Smart Siting Guide: Portugal

Balancing energy, conservation, and community priorities in developing ground-mounted solar and onshore wind low conflict sites – Frequently Asked Questions.

1) What is the REDIII, what are RAAs, and what is the expected timeline for RAA implementation?

The RED refers to the Renewable Energy Directive of the European Union, currently in its most recent revision as RED III. This directive establishes common rules for renewable energy deployment across EU Member States, including targets, procedures, and specific mechanisms to accelerate permitting (See supplement VI).

Under RED III, each Member State must designate Renewable Acceleration Areas (RAAs). These are zones where renewable energy projects can be developed more quickly, because the state has already assessed that these areas have lower environmental conflict, suitable grid access, and fewer legal constraints. Inside RAAs, permitting timelines are significantly shortened, and Member States must proactively carry out the relevant environmental assessments at a strategic level. Regarding the timeline, EU law requires Member States to define and adopt their RAAs through a Strategic Environmental Assessment (SEA) process and the timeline proposed by the directive was February 2026.

2) How is this study different from the LNEG (National Energy and Geology Laboratory) acceleration areas study in terms of methodology, inputs, and assumptions?

The Smart Siting Guide for Portugal estimates where renewable energy development is most likely and most suitable across the whole country, using predictive modelling for energy development and a combination of biodiversity and social-value maps. LNEG's work applies a set of exclusion criteria to identify only the areas that could become RAAs.

3) Does your study replace LNEG's one?

No, this study is complementary to LNEG's one. The final products are similar and can be used together in the decision-making process. As an example, if an area was mapped as a RAA candidate in LNEG's report and a low-conflict site in the Smart Siting Guide for Portugal, the confidence would increase. Moreover, the Guide complements LNEG's work by informing future energy infrastructure decisions, detailed classification of biodiversity value layers and aesthetic considerations.

4) Why does the project exclude rooftop solar? What else is not considered?

This study focuses only on new ground-mounted solar projects and onshore wind because land-use conflicts to achieve Portugal's renewable energy ambitions are expected for these technologies, that are already at scale in the market and the Guide proposes most value for this scope. Rooftop solar requires completely different datasets, which were not part of the project scope. Other technologies, like offshore wind, concentrated solar, and floating solar, were also outside the scope.

5) Does the study compare the results with existing renewable energy projects?

No. The Smart Siting guide does not directly compare its results with individual renewable energy projects. The analysis is conducted at a national scale and focuses on identifying areas with low environmental and social conflict, rather than evaluating or benchmarking specific developments.

6) How does the model handle scale mismatches between datasets?

All inputs, whether they are raster datasets or polygons, are converted into a harmonized 100-meter grid. This ensures that every layer fits together consistently before the modelling process.

7) How were substations and transmission lines considered in the energy modeling, and how sensitive is the model to missing or outdated grid data?

The model treats distance to substations and transmission lines as continuous variables, where locations closer to this infrastructure tend to score higher because they are historically more attractive for renewable development. To understand how sensitive the model is to these inputs, we also ran alternative versions of the model without substations and another without any electrical infrastructure at all. As shown in the Technical Annex, the overall spatial patterns remained largely consistent across these scenarios. This means the model is influenced by grid data, but not overly dependent on it.

7) In areas without existing grid infrastructure, were the risks/impacts of connecting to the existing grid taken into consideration?

The risks and impacts associated with future grid connection were not explicitly modeled. This is because the primary function of Smart Siting is to identify areas with the best balance between energy potential and low environmental/social conflict for the installation of new solar or wind plants. However, it is essential that future grid connection infrastructure follows the same principle. Therefore, new transmission lines, corridors, or reinforcements should prioritize routes that avoid areas with high concentrations of biodiversity values, sensitive habitats, or areas of high social and landscape importance (see supplement II).

8) What is the justification for using the coarse-filter / fine-filter approach, and why is it appropriate for national scale siting?

The coarse filter looks at ecosystems and habitat patterns across Portugal, while the fine filter focuses on specific species and their sensitivities. Using species data alone (which is mainly available at 10×10 km resolution) would wrongly exclude most of the country. By combining both filters, we obtain a balanced national-scale biodiversity map that avoids unrealistic exclusion zones everywhere.

9) How do you justify combining datasets originally developed for other purposes (e.g., Natura 2000 or LULC map) to create biodiversity value layers?

These datasets still represent areas with clear ecological importance, even if they were originally developed for policy or land-use reporting. For example, Natura 2000 sites, Important Bird Areas, and landcover classes all describe habitats and features that are essential for biodiversity. Using them together gives a more complete and realistic picture of ecological sensitivity at the national scale.

10) How were agricultural areas considered?

Agricultural areas were incorporated into the biodiversity map through the coarse filter, which uses land-use classes from COS2018 to assess the ecological favorability of each type of land cover. This includes an explicit differentiation between irrigated and rainfed agriculture, as well as other relevant agricultural classes. Each class receives a score assigned by 25 experts based on its ability to sustain ecological processes, provide habitat, or partially contribute to biodiversity (see Chapter 3.1 of the Technical Annex).

11) How did you determine cutoffs such as “low conflict,” “moderate conflict,” or “high conflict”?

We used statistical methods, mainly quantile breaks, to divide the conflict maps into clear categories. These thresholds were chosen because they group locations with similar biodiversity characteristics. All details are explained in the Technical Annex.

12) How does the models differentiate between species highly sensitive to wind vs. solar impacts?

Our energy models for wind and solar are completely separate because each technology has different technical requirements and spatial patterns. For biodiversity, the current model does not yet distinguish species sensitivity by technology. This would require detailed information on collision risks, disturbance patterns, and appropriate buffer distances for each species group, which was beyond the scope and resources of this project. However, this is an important next step. Future work, including the upcoming SEA for the RAAs, could develop technology-specific sensitivity analyses, as they can incorporate more detailed species data, expert input, and project-level ecological assessments.

13) How representative is Flickr data for landscape value in Portugal, considering is not a social media widely used in the country?

Flickr is widely used in scientific studies as a credible proxy for aesthetic and recreational landscape values. People who upload photos there are usually hikers, photographers, and tourists, visitors and tag places they find scenic, memorable, or visually striking. To ensure reliability, we included only areas with a consistent density of photos and excluded places with very few uploads. This avoids bias and keeps the analysis grounded in meaningful patterns of landscape appreciation. The method is supported by established literature on social-value mapping, and all the technical details and academic references are in the Technical Annex.

14) What other considerations were accounted in the project for calculating new land requirements for renewable energy development?

We used Global Energy Monitor (GEM) data to subtract the capacity of projects already under development from Portugal's 2030 target. We also included the potential for repowering and overpowering, using APREN and LNEG estimates and the method described in Box 4 of the report.

15) what are the impacts of repowering/overpowering on biodiversity? How do they compare to new developments?

On one hand, repowering can reduce the need for new land because additional capacity is added within existing wind farm areas. However, it often involves installing larger, more powerful turbines, which can create new biodiversity and social impacts. The report notes that many existing wind farms are located in areas with high biodiversity value, so repowering must be evaluated very carefully in those locations.

16) What is the community meeting in Silves about?

The Silves meeting was a community engagement workshop aimed to verify the fine-scale social-value datasets while complementing it with qualitative data about community engagement and benefits. Participants helped identify local landscape features and concerns that do not appear in national datasets in a participatory and interactive setting and shared their perspectives on renewable energy development in the region in scientifically planned focus group discussions. All the details of the Silves meeting are on supplement V and on the Technical Annex.

17) What are the main data limitations of the study, and what could be improved in the next steps?

This is a national-scale study, so it depends on the best nationwide datasets available, and these still have important gaps. Some examples include:

i) Not all species groups (like invertebrates or flora) have detailed national data, and many species records are available only at a coarse 10×10 km resolution. This means some fine-scale ecological patterns cannot be fully captured.

ii) Social-value mapping doesn't yet include detailed community perceptions or newer cultural landscapes, and the most recent national land-use map is from 2018, so some changes may be missing.

iii) There is limited public information on planned substations, transmission expansion, or detailed grid capacity in a geospatial format. This creates uncertainty when estimating where new projects can connect efficiently.

18) Could your biodiversity and social maps support the SEA process for RAAs?

Yes, as background evidence. These maps help SEA teams understand where ecological and landscape pressures are higher and offer transparent, national-scale information that complements other official datasets and studies (e.g., landscape aesthetics with the viewshed layer). They are not regulatory tools, but they can support environmental reasoning within the SEA process.

19) Can licensing authorities (e.g., APA, CCDR) use these conflict maps as a screening tool in the EIA process?

Yes, as an early-stage screening aid. The maps help identify areas where EIAs may need more detailed analysis due to biodiversity sensitivity, species hotspots, or landscape concerns. They support the pre-evaluation phase, but they do not replace project-specific studies.

20) How were cumulative impacts addressed? Were they included?

Cumulative impact assessment was not explicitly modeled in the Smart Siting maps, since the tool has a strategic purpose: to identify, at the national scale, areas with lower potential conflict, and not to replace the detailed analyses required in formal licensing procedures.

It is important to emphasize that any future project must fully comply with the legal procedures of Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA), where cumulative impacts are mandatorily analyzed under national and European legislation, including effects on protected species, habitats, landscape, tourism, agriculture, and local communities.

21. There are areas classified as "moderate-low conflict" (or other conflict classes) where threatened species protected under national and European environmental legislation (e.g., the Birds Directive) are present, and these must be taken into account in the EIA process.

We agree with this comment. Even in areas classified by the study as "moderate-low conflict," there may be species protected under national and EU legislation. Whenever this occurs, these species must be considered within the formal environmental assessment procedures (EIA or SEA), as required by law.

22) Can this study support the development of the mitigation rulebook for Portugal mandated by REDIII?

Yes, it can help strengthen parts of the mitigation rulebook. By identifying biodiversity hotspots and areas with high species sensitivity, the study helps clarify where strong minimization and restoration measures will be necessary. Several suggestions relating to the application of the mitigation hierarchy are provided in Supplement III of the report.

23) How could grid operators use this mapping to help on new developments?

Grid operators can use the maps to:

- Anticipate where new renewable energy development is most likely to occur.
- Identify areas currently underserved by infrastructure that may need future investment.
- Align grid planning with national siting priorities, helping reduce mismatches between renewable growth and grid capacity.