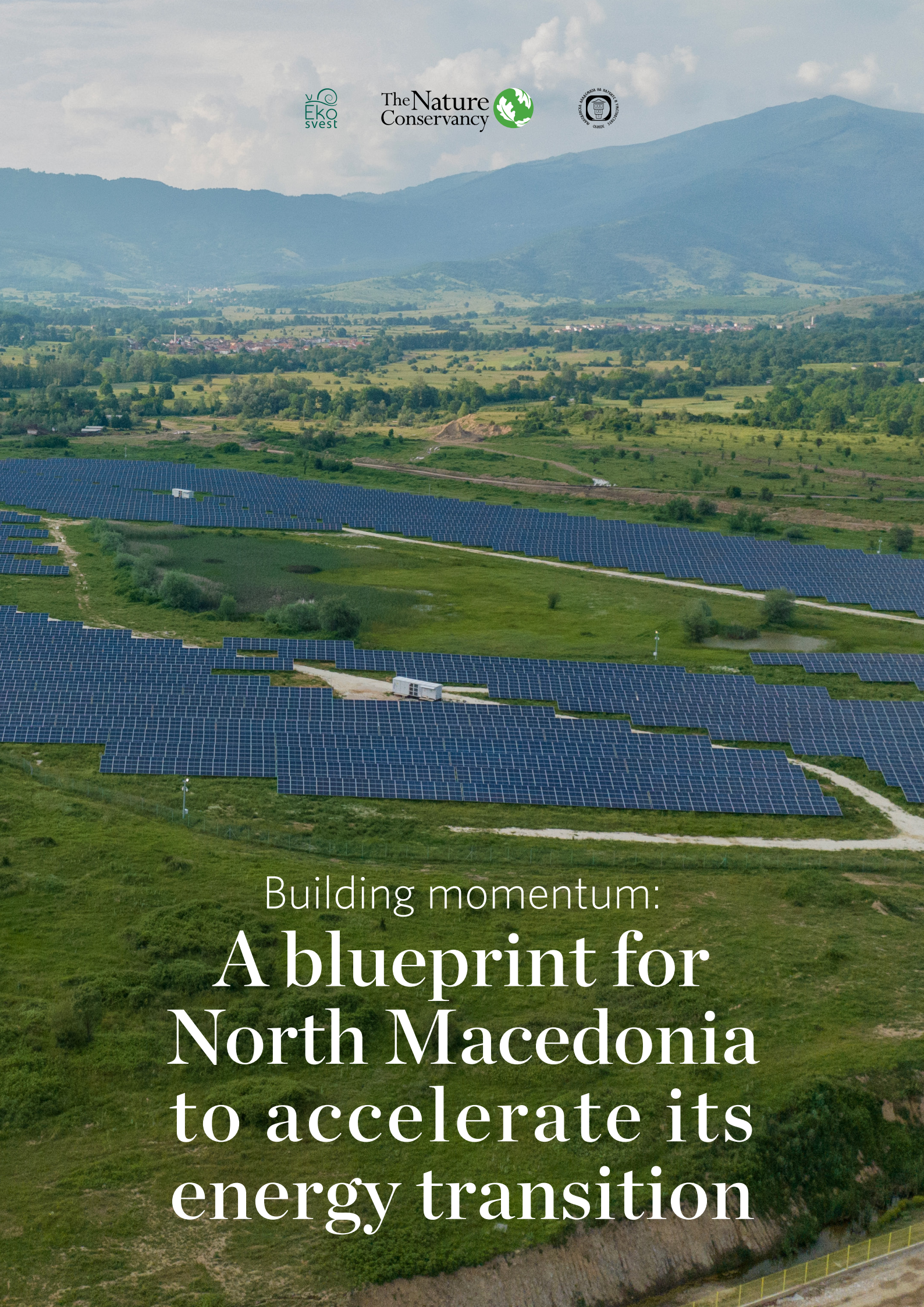

Building momentum:

A blueprint for North Macedonia to accelerate its energy transition

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Introduction

Europe's energy landscape is changing at an unprecedented pace – due not only to the climate crisis, but also disruptions in Europe's energy system as a result of the Russian invasion of Ukraine. Many European countries are now rapidly accelerating their deployment of renewable energy sources (RES) to reduce their carbon footprint and diversify their energy sources, thus increasing their energy security.

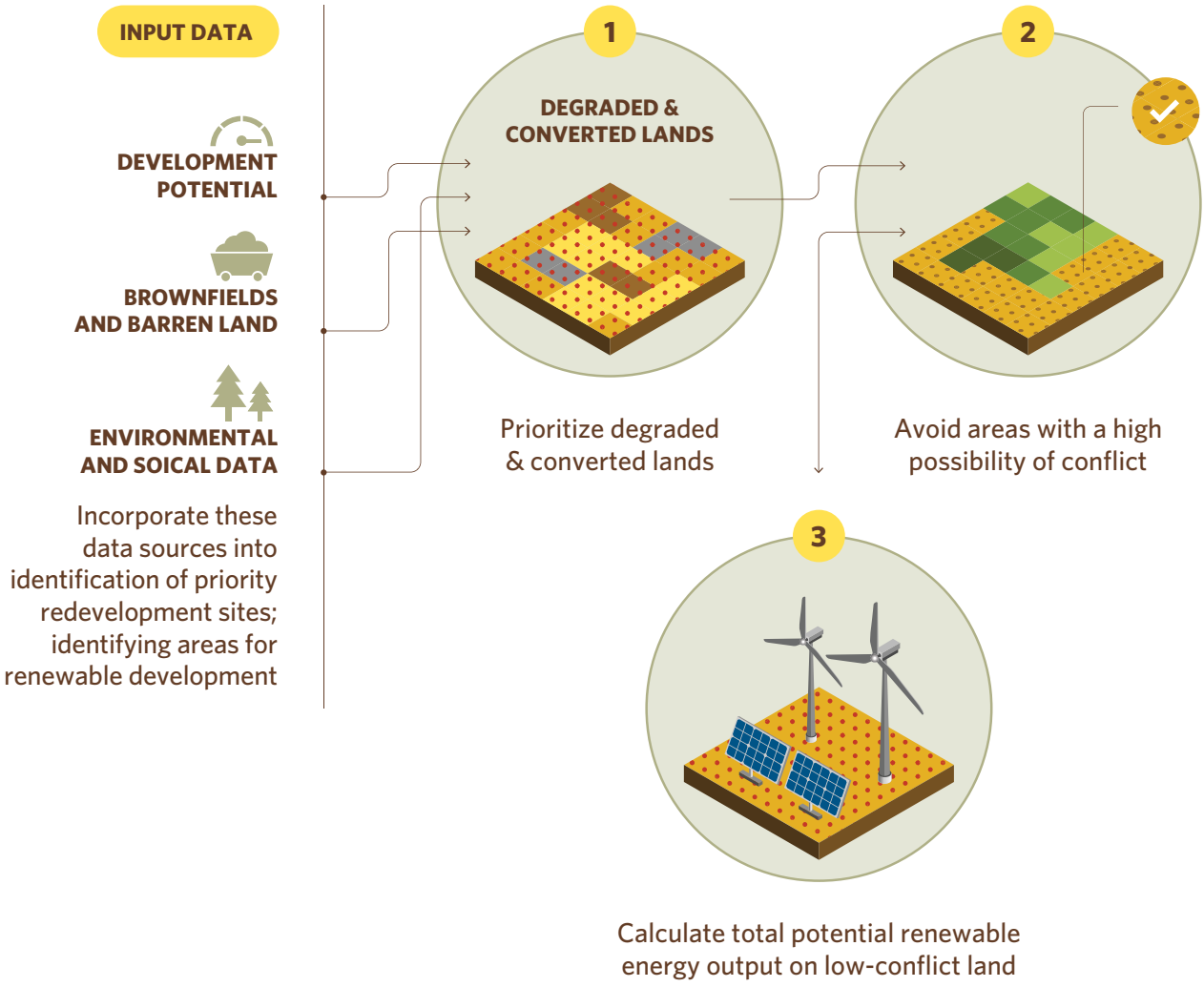
The EU's REPowerEU plan aims to address these issues through a sweeping set of measures, including establishing zones with accelerated permitting: so-called Renewables Acceleration Areas. These areas should align with areas of high energy yield, but also avoid zones of high biodiversity value such as Natura 2000 sites.

As a contracting party to the Energy Community, North Macedonia will soon be required to implement REPowerEU contingent on the transposition of the revised Renewable Energy Directive, as well as increasing the share of renewable energy sources in its gross energy consumption to 38% by 2030[1]. Even though the country has historically been dependent on lignite mining for around 30% and gas imports for an additional 15% of its electricity production, it has nonetheless set more ambitious goals for decarbonization. As part of the Powering Past Coal Alliance, North Macedonia has committed to a coal phase-out by 2027. As a net importer of electricity, accelerating the transition to renewables is not only a matter of energy security for the country, but also an opportunity to create green jobs in former mining regions to ensure no one is left behind.

North Macedonia is already putting these commitments into practice: it was the first Energy Community contracting party to complete a National Energy and Climate Plan (NECP). The Oslomej solar park, built on a former lignite open pit mining site, is already partly operational and will have an installed capacity of 120 MW when fully completed. There are also a series of auctions for solar power investments to ensure more solar PV projects in the pipeline.

This study offers a blueprint for North Macedonia to continue to build on its leadership in the renewable energy space – identifying double the amount of suitable land needed for renewables to meet current electricity demand without unduly impacting nature and communities.

1 https://www.energy-community.org/implementation/package/CEP.html

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Phase 1
Preparing the ground

The Nature Conservancy (TNC) identified North Macedonia as a prime candidate for the implementation of its smart siting approach[2]. The country not only boasts forward-thinking policies, but is also a regional leader in coal mine redevelopment, and is facing an urgent need to bridge its electricity import deficit by rapidly expanding its renewable energy sources. Importantly, North Macedonia also stands out as a biodiversity hotspot and the expansion of renewable energy in the country needs to be executed carefully to ensure its rich biodiversity isn't compromised.

To facilitate this, TNC partnered with the Macedonian Academy of Sciences and Arts and NGO Ekosvest to lay the groundwork for smart siting. Because the science and art of successful renewable siting requires consensus, the research included a public survey as well as three focus groups, which convened 35 stakeholders from regional and municipal government, the agricultural and energy sectors, as well as civil society organizations focused on environment, biodiversity, and poverty alleviation. Feedback from these engagements underscored the importance of integrating low-impact energy siting into spatial planning, engaging local communities in energy projects, preserving habitats, and articulating the overarching benefits of renewable energy. Moreover, there was an emphasis on prioritizing development on degraded land and avoiding high-value agricultural land.[3]

In line with these recommendations, the project aimed to circumvent potential conflicts between energy development and environmental conservation by focusing on degraded and repurposed lands. Owing to North Macedonia's advancements in redeveloping coal mines, the first phase explored the feasibility of placing renewable energy infrastructure on former mine sites, identifying 664 MW of solar PV potential capacity at select sites.[4]

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2 https://www.nature.org/en-us/what-we-do/our-priorities/tackle-climate-change/climate-change-stories/choosing-clean-energy
3 https://ekosvest.com.mk/?project=exploring-pathways-for-low-impact-energy-solutions-in-north-macedonia-2022
4 https://bit.ly/manu-brownfields-report


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Phase 2
Putting barren land to work

In the second phase, based on the stakeholder feedback, the scope of research was expanded to include sparsely vegetated lands, transitional woodland-shrub, and pastures, as well as all mineral extraction sites and industrial areas. Working lands such as forests and high-quality arable land, as well as protected areas and proposed Natura 2000 sites, were treated as constraints and excluded from further consideration together with areas unfeasible to develop due to biophysical factors, such as a steep slope. An advisory board of diverse experts from the government, industry and civil society provided crucial feedback, guidance, and recommendations for data sources.

The land remaining after removing the constraints was overlaid with a wealth of spatial data representing both the potential for development (e.g., distance from electrical grids or solar irradiation) and potential for conflict with natural and social values (e.g., proximity to areas important for biodiversity or settlements). The relative importance of all criteria was assessed using the Analytic Hierarchy Process[5], a robust multi-criteria approach based on expert input, and the results of which were used to assign a normalized grade between 1 and 5 to every piece of land.

Only land with very high grade of over 4.2 was considered in the final results. The resulting map, therefore, highlights both the development potential and conflict potential of the any particular piece of land and prioritizes the selection of land that has strong development potential but is less important from a natural, social, and cultural standpoint.

5 https://www.sciencedirect.com/topics/economics-econometrics-and-finance/ahp-approach


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Results

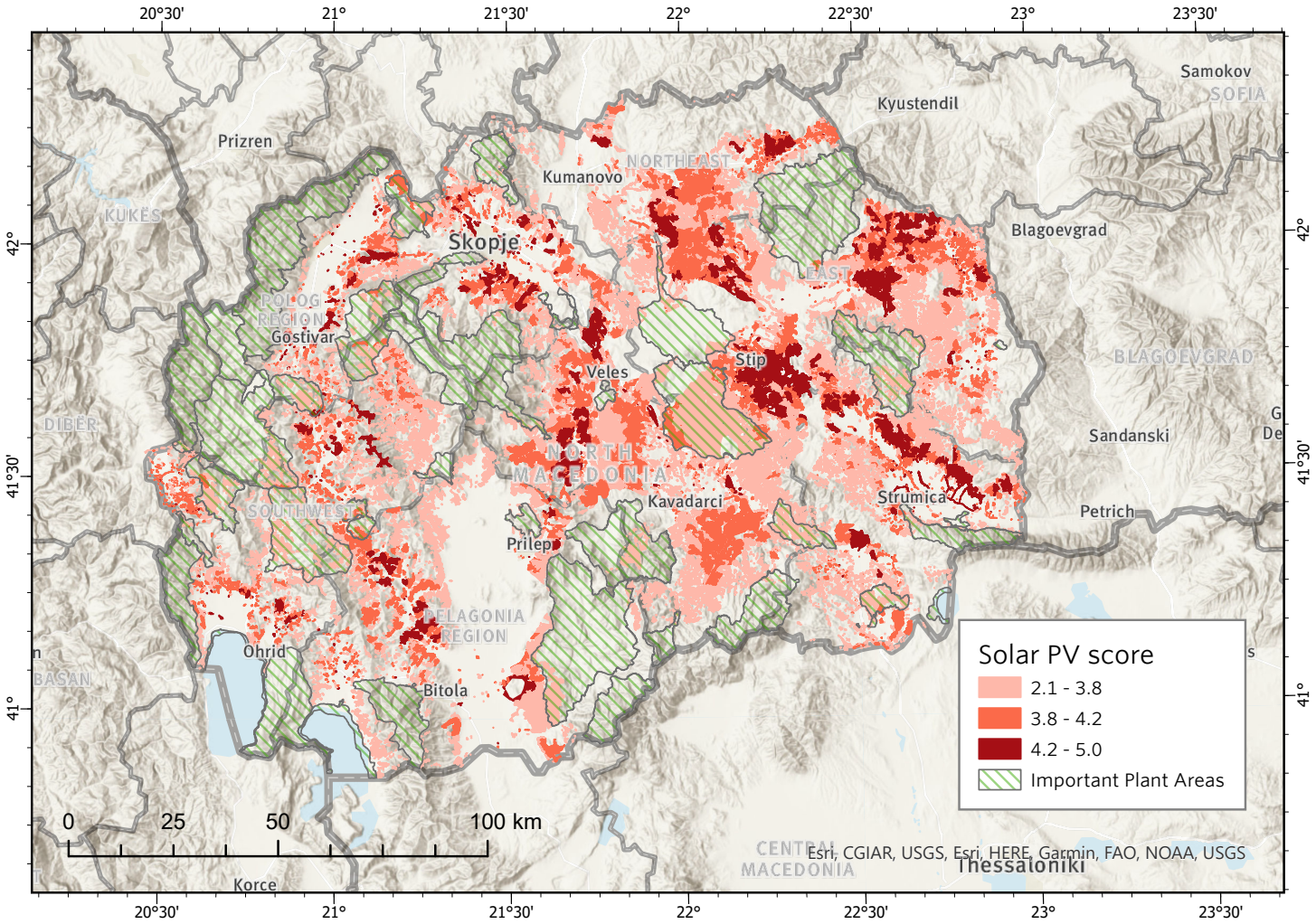


Figure 1:
Potential solar PV locations in North Macedonia with their final score, excluding constraints, in relation to Important Plant Areas (IPA). An estimated 50 GW of solar PV installed capacity could be developed in areas with a score higher than 4.2 outlined in dark red, or 11 GW if considering only areas outside IPA and IBA sites.

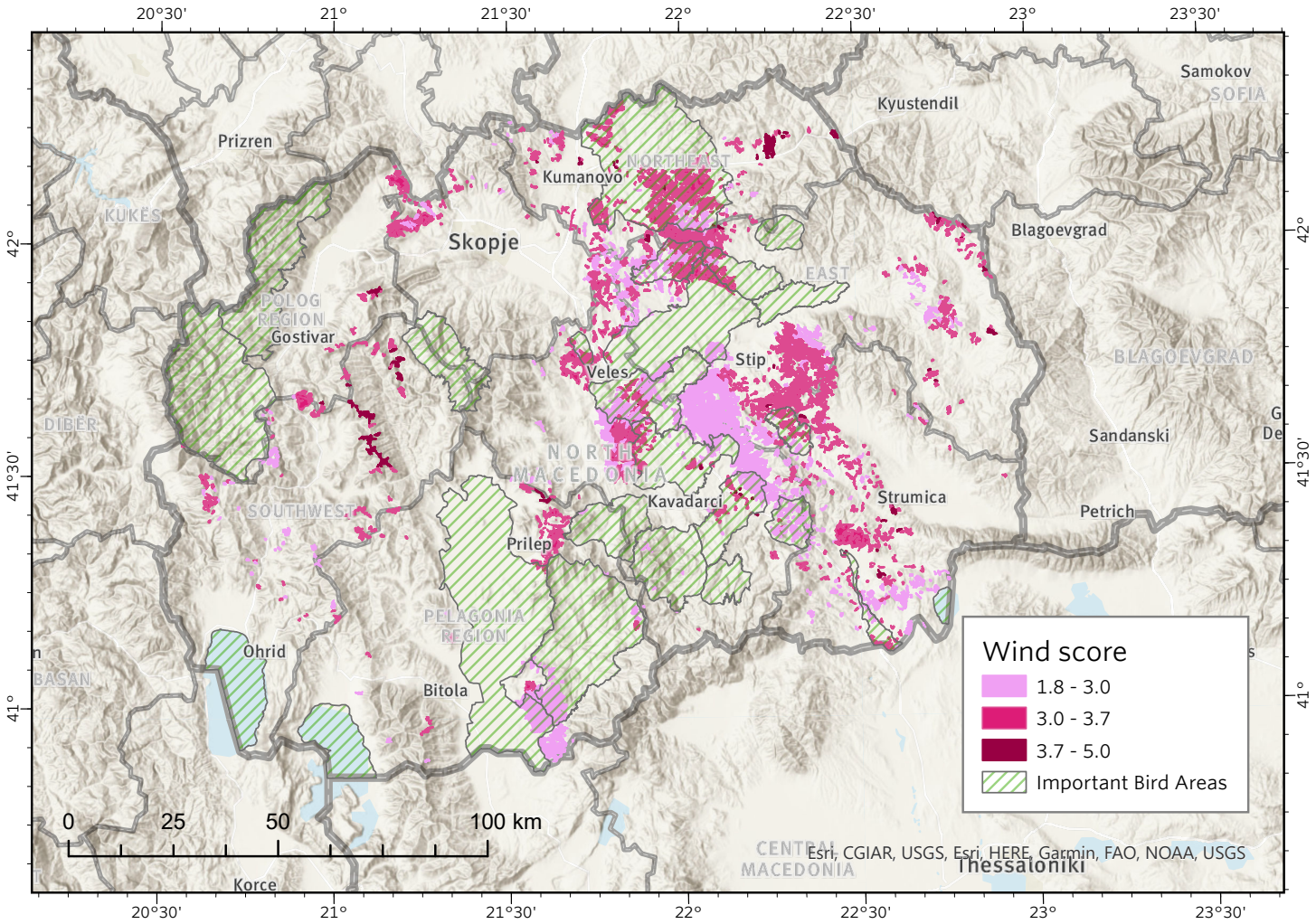


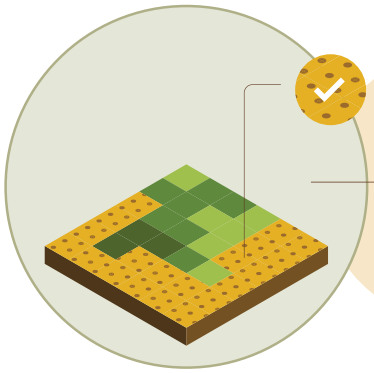
Figure 2:
Potential wind farm locations in North Macedonia with their final score, excluding constraints, in relation to Important Bird Areas (IBA). An estimated 457 MW of wind farm installed capacity could be developed in areas with a score higher than 3.7 outlined in dark purple, or 354 MW if considering only areas outside IPA and IBA sites.

The results are unambiguous: North Macedonia has an enormous untapped potential for RES development. Some 64,000 hectares of land graded highly for solar PV along with approximately 4,600 hectares of land for wind. This corresponds to a potential installed capacity of 50 GW for solar and 0.45 GW for wind.

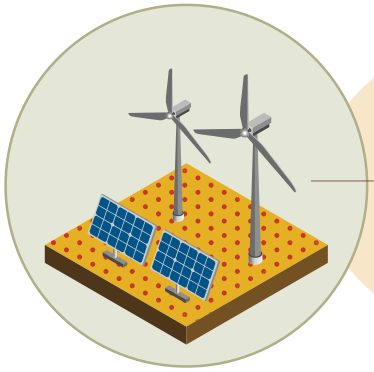
Even when completely excluding all important bird and plant areas (IBA & IPA), the potential comes to as much as 11 GW for solar PV and 0.35 GW for wind. This means that if only a half of these priority locations were built out, they could produce 7.7 terawatt-hours of electricity per year – which exceeds North Macedonia's current electricity consumption[6], and could even fully cover the estimated electricity consumption in 2030 under the energy efficient scenario of the NECP[7].

6 https://www.iea.org/countries/north-macedonia
7 https://www.energy-community.org/dam/jcr:bbb63b32-6446-4df8-adc6-c90613daf309/Draft_NECP_NM_%202020.pdf
8 https://www.irena.org/Data/View-data-by-topic/Climate-Change/Avoided-Emissions-Calculator

Our study strongly suggests that North Macedonia can meet and exceed its most ambitious RES targets without endangering its most valuable lands, while ensuring a just transition for its citizens.



Developing **only half** of the high-grade **identified areas** could cover **all electricity demands** up to 2030



7.7 TWh of clean electricity could avoid an estimated **6.3 million tonnes of CO2** emissions per year[8]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Recommendations

The initiative undertaken in North Macedonia is a template that can be scaled and replicated across the region, provided there is robust political commitment and a clear strategic direction. Capitalizing on brownfields, degraded, and converted lands for an ecologically sensitive and just energy transition presents an opportunity not only for sustainable energy generation, but also for restoring and repurposing land that has lost its primary utility.

With this in mind, we put forth the following recommendations:

National government:
We recommend integrating detailed maps that highlight brownfields, degraded, and converted lands into critical planning documents. Specifically, forthcoming iterations of the Energy Strategy of North Macedonia, the National Energy and Climate Plan (NECP), and plans for site-specific renewable energy auctions should consider these maps. The maps don't merely depict potential renewable energy sites, but also paint a picture of how energy scenarios can pragmatically evolve on the ground. By incorporating these insights, the government can craft well-informed, actionable policies that align with ground realities and future energy goals. The national government should also remove any legal barriers to siting renewables on mine sites and degraded land.

Local governments:
Collaboration is key. Local governments possess a unique vantage point and understanding of their terrains and communities. By forging synergies with local communities, NGOs, financial institutions, and the national government, they can identify and tap into potential energy sites. Such efforts can be instrumental in accelerating the local energy transition while also fostering community development and ownership.

The Energy Community Secretariat:
By acknowledging and promoting the use of brownfields, degraded, and converted lands for nature-friendly energy generation, the Energy Community Secretariat can pave the way for more Contracting Parties to meet their NECP objectives. This can be done by promoting this approach within its Environmental Task Force and other expert groups, and by paving the way to use maps of renewable sites on brownfields, degraded, and converted lands as a means to remove permitting bottlenecks. This involves encouraging countries to prioritize and enable a legal framework for such an approach.

European Investment Bank, European Bank for Reconstruction and Development, and other financial institutions:
European multilateral and bilateral development finance institutions' investments in renewable energy are instrumental to develop projects successfully and to support increased private sector investments in clean energy. By prioritizing and frontloading the development and financing of projects in the identified low-impact sites, these institutions can ensure that they leverage investments not only to support decarbonization targets but also to create a greener place for current and future generations.

Renewable energy project developers:
It's prudent to be proactive. By actively referring to and integrating insights from the provided maps and methodologies during project planning and execution, developers can pre-emptively address potential challenges, reduce delays, and ensure that their projects align with nature and community needs.

NGOs and expert communities:
We believe in the power of collaboration. Whether it's to adapt our strategies, refine methodologies, or share constructive feedback, we invite organizations and experts to engage with us. Such collaboration can not only refine our approach, but also inspire new, innovative solutions for sustainable energy transition. We invite civil society to use the maps to develop locally-owned projects and energy communities that will benefit from the analysis done.