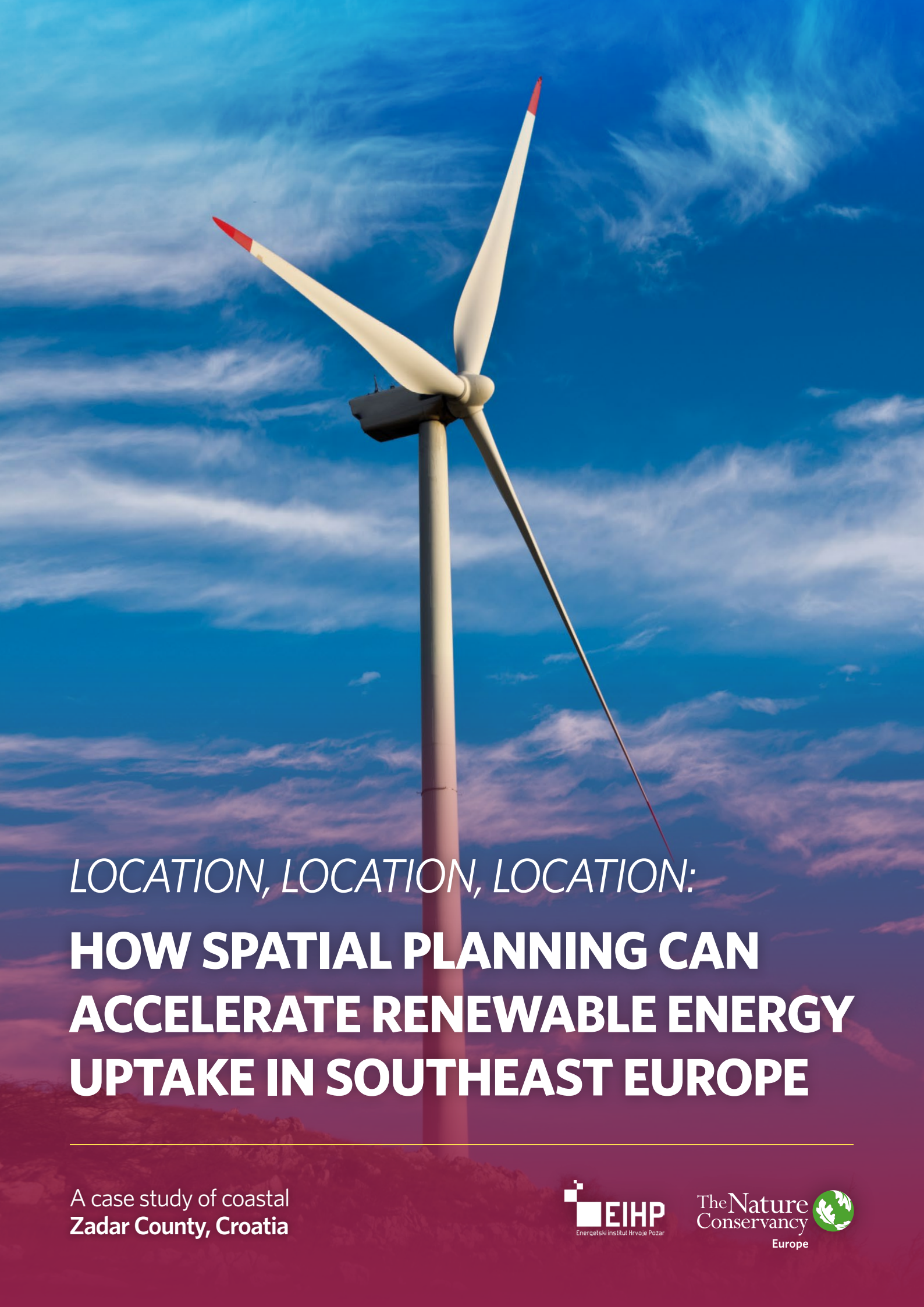

LOCATION, LOCATION, LOCATION:

HOW SPATIAL PLANNING CAN ACCELERATE RENEWABLE ENERGY UPTAKE IN SOUTHEAST EUROPE

A case study of coastal
Zadar County, Croatia

EIHP
Energetski institut Hrvoje Požar

The Nature Conservancy
Europe

The full study, EIHP, Integrated Renewable Energy Planning in Southeast Europe, Pilot project: Integrated Wind and Solar Planning in Zadar County, 2021, is available at:

http://www.eihp.hr/integrated-renewable-energy-planning-in-southeast-europe/?lang=en

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How spatial planning can accelerate renewable energy uptake in Southeast Europe

European countries are increasingly choosing to produce energy from renewables instead of fossil fuels, and Southeast Europe is starting to follow this trend, too. In recent years, there has been a surging interest in hydropower development; now, solar and wind energy are catching up. However, many of the proposed projects have not been realised due to growing opposition from the environmental and social standpoint, triggered by poor project execution and a lack of communication between project promotors and governments on one side and local communities and environmentalists on the other. Failure to address these issues has led to project delays or cancellations due to failed investments, public protests and litigation.

To accelerate renewable energy deployment, we need not only a constructive dialogue among project promotors, governments, local communities and environmentalists, but we also need tools that can integrate the diverse views of these stakeholders into renewable energy planning. This can be done by overlaying solar and wind resource potential with mapped social and environmental sensitivities. The outcome of this exercise is ideally a set of locations that both generate high electricity yields and are accepted by locals and environmentalists. For instance, these could be former mines that are ready for remediation, yet have transmission infrastructure that can be made readily available for use by new solar and wind facilities. Community involvement in project planning and the development of regulations for land use and zoning can help alleviate nearby residents' concerns.

The Nature Conservancy (TNC) has been applying this approach globally[1], and we have proven that such locations exist: the 2019 ***Paris to Practice*** study[2] by The Nature Conservancy identified that the world has 17 times more converted or degraded land that could host electricity generation than is required to meet the Paris targets set forth by governments. In Southeast Europe, we've been collaborating with the Energy Institute Hrvoje Požar (EIHP) to identify pathways for developing renewables with the highest ecological and social safeguards. We tested our approach in Zadar County, Croatia.

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[1] *McKenney, Bruce and Jessica Wilkinson. 2020. "Clean and Green Pathways for the Global Renewable Energy Buildout." The Nature Conservancy. Arlington, VA*

[2] *Baruch-Mordo, S., Kiesecker, J.M., Kennedy, C.M., Oakleaf, J.R. and Opperman, J.J., 2019. From Paris to practice: sustainable implementation of renewable energy goals. Environmental Research Letters, 14(2), p.024013*


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Zadar County pilot

Zadar County was selected as an ideal location for testing our approach in Southeast Europe: with over 2,000 hours of sunshine annually, the Croatian coast is rich in solar radiance[3]. Likewise, Zadar County is one of the windiest areas in Europe (with a mean power density of 1,999 W/m² in the 10% windiest areas)[4]. The region is already a hub for wind energy, and there are plans for it to serve as the future centre of utility-scale solar. At the same time, Zadar is a biodiversity hotspot. Around 50% of its surface area is part of the Natura 2000 ecological network. As both a potential energy hub and a biodiversity hotspot, Zadar was deemed an ideal place to test our approach to renewable energy siting.

Finally, Zadar County's leaders welcomed the opportunity to work with us and apply our results in their planning documents, a crucial element needed for identifying locations that would be truly embraced by all local stakeholders.

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[3] *Gašparović, I., Gašparović, M. and Medak, D., 2018. Determining and analysing solar irradiation based on freely available data: A case study from Croatia. Environmental Development, 26, pp.55-67.*

[4] *https://globalwindatlas.info/area/Croatia/Zadarska*

Photo credit: iStock.com/AygulSarvarova

Stakeholder engagement

A crucial element of our methodology is intensive consultations with the local communities and experts involved in renewables planning in order to capture and incorporate environmental and social sensitivities that need to be conserved. Individual expert consultations and two peer review workshops were organised with experts from the field of nature protection, the government's spatial planning departments, and environmental non-governmental organisations (NGOs). Input on the study's methodology was collected during these events and later verified.

"The maps provided by the project team are helpful for assessing the areas that are going to be assigned for the future development of renewables in our county. We applaud the project team for the work done to make this development more sustainable."

Stjepan Gverić, Director of Institute for Spatial Planning of Zadar County

Nature protection

Nature protection experts and governmental departments provided crucial information on environmental sensitivities that fed into the maps of highly sensitive areas. These stakeholders can use these maps in assessing risk during the Strategic Impact Assessment process for future renewables projects.

Spatial planning

Spatial planners are the primary users of our results: they will be integrating the results from the maps into national, county and local level plans and can use them to provide guidance to investors seeking location permits.

Environmental NGOs

Several NGOs represented civil society and provided critical information about environmental and social values that was integrated into the maps. If future project sites contradict these values, the NGOs are likely to oppose the projects through public campaigning and litigation.

Sensitivity analysis

The project team translated stakeholders' views into spatial maps. This data helped determine areas sensitive to renewable energy development as well the production potential of wind and solar energy. These maps can be used by spatial planners, investors and nature protection agencies to proactively identify potential conflicts with solar and wind development plans or to highlight suitable sites where development could be prioritised. The sensitivity analysis utilised 22 datasets on the prevailing state of the environment, biodiversity characteristics, land use patterns, and the social and cultural features of Zadar County through the following process:

» **Step 1:** Identify areas that cannot be used for wind and solar siting due to legal constraints, such as national parks and strict reserves. These areas are labelled as ***exclusion zones***.

» **Step 2:** Identify areas with potentially high adverse impacts to the establishment of wind and solar plants. These areas are labelled as *very* ***highly sensitive***.

» **Step 3:** Evaluate the remaining areas against a set of 20 indicators for wind plants and 18 indicators for solar plants to determine the land cover sensitivity level using a multi-criteria analysis, peer-reviewed through stakeholder engagement.

The project team used these criteria to design maps representing the different sensitivity levels: very high, high, medium and low.

FIGURE 1: Sensitivity map for solar

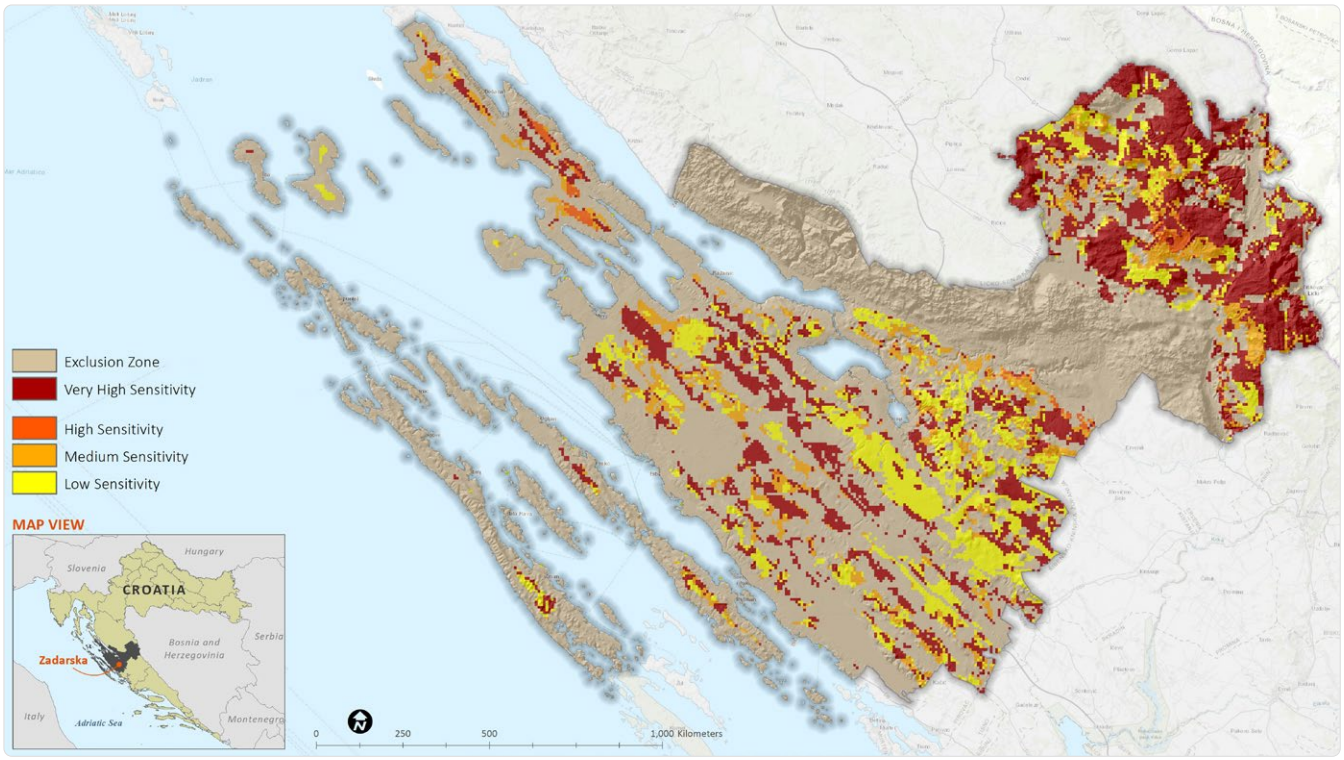
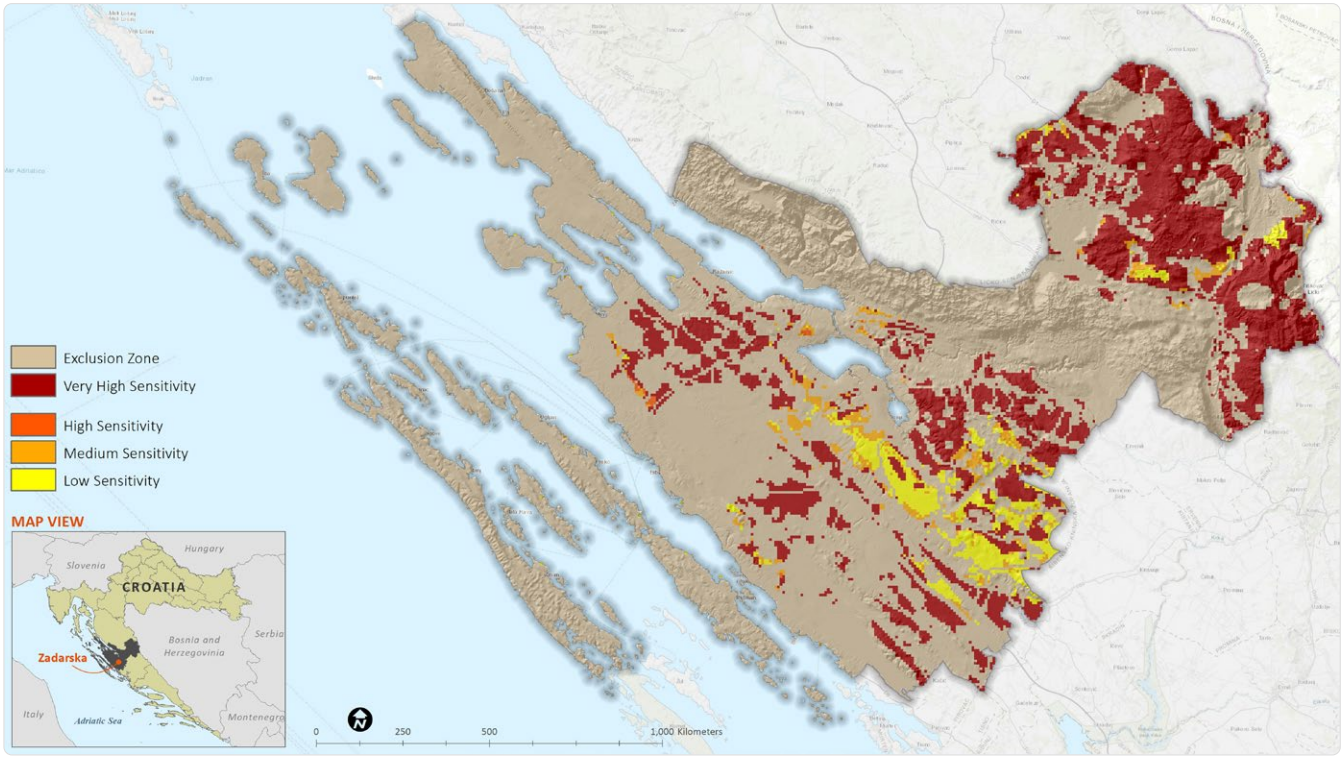


FIGURE 2: Sensitivity map for wind



Potential identified

After removing the areas unsuitable for renewable energy development (e.g. areas that are under strict protection, have low energy resource value, contain biophysical constraints, or experience high multi-use competition), we estimated that the total area suitable for development amounts to 22,529 hectares (ha) for solar and 8,451 hectares for wind. Looking at the existing solar and wind plants and calculations by EIHP, the project team assumed that approximately two hectares of land are required to host an installed capacity of 1 MW of solar energy, and 15 hectares are needed for 1 MW of wind energy. The team used an additional conservative assumption that only 5% of the low-sensitivity area will be exploited for solar power.[5] As a result, we found that over 1.1 GW of solar and wind potential is available in the areas where the lowest risk of environmental and social conflicts is estimated.

The low-sensitivity areas are further subdivided into excellent, very good and good suitability based on criteria such as solar insolation or the slope of the land for solar plants and wind speed and distance from a transmission line for wind farms. Investors can use these classifications for project specific siting within these areas.

FIGURE 3: Estimated potential *vs* Croatia's 2030 renewable energy target[6]

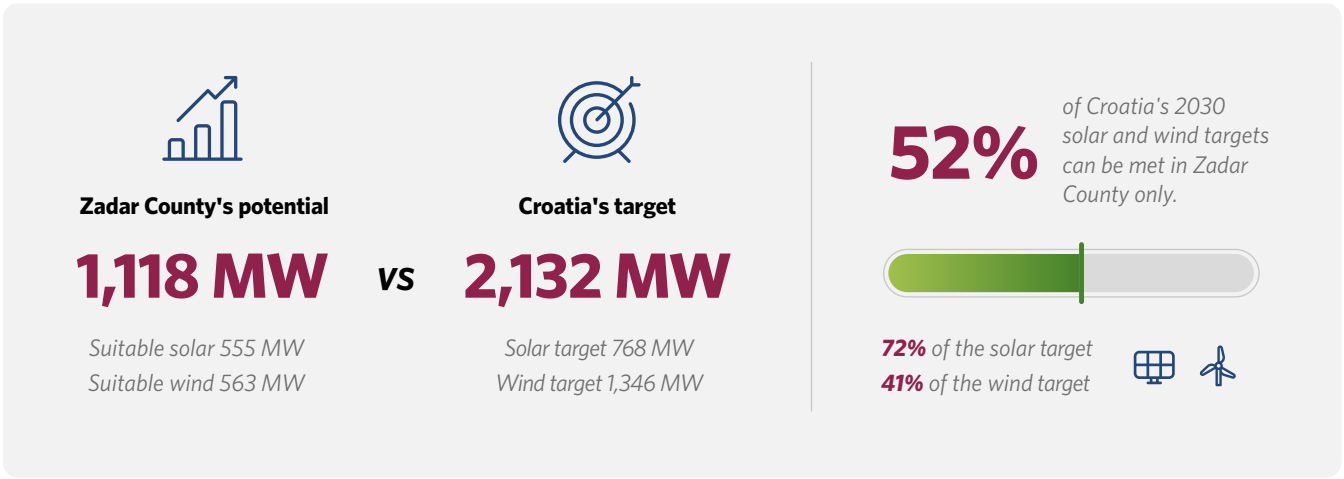
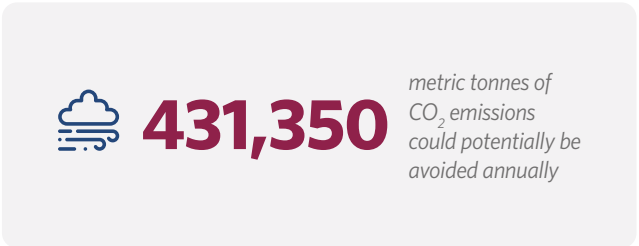


FIGURE 4: Comparison with electricity consumption needs[7]

FIGURE 5: Contribution to climate objectives[8]



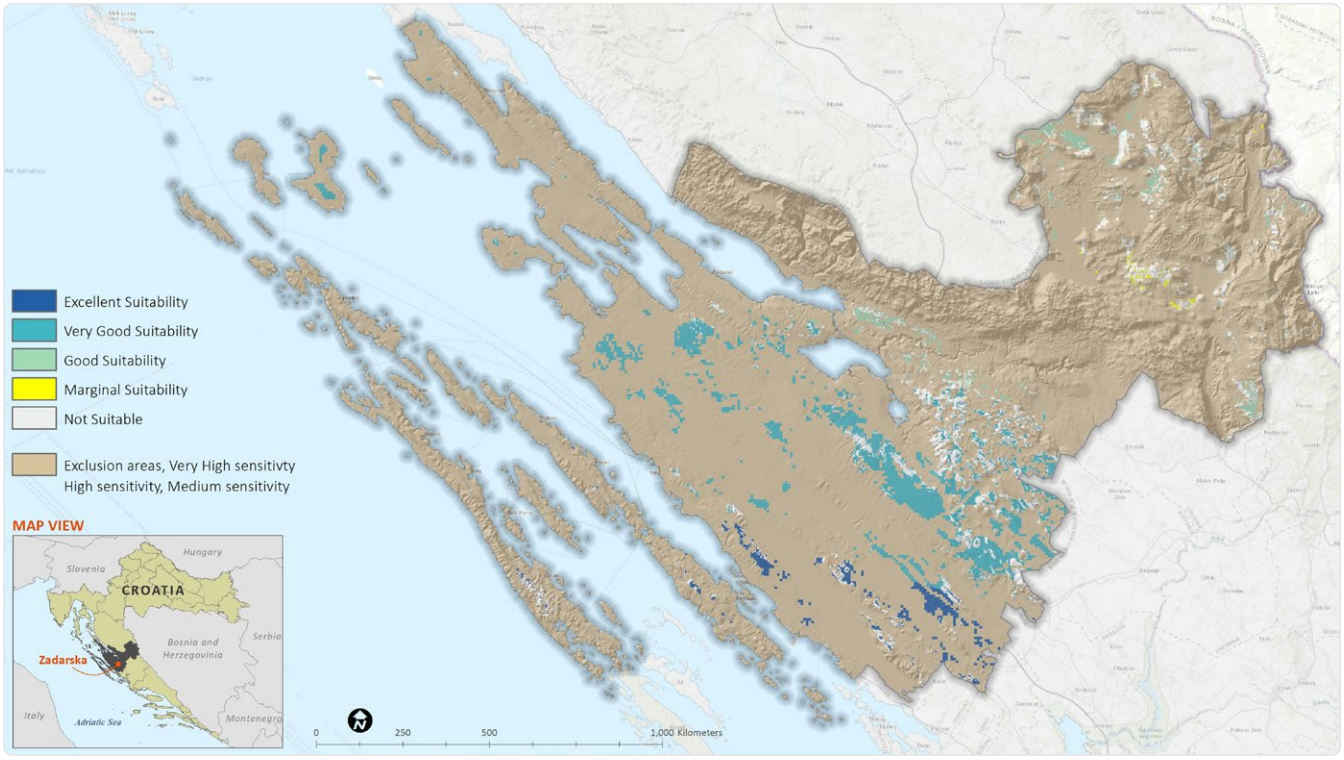
[5] *This is based on the assumption that only a fraction of low-impact area is realistically available for solar power plants, based on other limitations to development not addressed here (e.g. property rights and the size of land parcels, competition with other types of projects for low-sensitivity areas, and cumulative effects resulting from grouping large solar installations in certain areas).*

[6] *An explanation of the assumptions made is available in the report: EIHP, Integrated Renewable Energy Planning in Southeast Europe Pilot project: Integrated Wind and Solar Planning in Zadar County, 2021. The approach taken here is not in any way a replacement for the official legal procedure on environmental impact assessment that all projects must be subject to, regardless of their positioning within the sensitivity spectrum. The methodology is primarily developed for larger solar power plants (with an installed capacity of 3 MW or more), since the size of solar power plants is related to the plants' expected impact.*

[7] *We assummed 2,500 working hours for wind power plants and 1,350 working hours for solar power plants (an expert estimate for Zadar County). The number of households in Croatia and Zadar County is taken from the 2011 census and the average household consumption is taken from the Croatian National Energy and Climate Plan.*

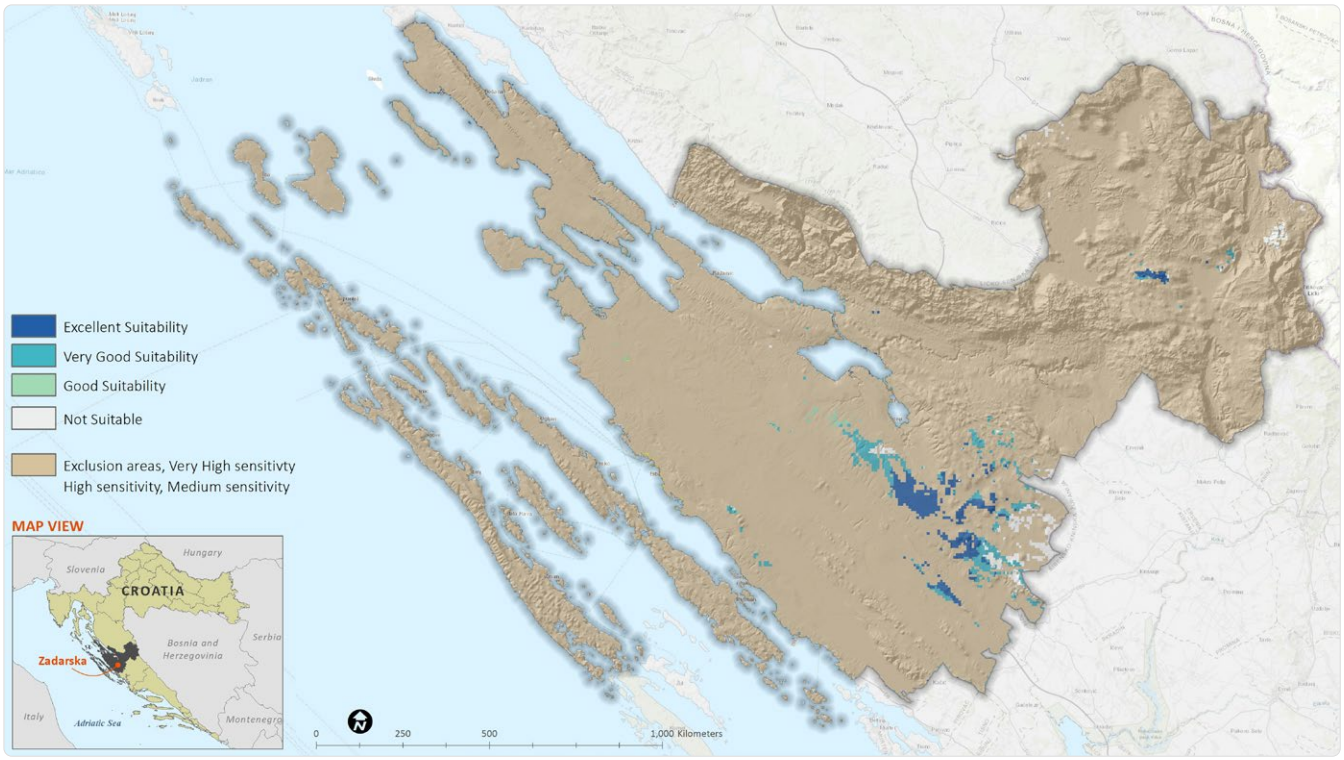
[8] *We used the average CO2 emissions factor for energy production in Croatia 2014-2019 (source: Croatian Ministry of Economy and Sustainable Development, Annual Energy Report for 2019, p 301) and assumed zero emissions from wind and solar plants.*

FIGURE 6: Solar power plants' suitability in 22,188 ha of the lowest sensitivity areas



The study's results estimated approximately 1.1 GW of solar and wind potential in locations identified as lowest risk to environmental and social conflicts in Zadar County. For comparison, this estimated potential is equivalent to half of Croatia's 2030 wind and solar target.

FIGURE 7: Wind power plants' suitability in 8,451 ha of the lowest sensitivity areas



How to scale up and replicate this approach across Southeast Europe

Implementation of the European Green Deal in Slovenia and Croatia and the Green Agenda for the Western Balkans provides an opportunity to accelerate renewable energy in the region. Technological and policy solutions can lessen the land use impact of renewable energy and the potential for conflicts and opposition. Nevertheless, there is no perfect way to produce electricity on an industrial scale. Policymakers must recognise these challenges and face them head-on as countries transition to net-zero carbon societies.

We call on:

The local, county and national governments to recognise the value of integrating spatial and renewable energy planning by requiring such measures 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. Some of the countries have foreseen national-scale assessments of locations suitable for renewable energy.

The Energy Community Secretariat to help coordinate the identification of suitable zones, as part of the implementation of the NECPs. The larger geographic scale of these assessments will ultimately help the energy industry by reducing conflicts and securing investments.

The European Commission, European Investment Bank and the European Bank for Reconstruction and Development to enable financial and technical assistance for EU Member States and accession countries to run these assessments before the revision of the NECPs in mid-2023.

Renewable energy project promotors to 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 reach out to us if they are interested in applying our approach themselves or wish to provide critical feedback to our methodology.

Photo credit: iStock.com/SimonSkafar

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