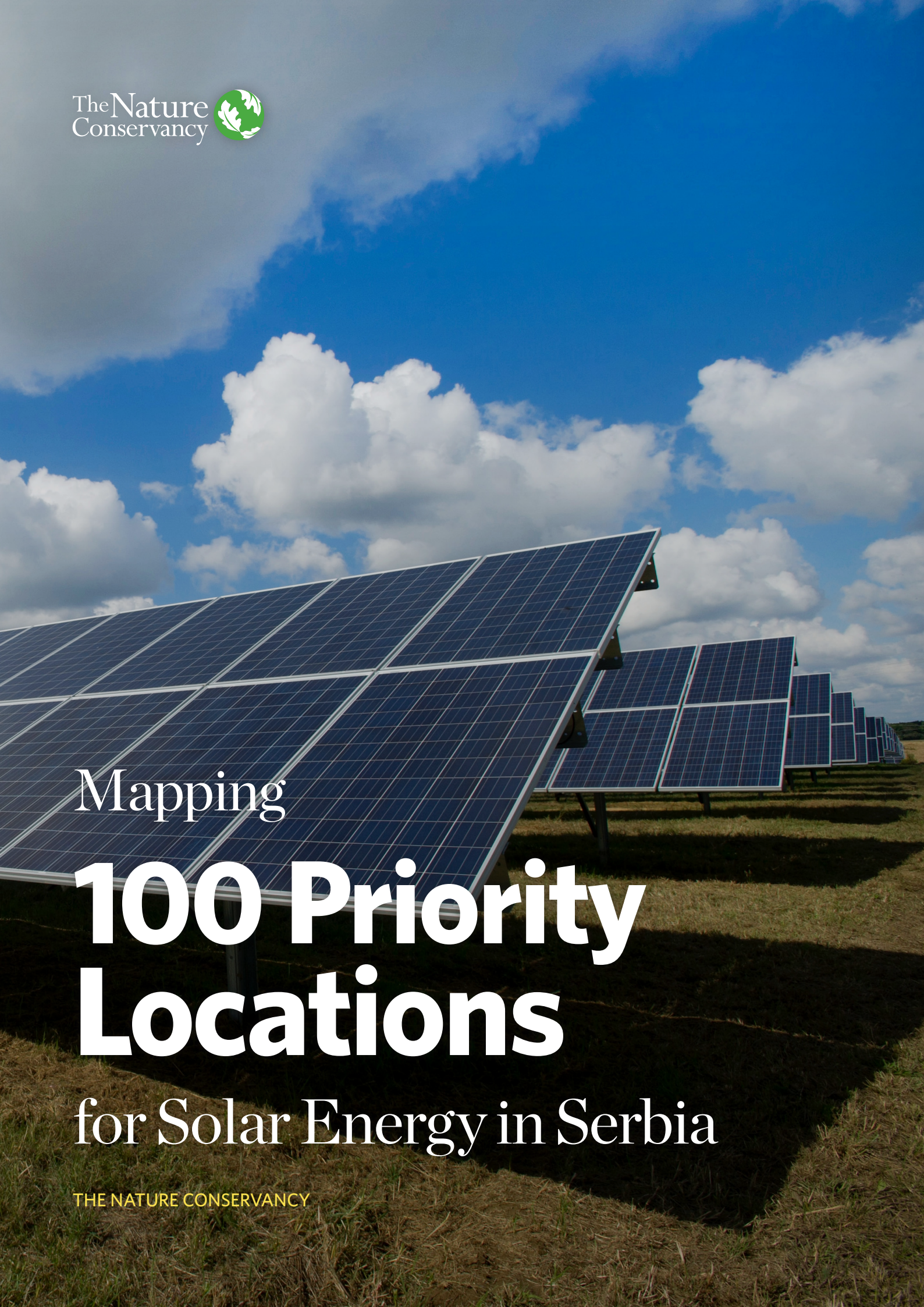


The Nature Conservancy

Mapping 100 Priority Locations for Solar Energy in Serbia

THE NATURE CONSERVANCY

CONTACT PERSON

Igor Vejnović, igor.vejnovic@tnc.org

CONTRIBUTORS

Dejan Doljak, Ph.D.

Ilija Batas Bjelić, Ph.D.

Maja Pupovac, Ph.D.

AUTHOR

Mate Zec

EDITING

Bridget Jennions

DESIGN

Milan Trivić

COVER PHOTO

American Public Power Association, Unsplash.com

ACKNOWLEDGMENTS

We are deeply grateful to many who made this project possible. Our thanks go to Joe Kiesecker, Kei Sochi, and Jim Oakleaf of The Nature Conservancy, our collaborative partners at the Institute for Nature Conservation of Serbia, Institute for Soil Science, and Institute for the Protection of Cultural Monuments of Serbia, our dedicated team members Kasandra Zorica Dropuljić, Tijana Simonović, Branislava Jovičić, Goran Sekulić, Varvara Aleksić, and Slobodan Knežević, the invaluable support from the Renewables and Environmental Regulatory Institute (RERI), and the numerous stakeholders and experts who contributed their experience and expertise during project workshops and beyond.

Why rapid development of solar is needed in Serbia

With the decreasing cost per installed MW of solar photovoltaics (PV), the twin objectives of decreasing dependence on fossil fuels and decarbonizing to mitigate the climate crisis are more attainable than ever. The countries of Europe have shown willingness to set ambitious decarbonization targets on the way to becoming the first carbon-neutral continent by 2050.

Countries dependent on foreign oil and gas exports are feeling increasing pressure to further diversify their energy sources. This fact is reflected in the EU's REPowerEU plan[1], which specifically aims to reduce dependency on Russian fuel imports and accelerate deployment of renewable energy sources across the EU. As one of the measures, REPowerEU proposes 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.

REPowerEU will impact Energy Community Countries, including Serbia, via the transposition of the revised Renewable Energy Directive and its provisions on Renewables Acceleration Areas. Also, in order to meet its commitments as a contracting party to the Energy Community, Serbia needs to increase the share of renewable energy sources in its gross energy consumption to 40.7% by 2030[2].

To facilitate reaching this target, Serbia adopted the new Law on the use of renewable energy sources in 2021 and revised in 2023, and a new wave of investments were initiated into the construction and development of renewable energy plants, including solar PV plants. In addition to rooftop power plants installed by households and businesses, a significant portion of the investments is expected to include building ground-mounted solar power plants with larger capacities.

This, in turn, will require additional land to site ground-mounted solar PV plants, and scoping this land should, wherever possible, avoid areas that are of high value for nature protection, agriculture, tourism, and other strategic sectors important for the well-being of people in Serbia.

---

[1] *Communication REPowerEU Plan COM(2022)230:* *https://commission.europa.eu/publications/key-documents-repowereu_en*

[2] *Decision of the Ministerial Council of the Energy Community No 2022/02/MC-EnC*

Photo credit: MT-KOMEX, Serbia

How smart siting can help

The search for the best sites for solar PV development in Serbia

To accelerate development of renewable energy sources (RES) while ensuring that the rollout doesn't affect the places important for nature and treasured by people, a smart approach to siting is crucial. To this end, the "Smart Planning for Sustainable Development: Mapping Serbia's Solar Potentials" project, led by The Nature Conservancy (TNC), conducted an estimation of conflict and resource potential for solar PV development in Serbia. The resulting study is a map overlaying both (Map 1), in addition to a selection of 100 of the best sites for solar development according to both criteria (Map 2), with an estimated installed capacity of 10 MW each.

STEP 1 – Mapping the constraints

The first step of this process involved finding constraints that preclude RES development and excluding them from further analysis. This includes both legal constraints, such as protected areas, the national ecological network and immobile cultural properties, as well as biophysical constraints such as slope and areas prone to flooding.

STEP 2 – Finding the development potential

The process of estimating spatially explicit development potential included a measure of resource yield[3] as well as a weighted mix of other factors such as distance to power lines and substations, distance to urban areas and transport infrastructure as well as land cover. All of these factors are then combined into a measure of development potential (DPI index[4]).

STEP 3 – Reducing the conflicts

After implementing constraints and estimating the development potential, the potential for conflict with natural, social or cultural values was calculated on the basis of land cover classes, through a process of consultation with national experts. These factors were combined into a measure of conflict probability (Spatial Conflict Index, SCI). Only the areas with the lowest potential for conflict were considered for the site selection.

STEP 4 – Bringing it together

Finally, to select the top sites, all locations were ranked according to both overall criteria (development potential and spatial conflict). In line with the precautionary principle, the conflict potential was given priority. A total of 100 locations were selected this way, corresponding to a potential 1 GW of low-impact solar deployment.

More in-depth information on the TNC approach to siting renewable energy sources is available in TNC's handbook for practitioners titled "Mapping a Sustainable Energy Transition".[5]

[3] *Global Solar Atlas, https://globalsolaratlas.info*

[4] *Oakleaf, J.R., Kennedy, C.M., Baruch-Mordo, S. et al. 2019. Mapping global development potential for renewable energy, fossil fuels, mining and agriculture sectors. Sci Data 6, 101*

[5] *Sochi, K., J.R. Oakleaf, A. Bhattacharjee, J.S. Evans, I. Vejnović, K.Z. Dropuljić, D. Mileusnić, T. Bevk, I.B. Bjelić, A. Dedinec, D. Doljak, S. Gorin, B. Pavlović, M. Zec, and J.M. Kiesecker. 2023. Mapping a Sustainable Renewable Energy Transition: Handbook for Practitioners. The Nature Conservancy https://www.nature.org/content/dam/tnc/nature/en/documents/Europe_Energy_Practitioners_Guide.pdf*

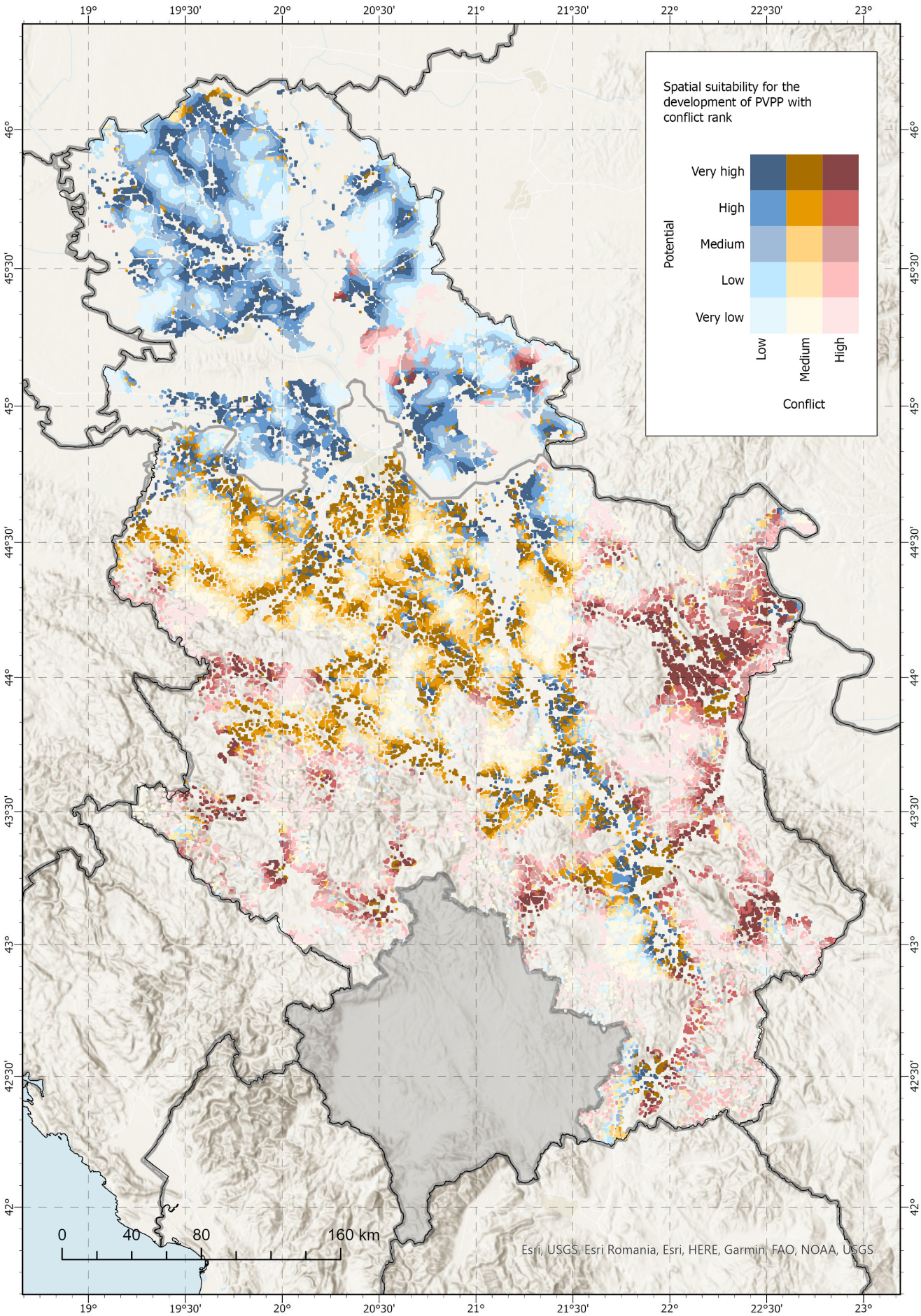
Stakeholder engagement

Steering a consultative process, the project team facilitated a series of workshops called 'Clean and Green Dialogue', involving 70 representatives, primarily from municipal departments, agencies, and NGOs across the North, West, and Southeast of Serbia. The goal was to assess the impacts of photovoltaic solar energy, specifically identifying go-to and no-go areas, thereby evaluating potential conflicts with natural, social, and cultural values. National experts, through a peer review, confirmed the robustness of this methodology for assessing risks associated with solar photovoltaic developments, covering biodiversity, agriculture, tourism, and cultural heritage. Moreover, a detailed legal analysis was undertaken to identify and assess legal obstacles and risks for solar PV development on agricultural lands. A notable concern was the risk of overdevelopment of solar PV, particularly on high-quality agricultural land.

Photo credit: MT-KOMEX, Serbia

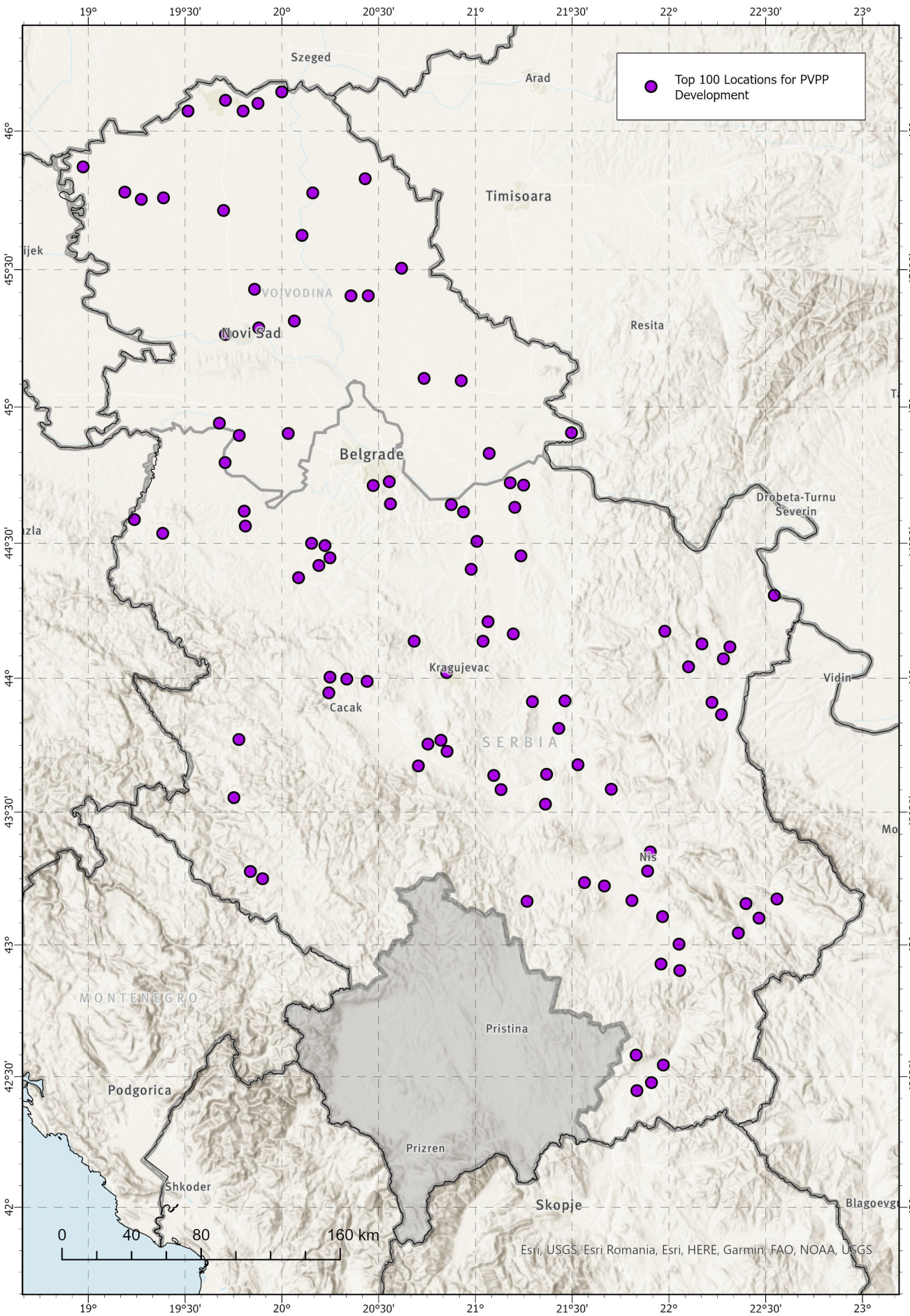
Results

Map 1: Suitability for PV Solar in Serbia (Development potential vs Conflict potential)[6]



[6] *This project did not include Kosovo (this designation is without prejudice to positions on status and is in line with UNSCR 1244 and the ICJ opinion on Kosovo Declaration of Independence).*

Map 2: Top 100 locations for PV solar development in Serbia



How to scale up and replicate this approach across Southeast Europe

Countries of Southeast Europe need to transition away from fossil fuels, both to increase their energy security by reducing their dependence on fuel imports, and in order to meet their decarbonization commitments. At the same time, according to the targets of the Kunming-Montreal Global Biodiversity Framework, countries need to take decisive steps to halt the loss of biodiversity, which includes putting 30% of their land and sea under effective protection. Finally, all these countries will need to carefully balance energy needs and biodiversity protection commitments with the development of other economic sectors, such as agriculture and tourism, for which land use and landscape configuration is crucial to secure incomes for people.

Smart renewables siting streamlined through Renewables Acceleration Areas via relevant policy initiatives, such as Green Agenda for the Western Balkans or Energy Community Treaty, could lessen the land use impact of renewable energy and the potential for conflicts and opposition, thereby protecting the most vulnerable species and areas while accelerating renewable energy deployment. Nevertheless, there is no perfect way to produce electricity on an industrial scale. Policymakers must recognize these challenges and face them head-on as countries transition to net-zero carbon societies.

We call on:

Local and national government leaders to recognize the value of establishing suitable low-conflict and high energy yield zones for the accelerated development of renewable energy sources (Renewables Acceleration Areas). As a first step, governments should integrate spatial and renewable energy planning in their local development strategies and National Energy and Climate Plans (NECPs). Croatia, Slovenia, and North Macedonia have already taken this route, demanding the development of guidelines and criteria for the integration of a spatial component into renewables development planning. These countries are already implementing national-scale assessments of locations suitable for renewable energy, and other countries should follow suit – balancing energy needs with other elements of public interest such as nature protection and food security.

The Energy Community Secretariat to help coordinate the identification of Renewables Acceleration Areas in the Contracting Parties, anticipating the need that will come with EU Renewable Energy Directive transposition. Renewables Acceleration Areas should be part of the Contracting Parties' strategies to tackle the permitting delays. The larger, regional scale of the Areas' assessments could ultimately help the energy industry by creating the same rules for the Renewables Acceleration Areas across the continent and thus creating a more predictable regulatory environment for investments.

The European Commission, European Investment Bank, and the **European Bank for Reconstruction and Development** to enable technical assistance for European Union accession countries to identify Renewables Acceleration Areas and ensure frontload financing for projects developed in these Areas. This approach allows for significant initial investments, which is critical for rapidly establishing and scaling energy infrastructure.

Renewable energy project developers to use the maps and methodology for establishing low-conflict and high energy potential Solar PV areas in order to avoid project delays and ensure a nature- and people-friendly approach. Developers should approach local communities and NGOs from the get-go, inviting them into an open dialogue and offering concrete cooperation opportunities. Success stories from other geographies indicate that the local communities are ready to cooperate and find win-win solutions when given the option to engage, by participating in projects' steering committees or via direct shareholding in projects.

NGOs and the expert community to participate in the process of outlining Renewables Acceleration Areas and reach out to us if they are interested in applying our approach themselves or wish to provide critical feedback on our methodology.

1GW of installed solar PV

could be achieved on **25 km²** (1/2 of Sremski Karlovci, one of the smallest municipalities in Serbia)[7]

200.000 households

could be powered from **100** selected solar sites[8]

1M tonnes of CO_2 emissions/year

can be saved in with **1GW** of solar installed[9]

---

[7] *Based on an estimated average installed capacity of 10 MW per 25-hectare plot*

[8] *Based on an annual household consumption of 14 TWh for Serbia and 2.5 million households (source: https://stat.gov.rs/)*

[9] *Based on a rough estimate of 1.2 GWh of coal displaced*

Photo credit: Markus Spiske, Unspash.com

The Nature Conservancy

Mapping 100 Priority Locations for Solar Energy in Serbia