are sourced in a sustainable way.

Establish meaningful and early consultation processes with local communities. To do so, local communities should be systematically informed by the sector, starting from the project planning stage, regulatory framework, and the concrete socioeconomic (e.g., enhancement of job creation and regional development) and environmental (e.g., climate change mitigation) returns of the project. Clear, transparent and effective local consultation processes have to be foreseen, budgeted and established at an early stage for local communities affected by wind energy projects with measures for local communities to withhold consent if costs (all types) are too high and ensure that the local communities retain a fair share of the added value generated by the projects.

Foster alignment of climate change and biodiversity policies. Policies that simultaneously address synergies between mitigating biodiversity loss and climate change, while also considering their societal

impacts, offer the opportunity to maximize co-benefits and help achieve the needed transformational change of the economy and society. Current policies are constrained by many factors, including the absence of regional energy market integration. It is needed to identify gaps as well as recognize benefits of coordination and coherence across regional institutions for nature conservation-transition to wind energy to improve understanding of the actions that will address the trade-off between the two issues. Regional policy forums and CSOs could facilitate a greater integration of overlapping climate and biodiversity considerations into relevant domestic plans (NDCs, NBSAPs) and their transparency requirements.



References

Antonelli et al. (2021). Greening the Mediterranean: Pathways for Sustainable Energy and Climate Cooperation, Istituto Affari Internazionali (IAI) Research Studies 6, July.

Arezki, R., Moreno-Dodson, B., Yuting Fan, R., Gansey, R., Nguyen, H., Nguyen, M. C., Mottaghi, L., Tsakas, C., Wood, C. A. (2020). Trading Together: Reviving Middle East and North Africa Regional Integration in the Post-Covid Era, Middle East and North Africa Economic Update, Washington, DC: World Bank, October.

Bianchi, M. (2020). Prospects for Energy Transition in the Mediterranean after COVID-19, IAI Papers, No. 20|18, July.

Danilina, V. (2020). Policy Responses to the Environmental Challenges of COVID-19 in the Southern Mediterranean Region in a Short- and Medium-run Perspective, CMI-FEMISE COVID-19 Med Brief, No 8, November.

Degraer, S., Carey A. D., Coolen J., Hutchison, Z., Kerckhof, F., Rumes, B. Vanaverbeke J. (2020). Offshore wind farm artificial reefs affect ecosystem structure and functioning: A synthesis. Oceanography 33(4):48–57. https://doi.org/10.5670/oceanog.2020.405

Diffendorfer, J. E., Dorning, M.A., Keen, J. R., Kramer, L.A. & Taylor, R. V. (2019). Geographic context affects the landscape change and fragmentation caused by wind energy facilities. PeerJ 2019, e7129. https://doi.org/10.7717/peerj.7129

EC (2020). Guidance document on wind energy developments and EU nature legislation, Brussels, Belgium.

ETC/CME (2020). Eionet Report 3/2020: Trends and projections in the EU ETS in 2020, European Topic Centre on Climate change mitigation and energy, Belgium, December. Available at: https://www.eionet.europa.eu/etcs/etc-cme/products/etc-cme-reports/etc-cme-report-3-2020-trends-and-projections-in-the-eu-ets-in-2020

Fakoussa, D. (2022). The EU Green Deal. A new momentum for democratic governance in the MENA region?, Euromesco Paper, No 48, January. Available at: https://www.euneighbours.eu/en/south/stay-informed/publications/euromesco-policy-paper-eu-green-deal-new-momentum-democratic

Gasparatos, A., Doll, C. N., Esteban, M., Ahmed, A., & Olang, T. A. (2017). Renewable energy and biodiversity: Implications for transitioning to a green economy. Renewable and Sustainable Energy Reviews, 70. https://doi.org/10.1016/j.rser.2016.08.030

Gibson, L., Wilman, E. N., & Laurance, W. F. (2017). How green is 'green' energy? Trends in Ecology & Evolution, 12. https://doi.org/10.1016/j.tree.2017.09.007

IPCC (2022). Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, United Kingdom.

IRENA Coalition for Action (2020). Community Energy Toolkit: Best practices for broadening the ownership of renewables, International Renewable Energy Agency, Abu Dhabi.

IRENA and ILO (2021). Renewable Energy and Jobs – Annual Review 2021, International Renewable Energy Agency, International Labour Organization, Abu Dhabi, Geneva.

Jackson, A. L. (2011). Renewable energy vs biodiversity: Policy conflicts and the future of nature conservation. Global Environmental Change, 21.

Jones, N. F., Pejchar, L. & Kiesecker, J. M. (2015). The Energy Footprint: How Oil, Natural Gas, and Wind Energy Affect Land for Biodiversity and the Flow of Ecosystem Services. BioScience, 65.

Kati, V., Kassara, C., Vrontisi, Z., Moustakas, A. (2021). The biodiversity-wind energy-land use nexus in a global biodiversity hotspot. Science of The Total Environment, 768. https://doi.org/10.1016/j.scitotenv.2020.144471.

MedECC (2020). Climate and Environmental Change in the Mediterranean Basin – Current Situation and Risks for the Future. First Mediterranean Assessment Report [Cramer, W., Guiot, J., Marini, K. (eds.)] Union for the Mediterranean, Plan Bleu, UNEP/MAP, Marseille, France, 632pp.

Milieu, IEEP and ICF (2016). Evaluation Study to support the Fitness Check of the Birds and Habitats Directives. Available at: https://ec.europa.eu/environment/nature/legislation/fitness_check/docs/study_evaluation_support_fitness_check_nature_directives.pdf

OME (2016). The Mediterranean Energy Perspectives to 2040. Observatoire Méditerranéen de l'Energie, Paris.

OME (2020). Renewable energy technology dynamics. Observatoire Méditerranéen de l'Energie, Paris.

OME (2021). The Mediterranean Energy Perspectives to 2050. Observatoire Méditerranéen de l'Energie, Paris.

Potrč, S., Čuček, L., Martin, M., Kravanja, Z. (2021). Sustainable renewable energy supply networks optimization – The gradual transition to a renewable energy system within the European Union by 2050. Renewable and Sustainable Energy Reviews, 146. https://doi.org/10.1016/j.rser.2021.111186.

Popescu, V. D., Munshaw, R. G., Shackelford, N. et al. (2020). Quantifying biodiversity trade-offs in the face of widespread renewable and unconventional energy development. Scientific Reports, 10. https://doi.org/10.1038/s41598-020-64501-7

Rehbein, J. A., Watson, J. E., Lane, J. L., Sonter, L. J., Venter, O., Atkinson, S. C., & Allan, J. R. (2020). Renewable energy development threatens many globally important biodiversity areas. Global change biology, 26. https://doi.org/10.1111/gcb.15067

Rusu, E., & Rusu, L. (2019). Evaluation of the wind power potential in the European nearshore of the Mediterranean Sea. E3S Web Conference, 103.

Scoullos, M., Zogaris S., Scoullos, I., Pappas E. (2021). Feasibility Study for the Establishment of a Biosphere Reserve of the MAB/UNESCO Programme in South Euvoia – First Part: Main Study MIO-ECSDE, Athens.

Sonter, L. J., Dade, M. C., Watson, J. M., & Valenta, R. K. (2020). Renewable energy production will exacerbate mining threats to biodiversity. Nature Communications, 11. https://doi.org/10.1038/s41467-020-17928-5

Thaxter, C. B., Buchanan, G. M., Carr, J., Butchart, S. H., Newbold, T., Green, R. E., Tobias, J. A., Foden, W. B., O'Brien, S. & Pearce-Higgins, J. W. (2017). Bird and bat species' global vulnerability to collision mortality at wind farms revealed through a trait-based assessment. Proceedings of the Royal Society B: Biological Sciences, 284.

United Nations Convention to Combat Desertification (2018). The Global Land Outlook, Chapter 10: Energy and Climate, Germany.

United Nations Environment Programme (2021). Making Peace with Nature: A scientific blueprint to tackle the climate, biodiversity and pollution emergencies, Nairobi. https://www.unep.org/resources/making-peace-nature

United Nations Environment Programme/Mediterranean Action Plan and Plan Bleu (2020). State of the Environment and Development in the Mediterranean, Nairobi. https://planbleu.org/wp-content/uploads/2021/04/SoED_full-report.pdf

Vlami, V., Zogaris, S., Gallou, E., Kokkoris, I. P., Kehayias, G., & Dimopoulos P. (2020). Residents' Views on Landscape and Ecosystem Services during a Wind Farm Proposal in an Island Protected Area. Sustainability, 12. https://doi.org/10.3390/su12062442

Waite, J. L. (2017). Land reuse in support of renewable energy development. Land Use Policy, 66. https://doi.org/10.1016/j.landusepol.2017.04.030

Walston, L. J., Li, Y., Hartmann, H. M., Macknick, J., Hanson, A., Nootenboom, C., Lonsdorf, Eric, Hellmann, J. (2021). Modeling the ecosystem services of native vegetation management practices at solar energy facilities in the Midwestern United States. Ecosystem Services, 47. https://doi.org/10.1016/j.ecoser.2020.101227.

WindEurope (2017). Environmental impact of wind energy – a contribution to the circular economy discussion. Available at: https://windeurope.org/wp-content/uploads/files/policy/topics/sustainability/Circular-Economy-paper-20170418.pdf

WindEurope (2020). Wind Energy and Economic Recovery in Europe. Available at: https://windeurope.org/data-and-analysis/product/wind-energy-and-economic-recovery-in-europe/

WindEurope (2022). Wind Energy in Europe. 2021: Statistics and the outlook for 2022-2026. Available at: https://windeurope.org/intelligence-platform/product/wind-energy-in-europe-2021-statistics-and-the-outlook-

Mediterranean Information Office for Environment, Culture and Sustainable Development (MIO-ECSDE)

Who we are

We are a non-profit Federation of 133 Non-Governmental Organizations (NGOs) working in the fields of environment and development in 28 countries of the Euro-Mediterranean area.

Our mission

To protect the natural environment and cultural heritage and promote Sustainable Development in a peaceful Mediterranean by bringing together the efforts of NGOs, governments, international organisations, other socio-economic partners and networks.

What we do

We act as a technical and political platform furthering synergies and strengthening public participation on resources and waste, nature and biodiversity, cultural diversity, climate change, health and environment as well as on horizontal and cross-cutting issues.

A network of networks

We facilitate the work of four other networks of major Mediterranean stakeholders:

- **MEdIES**, the Mediterranean Education Initiative for Environment and Sustainability
- **COMPSUD**, the Circle of Mediterranean Parliamentarians for Sustainable Development
- **COMJESD**, the Circle of Mediterranean Journalists for Environment and Sustainable Development
- **MedUnNet**, the Mediterranean Universities Network for Education for Sustainable Development

MIO-ECSDE

12 Kyrristou str., 10556, Athens Greece,
T +30210 3247490
www.mio-ecsde.org

Contact

Haris Paliogiannis
Policy Officer, MIO-ECSDE
paliogiannis@mio-ecsde.org