

Policy recommendations for sustainable wind energy development

I. The aim of the package of proposals

The expansion of wind energy is a key tool not only for mitigating climate change, but also for addressing a number of global environmental challenges which, according to the 'Planetary Boundaries' concept, have already moved beyond safe operating limits. Our aim is to support the development of a professional framework that facilitates the rapid, yet responsible, sustainable and socially acceptable implementation of wind energy projects. As there are fundamental environmental, social and economic interests at stake in the use of renewables and the sustainable energy transition, it is crucial that no credibility deficit arises amongst the public concerned during implementation.

Well-founded decisions are not only essential for preventing conflicts relating to nature conservation and social issues, but also for the technical, economic and regulatory success of investments. Inadequately prepared site designations and development projects carry high risks, can lead to significant delays and additional costs, and may also jeopardise the feasibility of the projects; therefore, high-quality decision-making is in the shared interest of developers, financiers, the authorities and Hungarian society as a whole.

We are aware that, in order to meet domestic and European energy policy targets, certain strategic decisions may need to be taken and designation processes finalised within a short timeframe. Our proposals therefore aim to establish institutional, professional and regulatory frameworks that combine rapid decision-making with a sound professional basis, as well as opportunities for subsequent review and correction where necessary. A predictable, transparent and nationally uniform regulatory environment is also a key prerequisite for the sustainability and financial viability of these developments.

Hungary has a great opportunity to implement the next wave of wind energy developments in the light of the experience already gained in other European countries. Practice in many countries shows that rapid capacity expansion can give rise to environmental, social and licensing challenges, which subsequently required the development of specific regulatory and monitoring tools to address them. Our aim is to ensure that domestic developments are carried out with these experiences in mind, whilst striving to prevent potential conflicts. To this end, the correct designation of so-called 'Facilitated Areas' is essential; although this has already been done officially, it is necessary to rethink the methodological and technical foundations of this designation so that, based on transparent geospatial and complex technical criteria, investments are genuinely channelled towards the most suitable sites, whilst reducing the risk of conflicts relating to nature and landscape conservation, as well as social conflicts. Therefore, below,

we have compiled our specific recommendations regarding the review of 'Facilitated Areas', alongside our general recommendations on wind energy developments.

II. Expert position statement on domestic wind energy developments

The key to sustainable energy management in our country lies in reducing our energy demand to the lowest possible level and generating the necessary energy in the most environmentally and socially sustainable way, with the highest possible share of renewable energy. In all cases, we must strive to use the resources necessary for our well-being and the functioning of our economy as efficiently and sparingly as possible, because energy that is not used or produced is the cheapest and greenest. As much of the required energy as possible must be secured within our own borders in a manner that is sustainable from the perspectives of nature conservation, environmental protection, as well as social and economic considerations. This must be achieved through the systematic planning, construction and operation of renewable energy systems that function in a coordinated and synergistic manner.

Based on the latest scientific findings, life-cycle analyses and international experience, onshore wind turbines are among the electricity-generation technologies with the lowest emissions of pollutants. The electricity generated in this way is among the cheapest, whilst the external impacts and costs of appropriately sited wind turbines can also be minimised. It is important to note that new and modern wind turbines could operate with a capacity factor of up to nearly 30 per cent across most of the country (ensuring at least 8,400 hours of availability per year), which represents a significant improvement over currently operating installations in terms of both specific environmental impact and specific cost. From the perspective of the safe operation of the electricity system, it is of paramount importance that the winter generation peak of wind farms would, in seasonal terms, complement the summer generation peak of the current domestic solar portfolio, which stands at around 8,600 MW. Through planning that takes into account the characteristics and development potential of the electricity grid, and through a well-considered, supported by GIS and energy modelling software, and, where necessary, by establishing site-specific operational rules and protocols, the low environmental impact of wind turbines can be ensured. Furthermore, by adhering to the precautionary principle, their negative impact on the living environment and the landscape can also be minimised. Further information is available [here](#).

Based on the available wind measurement and mapping data, it can be established that wind turbines representing the state-of-the-art in technology could be installed economically on more than half of Hungary's territory. However, the size of the areas actually suitable for development is significantly influenced by grid connection options, nature conservation and landscape protection considerations, military and aviation safety restrictions, as well as numerous other technical, economic and social factors. [Based on the technical findings](#) accumulated in recent years, [it can be stated](#) that, by utilising just a few tenths of a per cent of Hungary's territory, it would be possible to generate wind power capacity of up to several thousand MW in the medium term

, which, according to [energy models developed for Hungary](#), could provide optimal support for and a climate-friendly complement to current solar panel capacity. However, the actual site selection is a complex process involving the joint assessment of multiple factors, in which energy, grid, nature conservation, social, town-planning and economic conditions are all of decisive importance. It is important that capacity expansion is appropriately distributed across the country's regions and takes place in low-risk areas that also meet nature conservation, social and economic requirements. A similar integrated approach is also required when developing the electricity grid, as the location of grid infrastructure and connection points can fundamentally influence the siting of wind energy developments in the long term, and thus the associated environmental impacts.

In light of the accelerating pace of global climate change and the increasingly stifling and oppressive geopolitical dependence on fossil and nuclear energy, our clear and primary objective is to encourage energy conservation and optimise energy use. Furthermore, we must recognise that we need energy to run our society, but it is also a fact that every method of energy production entails an environmental impact. Among the alternative technologies currently available, wind energy – which is one of our country's renewable sources with the greatest untapped potential – is on the verge of significant capacity expansion. In our view, the key question is what sort of unified, predictable and consistently applied regulatory framework – one that strikes a balance between natural, environmental, social and economic considerations – is required for these future developments. In other words, where and how should we locate and operate new wind farms in order to minimise ecological risks whilst maximising economic benefits and maintaining public support? This is particularly important at a time when, in order to meet domestic and European energy policy targets, strategic decisions must be taken within a short timeframe that could define the spatial and regulatory frameworks for wind energy development for decades to come. Furthermore, the assessment of the first new wind farm projects could fundamentally determine the technology's future public support and its true development potential. With the following recommendations, we aim to lay the foundations for these endeavours and to initiate a wide-ranging professional and public consultation on sustainable wind energy development.

III. Policy recommendations

A coordinated and comprehensive policy approach is required to accelerate the uptake of renewable energy sources (and, within this, wind energy) in Hungary. The recommendations set out below provide guidance on wind energy development, in line with the EU's climate policy objectives and Hungary's national priorities.

List of 9+1 policy proposals relating to wind energy development and energy planning:

- 1) Establishment of an expanded inter-ministerial working group on wind energy developments
- 2) Establishment of a working group (led by the Ministry of Environment and Water Management) to define nature conservation buffer zones and standardised protocols for the expansion of wind energy capacity and other related land-use changes
- 3) Addressing the fundamental data gaps and research gaps necessary for the correct designation of wind turbine development sites; identifying the (spatial) data required for this; ensuring access to existing data; and creating missing databases
- 4) Prioritising artificial land surfaces and heavily degraded agricultural areas, and reviewing buffer zones around industrial sites
- 5) Creating opportunities to involve local capital (from residents, SMEs or other private sources)
- 6) Transparent monitoring of the environmental impact of wind energy projects, and the development of standardised survey protocols to support the licensing process and protect bird and bat species
- 7) Conducting a Strategic Environmental Assessment for the 'Simplified Areas'
- 8) Application of environmentally friendly technological solutions during the operation of wind turbines
- 9) Development and launch of transparent and credible public awareness-raising and information campaigns
- +1) Establishment of a national energy planning and environmental management centre

IV. Detailed explanation of policy proposals:

1) Establishment of an expanded inter-ministerial working group on wind energy development

We recommend the formation, under the leadership of GEM, of an inter-ministerial working group (e.g. comprising ÉKFM, ÉKM, VTM, AÉM, HM) and supplemented by external experts. Given that certain strategic decisions concerning wind energy developments and the review of the designation of Facilitated Areas need to be taken in the short term, whilst regulatory and knowledge-base development tasks require a longer timeframe, we recommend establishing a working group structure comprising one group for operational tasks and another for strategic tasks. An expert working group comprising stakeholders representing a range of perspectives would ensure that the designation of ‘Simplified Areas’ and, more generally, the regulations relating to wind energy development are consistent, transparent, balanced and socially acceptable at national level. Involving various stakeholders – such as nature conservation organisations, the energy sector, local authorities, the agricultural sector and civil society – helps to prevent conflicts, enhances the legitimacy of decisions and supports the efficient, rapid and successful implementation of projects.

2) Establishment of a working group (led by the Ministry of Environment and Water Management) to determine nature conservation buffer zones and standardised protocols for the expansion of wind energy capacity and other associated land-use changes

The development of nationally uniform databases of sufficient detail – which are currently lacking – is of fundamental importance for nature conservation-based planning, as they can provide a reliable basis for planning and authorisation processes. *To this end, we urge the urgent establishment and operation of a dedicated working group within the nature conservation sector to develop a common position on the size of buffer zones – such as those concerning the stable populations of protected species threatened by the installation and operation of wind farms and the migration routes of migratory species – as well as the development, in collaboration with the relevant authorities and national park authorities, of a standardised, nationwide protocol for the survey and monitoring of birds and bats.*

When designating areas for renewable energy developments, it is essential that clear and uniform principles be established across all national park authorities’ management areas regarding the prioritisation of habitats of protected species and the designation of buffer zones around them. The establishment of a specialised working group within the Ministry of Environment and Water (which would work in close collaboration with the inter-ministerial working group proposed in point 1) would ensure that nature conservation considerations are applied as soon as possible in a scientifically sound and consistent manner throughout the designation process.

Furthermore, we recommend that the working group's remit should include developing a framework for how national park authorities and other specialist nature conservation organisations should be involved in the planning and authorisation processes for wind energy developments, in the final designation of 'Facilitated Areas', and in the planning of related grid and other infrastructure developments, with a view to minimising and, where possible, avoiding negative environmental impacts. It is important that nature conservation considerations are not confined solely to the consultation phase of already completed documentation, but are also meaningfully incorporated at an early stage of the site designation and infrastructure planning processes; therefore expert opinions must be available as early as the preparatory stage, and we recommend that decision-makers be required to justify any deviations from them.

3 Closing the gaps in basic research necessary for the correct designation of wind turbine development areas, and ensuring access to the (spatial) data required for this

The lag in wind energy over recent decades is also evident in the availability of reliable data. This is partly due to the cumbersome and costly access to existing databases; a review of this restrictive practice is also recommended. Furthermore, the complete lack of public research and development funding for wind energy causes fundamental gaps in knowledge and planning uncertainties for developers, which may indirectly result in significant delays in the actual implementation of projects and jeopardise the achievement of energy sovereignty and climate targets. Data gaps may significantly hinder the sustainable development of the sector in the future. It is therefore recommended that the relevant ministries carry out the following scientific research and analyses as soon as possible:

- A comprehensive and in-depth nationwide social survey on public perception of and support for wind energy developments.
- In order to designate suitable sites for wind turbine developments, and in particular to precisely define 'Facilitated Areas', complex energy planning is required, taking nature conservation considerations into account to the greatest extent possible (see point 7 for further details); therefore, it is necessary to produce GIS calculations and maps based on multi-criteria analysis, and it is recommended that software-based energy modelling calculations, based on real-time weather data, be run and published. To generate the data required for these analyses, which fill a gap in the existing body of knowledge, it is recommended that the human resources available at the Lechner Knowledge Centre be developed in a targeted manner.
- In potentially conflict-prone areas, it is necessary to carry out state-funded, GIS-based research enabling the observation of bird and bat migration routes and nesting habits, and to produce and keep up to date detailed, high-resolution maps; this is particularly true in connection with the revised designation of 'Eased Areas' (see point 7 for further details).

- During wind energy developments, harmonisation with the Nature Restoration Regulation and water retention plans must be taken into account. The precise mapping and demarcation of areas potentially suitable for water retention (heavily waterlogged, flooded) must be accurately mapped and demarcated prior to authorisation, as water retention and the creation of wetland habitats may automatically result in – potentially large-scale – waterbird presence, which could unnecessarily increase the incidence of habitat and collision conflicts.
- In wind energy developments, artificial (brownfield) sites and degraded agricultural land should be treated as a priority (see point 4 for further details). When identifying the latter, we recommend that surveys also cover areas registered as prime agricultural land; where a high ‘golden crown’ value or actual productivity cannot be substantiated, the current prohibitive provisions regarding wind turbine developments should be reviewed. The involvement of the Lechner Knowledge Centre is strongly recommended for the precise mapping and registration of these sites.
- In addition to nature conservation, social and spatial planning considerations, the GIS analyses must also cover grid connectivity, transmission and distribution network development plans, and the examination of the expected locations of new connection points.
- Furthermore, it is recommended that, as with all our domestic natural resources, maps showing the actual wind energy potential – produced using state-of-the-art and reliable LIDAR data collection and made publicly available to everyone nationwide – should also be prepared for wind energy.

We recommend that, in addition to the Lechner Knowledge Centre, domestic civil society organisations and other relevant professional bodies, universities and research institutes with expertise in this field be actively involved in carrying out and analysing this research, so that wind energy developments can be realised in a sustainable manner and within the government's set timeframe.

4) Prioritising artificial land surfaces and heavily degraded agricultural land, and reviewing buffer zones around industrial areas

In the case of wind turbine developments, particularly during the review of the designation of ‘Facilitated Areas’:

a) Priority must be given to artificial and built-up surfaces and land areas: industrial estates, transport infrastructure and other artificial areas have, for the most part, already lost their natural value and may therefore be suitable sites for renewable energy investments. Putting this priority into practice can reduce pressure on near-natural habitats and also improve public acceptance, as it has less impact on the population and

ecosystems. To facilitate this, we recommend reviewing the regulations and planning permission procedures relating to the utilisation of artificial land areas – and in particular existing industrial sites and their immediate surroundings – and, where necessary, relaxing them, as well as taking stock of the results of [ongoing projects](#) in this field.

b) Particular attention should be paid to the possible inclusion of heavily degraded agricultural land that is not particularly suitable for farming, whilst taking into account nature restoration efforts: areas that are already environmentally degraded – such as intensively used arable land or land of low ecological value – can be utilised effectively, thereby serving both energy production and the protection of biodiversity. Incorporating degraded arable land can help to avoid conflicts over nature conservation and encourage the development of economically less viable regions.

At the same time, irrespective of agricultural production potential, particular attention must be paid to the conservation of pasture and meadow land (grasslands with high biodiversity) and periodically waterlogged areas, as these play an important role at the landscape level from an ecological perspective and have high potential for water retention and nature restoration.

c) Adopting an integrated planning approach when planning the development of the electricity grid: When planning the development of the electricity grid, wind energy potential and nature conservation considerations must be taken into account in an integrated manner. The designation of grid infrastructure and connection points fundamentally determines the spatial direction of wind energy developments in the long term; therefore, the early involvement of nature conservation stakeholders is also justified in these decision-making processes.

We also recommend that, when determining new connection points, the availability of areas within a 15 km radius that are considered to pose a low risk from a nature conservation perspective should be assessed in every case. When allocating connection points, priority should be given to those points around which, based on geospatial analyses, low-risk areas significantly exceeding the planned capacity are available.

5) Promoting the establishment of wind energy-based energy communities by creating opportunities to involve local (residential, SME or other private) capital

We recommend that local land users, landowners, rural communities and even urban residents living in nearby or more distant towns should be able to participate in the financing of wind energy projects and share in the benefits proportionately. To this end, we recommend that the current legislation on energy communities be supplemented with detailed rules specifically relating to wind energy. The social acceptance and sustainability of renewable energy projects can be significantly enhanced if local communities – particularly landowners and land users – have a genuine financial stake in the investments. Experience from abroad shows that community participation enables those affected to be not merely the victims, but also the beneficiaries of such developments. This helps to strengthen the rural economy,

reduces social resistance and contributes to the creation of a fairer energy system.

6) Transparent monitoring of the environmental impact of wind energy projects, and the development of standardised survey protocols to support the licensing process and protect bird and bat species

It is important to monitor completed projects from a nature conservation perspective (e.g. through the publication of real-time noise monitoring data and bird/bat mortality figures) and to review spatial planning documents every 3–5 years. The results of monitoring must be collected in a nationally standardised database and regularly evaluated so that the experience gained can be directly utilised in the planning and authorisation of future investments.

Continuous and transparent nature conservation monitoring is essential for the long-term sustainability of renewable energy investments, as is ensuring that, during the power transmission network developments essential for project implementation, bird protection aspects are fully taken into account (e.g. habitat restoration, the use of bird-deterrent devices and, where possible, prioritising underground cabling), as this is the only way to ensure that the original objectives – such as the conservation of biodiversity – are met throughout every phase of wind turbine projects and in relation to all associated elements. The condition of habitats and the response of species may change over time; therefore, in accordance with the principle of evidence-based conservation, completed projects must be regularly assessed. Furthermore, reviewing spatial planning documents every 3–5 years ensures that they remain in line with the latest ecological, technological and social knowledge. This cyclical updating ensures that areas not yet used for development but which show potential are indeed suited to the prevailing environmental conditions and development priorities.

In the case of projects implemented in ‘Simplified Areas’, it may be justified to impose additional obligations relating to accelerated and simplified procedures. In this context, standardised monitoring requirements, regular data reporting and long-term monitoring of environmental impacts could ensure that the benefits arising from the simplified procedures are accompanied by appropriate professional safeguards.

7) Conducting a Strategic Environmental Assessment for Simplified Areas

In accordance with EU legislation, the preparation of a Strategic Environmental Assessment (SEA) is mandatory prior to the designation of potential sites for wind farms. Act LIII of 1995 on the General Rules of Environmental Protection, as well as the relevant EU directives and the domestic legislation transposing them, stipulate that any planning document drawn up by a national, regional or local authority which is likely to have a significant impact on the environment may only be adopted following an environmental assessment or a so-called strategic environmental assessment (SEA). Although the EU has developed streamlined procedures for renewable energy developments, even under RED III, *the designation of domestic ‘Streamlined Areas’* must be preceded by such a complex environmental assessment procedure, as a result of which provisions aimed at preventing potential nature conservation issues and minimising environmental impact must be adopted. It is both practical and lawful to conduct a national SEA procedure prior to the designation of wind energy development areas,

which is not merely tasked with assessing environmental risks, but also provides an opportunity to inform the public in detail, involve stakeholders and facilitate the broadest possible public consultation. It is advisable to address the majority of the siting criteria set out in our proposals within the framework of a national SEA procedure developed with appropriate detail, as this procedure encompasses all essential decision-preparation processes, from data collection through stakeholder consultation to the integration of policy considerations.

Given that the review of the designation of ‘Simplified Areas’ is expected to take place shortly, and that the national SEA procedure is not capable of comprehensively addressing all local conflicts and information that may become available at a later date, a review should be carried out within a maximum of 12–18 months following the current designation. The review must take into account new information relating to nature conservation, grid infrastructure, social issues and energy, as well as practical experience gained during the process. Based on the results of the review, it must be possible, where necessary, to amend the boundaries, conditions or related requirements of the ‘simplified’ zones.

8 Requirement for environmentally friendly technological solutions during operation

In order to minimise bird and bat mortality, in addition to appropriate installation, it may also be necessary to require modern operational practices. Examples include artificial intelligence-based camera systems that detect endangered species and bird movement prediction systems (IdentiFlight AI-based and radar-based systems), or the shutdown of turbines during the breeding and migration periods of certain species. We recommend that these protocols and the framework for their application be developed by the working groups established in accordance with points 1 and 2.

Furthermore, we recommend that legislators examine how wind farm operators can be involved in offsetting the unavoidable habitat displacement effects of the installations on certain bird species, e.g. by supporting habitat creation programmes – as set out in nature restoration plans – located at a safe distance from the wind farms. It is important to emphasise, however, that activities of this nature can in no way replace professional and low-risk site selection, but they can support the implementation in Hungary of EU trends aimed at impact mitigation and biodiversity enhancement, as well as proven international best practices.

9 Developing and launching transparent and credible public awareness-raising and information campaigns

Large-scale and rapid wind energy developments rely on achieving and maintaining consistent and favourable public support; this is particularly true for those living near wind farms. It is therefore recommended that scientifically rigorous, transparent and balanced public information on the technology and developments be developed. It is recommended that local and national civil society organisations working on this issue be actively involved in the implementation of awareness-raising communication campaigns.

It is recommended that the monitoring results and key environmental performance indicators of projects carried out in designated areas be made publicly available. Public data and regular updates can not only strengthen public acceptance but also create opportunities for the experience gained during these developments to be widely utilised in the planning of future investments.

+1) Establishment of a national energy planning and environmental management centre

The success of the sustainable energy transition lies in deliberate and well-organised planning that spans government terms; therefore we recommend the creation of a 'National Energy Planning and Environmental Management Centre' that effectively synthesises the work of experts essential for sustainable and long-term energy planning and the related – and broader – environmental management (e.g. energy specialists, geographers, engineers, conservationists, sociologists, etc.). In addition to coordinating the proper installation of wind turbines and other renewable energy generation and storage projects, the centre can play an active role in a number of other key areas, such as the implementation of building energy efficiency programmes, the organisation of one-stop advisory centres, or the support and monitoring of the implementation of municipal/county SECAPs, as well as in supporting and monitoring the implementation of the mitigation and energy poverty measures set out in the NEKT. Furthermore, it can play a role in promoting conscious and energy-efficient consumption habits, as well as smart DSM (demand-side management) solutions.

Initiating organisations and their representatives:

1. WWF Hungary; Dr Zoltán Fehér, Director of Nature Conservation
2. Environmental Planning and Education Network, Dr Béla Munkácsy, Chair
3. Solidarity Economy Centre Association, Dr András Molnár, Board Member
4. Hungarian Nature Conservationists' Association, Ákos Éger, Executive Chairman
5. Climate Protection Alliance, Csaba Lajtmann, Chair
6. Reflex Environmental Protection Association, Ferenc Horváth, Chair
7. Greenpeace Hungary Association, János Bálint Mező, Executive Director
8. Hungarian Ornithological and Nature Conservation Society, Dr Gergő Halmos, Executive Director
9. Energy Club Policy Institute, András Kéri, Executive Director

Organisations supporting the proposals and their representatives:

1. Department of Environmental and Landscape Geography, ELTE Faculty of Science, Dr Béla Munkácsy, Head of Department
2. Little Owl Conservation Foundation, Dr Ákos Klein, Executive Director
3. F6 Association for Sustainability, Anna Czigány, Chair
4. Jánoshida Local Council, Béla Eszes, Mayor
5. Bakony Bat Conservation Foundation, József Mészáros, Chair of the Board of Trustees
6. Green Geo Ltd., Dr Balázs Trásy, Managing Director
7. Regional Energy Economics Research Centre, László Szabó, Director
8. Envirosens Ltd., Dr Péter Burai, Managing Director
9. HUN-REN Energy Science Research Centre, Dr Ákos Horváth, Director-General
10. Hungarian Wind Energy Industry Association, Péter Lendvay, Chairman

