umweltbundesamt
PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT

Synergizing PV and Wind-Energy Infrastructure with Biodiversity Conservation

Florian Danzinger, Peggy Macaigne, Marc Sztatecsny, Stefan Schindler

© Gebhard Banko, Umweltbundesamt

BACKGROUND

Intact ecosystems are essential for human life. Amongst others they ...

- safeguard the **conservation of biodiversity**
- represent **carbon sinks** and support **climate protection**
- regulate the **water balance**
- are the basis for the production of **sustainable food** and **raw materials**
- offer protection against **natural hazards**

Status quo - Nature in the EU is severely declining:

- Species populations and the natural areas they inhabit are **shrinking and degrading**
- Despite EU's efforts in protecting nature, the most recent assessments (EEA, 2020) found:
  - 80% of habitats in poor condition | 10% of bee and butterfly species risk extinction | 70% of soils in unhealthy condition
- Austrian Red Lists (Zulka, 2005 & 2007)
  - 32% of native breeding birds | 27% of mammals | 64% of amphibians | 60% of reptiles are endangered
- Along with **habitat loss, fragmentation and degradation, climate change** is one of the key drivers of the dramatic decline in biodiversity

Accelerated energy transition in Europe to tackle climate change and to decrease energy dependence on unreliable suppliers and volatile fossil fuels:

- EU: Climate neutrality in EU by 2050
- AT: 100% renewable renewables by 2030 | Climate neutrality by 2040
- +11 TWh PV | +10 TWh wind energy by 2030 (EAG, 2021)
- +31 TWh PV | +18 TWh wind energy from 2030-2040 (NIP, 2024)
- Substantial expansion expected until 2050
- RED III (Renewable Energy Directive): acceleration areas

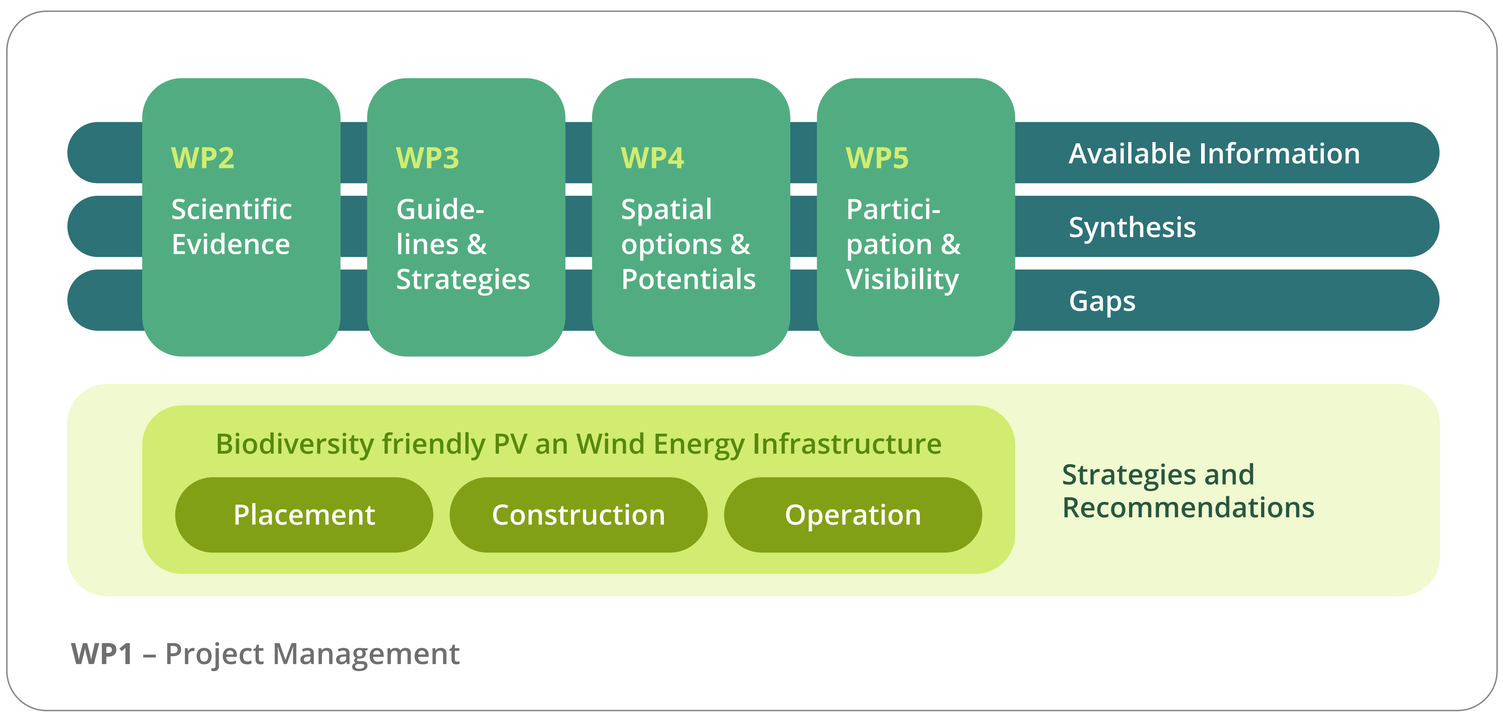
EFFECTS AND SYNERGIES

Energy transition, and in particular the expansion of photovoltaics and wind power, will also have substantial effects:

- Due to their nature, **WE plants** and **ground-mounted PV installations** have an undeniable **spatial and ecological impact**, whether visually in the landscape or in terms of their **influence on local habitats and ecosystems** as well as species and populations (Chiabrando et al., 2009; Adeyeye et al., 2020)
- Interactions between different rural land uses such as **energy production, agriculture, and nature protection** are becoming a **growing source of conflict** (Meller et al., 2015; Sacchelli et al., 2016)
- These impacts must be thoroughly analyzed, especially when **sensitive habitats** of conservation value **without protection status** and **valuable semi-natural habitats** are **considered as potential sites**

The ambitious goals to achieve climate neutrality require an urgent assessment of conflicts and synergies with the protection of biodiversity:

- There is a current lack of **evidence-based assessments** of the impacts of renewable energy sources on **Austrian natural areas** and particularly sensitive ecosystems as well the **Austrian animal and plant species and habitat types**
- Comprehensive **strategies and recommendations for policy makers** and infrastructure providers are needed to **minimize negative impacts** of the expansion of PV and WE infrastructure on biodiversity and to effectively **capitalize on potential synergies**
- Especially in agriculturally intensively used areas, PV and WE infrastructure plants have the **potential to enhance biodiversity** by providing **additional habitats** for fauna and flora (Blaydes et.al. 2021, Uldrijan et al. 2021).
- The **Austrian Biodiversity Strategy 2030+** advocates a **synergetic approach** to the expansion of **renewable energies and the protection of biodiversity**



KEY QUESTIONS

PV-Wind-Biodiv seeks to fill knowledge gaps by providing strategies and recommendations for policy makers and infrastructure providers to build on potential synergies between the expansion of PV and WE infrastructure and Austria's biodiversity to minimize negative impacts and maximize the positive effects for biodiversity.

- What are the positive, neutral, and negative effects of the expansion of PV and WE infrastructure on biodiversity?
- How can potential synergies be maximised and negative impacts minimised?
- What are prominent gaps in our knowledge and how can they be filled and addressed in recommendations for policy makers and energy providers?
- How do potential areas and designated areas as well as the required grid infrastructure spatially conflict with biodiversity?
- Do they overlap with biodiversity hotspots, endemism areas, sensitive habitats, High Nature Value Farmland (HNVF), habitat corridors, or protected areas in general hotspots of biodiversity and endemism areas?
- Are particularly sensitive habitats affected by the expansion of renewable energies (peatlands, dry grasslands, salt habitats, mountain habitats, etc.)?

METHODS

PV-Wind-Biodiv addresses the effects of the expansion of PV and WE systems on species and habitats by ...

- **reviewing scientific evidence** of the effects of PV and WE infrastructure on organisms, habitats and ecological networks,
- **reviewing** national, European and international **guidelines and strategies** for a biodiversity-friendly Use of PV and WE infrastructure is processed and
- **developing spatial options** for action and area potentials for renewable energy sources in Austria on the basis of a **GIS approach**. **Strategies and recommendations** for the **placement, construction and operation** of PV and WE infrastructure are developed and passed on to **political decision-makers, energy suppliers** and other interested **stakeholders**.

PROGRESS

WP 2: Scientific evidence

- **Development of search terms and strings** to reach the best search comprehensiveness and accuracy
- Definition of systematic screening and review process

WP 3: Guidelines and Strategies

- **Literature research** of available national and international guidelines and practical strategies
- Definition of criteria for evaluation and comparison

WP 4: Spatial Options and Potentials

- **Selection and classification of relevant geodata** regarding the suitability for placing PV and WE infrastructure with regard to the impact on species, species groups, habitats, and the integrity of the ecological network

WP 5: Participation and Visibility

- Planning of first **co-creation workshop** in April 2024

klima+ energie fonds

REFERENCES

Adeyeye, K., Ijumba, N., & Colton, J. (2020). Exploring the environmental and economic impacts of wind energy: a cost-benefit perspective. International Journal of Sustainable Development & World Ecology 27(8):718-731.

Blaydes, H., Potts, S. G., Whyatt, J. D., & Armstrong, A. (2021). Opportunities to enhance pollinator biodiversity in solar parks. Renewable and Sustainable Energy Reviews, 145, 111065.

BMK (2023): Strategische Umweltprüfung zum integrierten österreichischen Netzinfrastrukturplan. Entwurf des Umweltberichts. Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie

Chiabrando, R., Fabrizio, E., Garnero, G. (2009). The territorial and landscape impacts of photovoltaic systems: definition of impacts and assessment of the glare risk. Renewable and Sustainable Energy Review, 13:2441–51.

EEA (2020). State of nature in the EU - Results from reporting under the nature directives 2013-2018. https://www.eea.europa.eu/publications/state-of-nature-in-the-eu-2020 [13.03.2024]

Erneuerbaren-Ausbau-Gesetz – EAG (2021) (BGBl. I Nr. 150/2021). Bundesgesetz über den Ausbau von Energie aus erneuerbaren Quellen (Erneuerbaren-Ausbau-Gesetz – EAG). www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=20011619 [04.10.2022].

Meller, L., Thuiller W., Pironon, S., Barbet-Massin, M., Hof, A. & Cabeza, M. (2015). Balance between climate change mitigation benefits and land use impacts of bioenergy: conservation implications for European birds. GCB Bioenergy 7:741-751. https://doi.org/10.1111/gcbb.12178

Sacchelli, S., Garegnani, G., Geri, F., Grilli, G., Paletto, A., Zambelli, P., Ciolli, M., Vettorato, D. (2016). Land use policy trade-off between photovoltaic systems installation and agricultural practices on arable lands : an environmental and socioeconomic impact analysis for Italy. Land Use Policy 56, 90–99. https://doi.org/10.1016/j.landusepol.2016.04.024

Uldrijan, D., Kováčiková, M., Jakimiuk, A., Vaverková, M. D., & Winkler, J. (2021). Ecological effects of preferential vegetation composition developed on sites with photovoltaic power plants. Ecological Engineering, 168, 106274.

Zulka, K. P. (2005): Rote Listen gefährdeter Tiere Österreichs. Checklisten, Gefährdungsanalysen, Handlungsbedarf. Teil 1: Säugetiere, Vögel, Heschrecken, Wasserkäfer, Netzflügler, Schnabelfliegen, Tagfalter. Böhlau, Wien. Grüne Reihe des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (Gesamtherausgeberin Ruth Wallner) Vol. 14/1, 406 pp.,

Zulka, K. P. (2007): Rote Listen gefährdeter Tiere Österreichs. Checklisten, Gefährdungsanalysen, Handlungsbedarf. Teil 2: Kriechtiere, Lurche, Fische, Nachtfalter, Weichtiere. Böhlau, Wien. Grüne Reihe des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (Gesamt-herausgeberin Ruth Wallner) Vol. 14/2, 515 pp.