

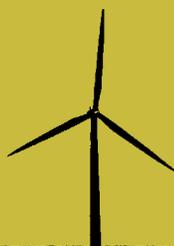


*Empowered lives.
Resilient nations.*

NATURE PROTECTION AND WIND FARM DEVELOPMENT IN SERBIA



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This publication was prepared with extensive support and valuable contribution of the Ministry of Energy, Development and Environmental Protection, Ministry of Natural Resources, Mining and Spatial Planning, Provincial Secretariat for Urban Planning, Construction and Environmental Protection, Institute for Nature Conservation of Serbia, Institute for Nature Conservation of Vojvodina Province, Natural History Museum and Serbian Wind Energy Association.

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Foreword

Securing sufficient energy supplies is one of the bases of economy and preconditions of welfare in a country. In energy sector, development of renewable energy sources and increase of its share in the overall energy consumption is high on the political agenda of Serbia. In that regard, development of wind farms has a potential for bringing many benefits to Serbian society, firstly by securing additional sources of energy necessary for growth, but also in reducing greenhouse gases emissions contributing thus to the country's efforts to combat climate change.

At the same time, Serbia is recognized as one of the biodiversity centres of Europe hosting 43.3% of all existing European species. Biodiversity and ecosystems provide to Serbian society valuable goods and services including secure livelihoods, food, water and health, enhanced resilience, conservation of threatened species and their habitats, and increased carbon storage and sequestration. This rich natural heritage is a national legacy and a valuable stake for wellbeing and growth of current and future generations.

Any human intervention that implies changes in the land use can have an impact on nature, on species and their habitats. In order to be truly sustainable it is important to ensure that the wind energy development respects other needs of the country, including social, economical and environmental ones. Careful and strategic planning with early participation of different and relevant stakeholders allows creation of wise solutions and help in minimizing the negative effects of such investments on nature. In addition, projects that respect environmental standards and interests of local communities are likely to be easier acceptable, more efficient and easier to implement hence equally beneficial for the investors.

UNDP is committed to supporting sustainable development pathways of Serbia that respect broader societal needs and integrate biodiversity values and environmental concerns for wellbeing of people. Through the provision of sound policy advice and the development and implementation of programs and projects, UNDP assists the authorities and people of Serbia to increase capacities to manage the biodiversity in sustainable manner.

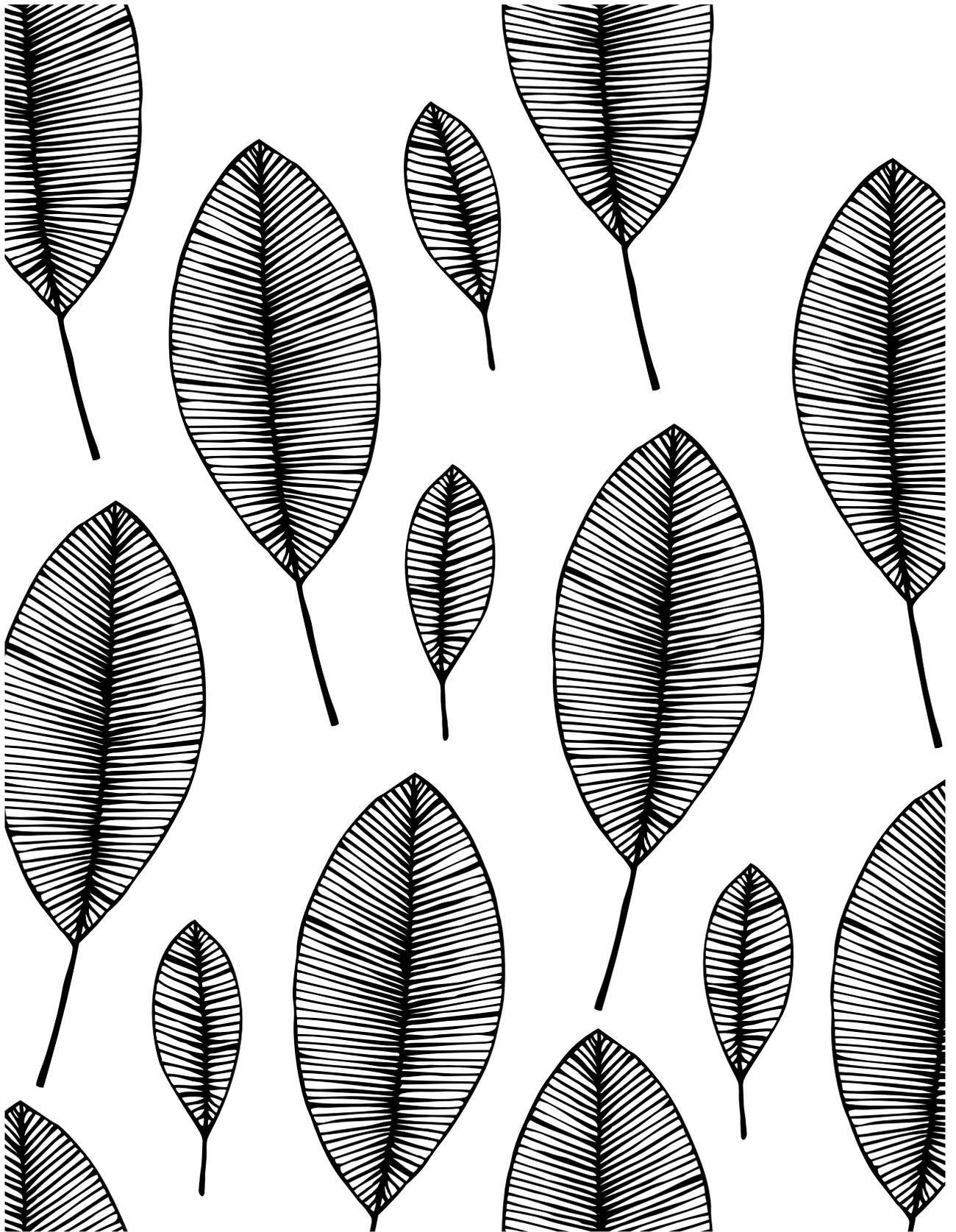
The purpose of this publication is to provide a framework for integration of biodiversity principles in wind energy development in Serbia. It presents an overview of both Serbian and EU legal and policy framework for wind energy and nature conservation, but also offers recommendations and best practices available.

I hope that the publication will help foster implementation of environmental standards and constructive communication among stakeholders in the process of wind energy development in Serbia.



Jürg Staudenmann

UNDP Deputy Resident Representative



CONTENTS

1. LEGISLATIVE FRAMEWORK FOR WINDPOWER SECTOR AND NATURE PROTECTION IN THE EU AND SERBIA	6
1.1. Overview of the Legislative Framework in the EU	7
1.2. Overview of the Legislative Framework in the Republic of Serbia	12
1.3. Comparison of the Legislative Frameworks of the EU and Serbia	18
2. DEVELOPMENT OF THE WIND POWER SECTOR IN SERBIA -STATUS AND OUTLOOK	20
2.1. Status and Development of the Wind Power Sector in the EU and Serbia	21
2.2. Contemporary trends in the Development of Technology for the Wind Energy Deployment	24
2.3. Wind farm locations in Serbia	25
3. POTENTIAL IMPACTS OF WIND FARMS ON ENVIRONMENT, HABITATS AND SPECIES	30
3.1. Status and outlook of biodiversity in the Republic of Serbia	31
3.2. Impacts of wind farms on the environment, habitats and species	33
3.3. Impacts of wind farms on birds and bats	37
4. SOCIO-ECONOMIC FRAMEWORK FOR WIND FARM DEVELOPMENT	42
4.1. Wind farm projects investment and profitability	43
4.2. The impacts of wind farms on local, regional and national levels	44
5. SOCIAL AND ENVIRONMENTAL REQUIEMENTS MATRIX	48
6. BEST PRACTICES AND ACTIONS TO MITIGATE THE IMPACTS OF WIND FARMS	52
7. WIND FARM POSITIVE AND NEGATIVE IMPACTS MATRIX AND PROJECT CATEGORISATION	58
8. ENVIRONMENTAL IMPACT MONITORING PLAN	60
9. RECOMMENDATIONS	64
REFERENCES	67
ANNEX I: List of relevant legislation of the Republic of Serbia	69
Strategic documents	69
Laws	69
By-laws	70
International Conventions ratified by the Republic of Serbia important for nature protection:	71

1.

LEGISLATIVE FRAMEWORK
FOR WIND POWER SECTOR
AND NATURE PROTECTION
IN THE EU AND SERBIA

On a path to obtaining the candidacy status for accession to the European Union, the Republic of Serbia undertook a great number of obligations and regulations in the area of energy and protection of nature and the environment. One of the energy priorities on a national and European level is the development of renewable sources of energy. In developing the plans for usage of wind energy it is necessary, along with the implementation of good practice, to strictly adhere to the existing legal provisions regulating the area of environment and nature protection in order to minimize the impact of the stated technology on the environment.

1.1. Overview of the legislative framework in the EU

Implementation of the European policy concerning the environment and nature protection is based on the principle of prevention and precaution and aims to ensure high standards in order to contribute to general strategic goal of sustainable development. Nature is considered the key asset in economic and social capital so along with achieving these goals the aim is to integrate the environmental protection into appropriate EU policies in other areas, the most important ones being agriculture, transport, regional development and energy.

Energy (generation, processing and consumption of energy) is the area which, apart from being considered a big pollutant of the environment, also represents an important strategic determinant of the EU's economic policies development. As an illustration, one should consider the Green Paper – A European Strategy for Sustainable, Competitive and Secure Energy¹ from 2006 which defines the EU's strategic determinants in the area of energy, with the focus on renewable energy sources (RES) development.

7

The Directive defining the entire area of renewable energy sources, which does not only imply the generation of electric power but also generation of heat energy and the biofuels sector is the **Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC**. It sets goals and determines the monitoring process for accomplishment of these goals. The Directive specifies the target of a minimum 20% share of energy from renewable sources in the overall energy consumption by 2020, 10 % target for energy from renewable sources in transport by 2020, mandatory development of national action plans for achieving the national goals and increasing the share of RES in the sectors of heating and cooling, electricity and transport.

The development of the energy supply system is accompanied by the development of the regulations linking the impact of energy power sector with the measures to protect the environment and nature representing thus the important determinants of EU legislation. A general strategic goal in the area of natural resources conservation and management would be "improvement of management and avoidance of excessive exploitation of natural resources starting with the values provided by the ecosystem" [1]. Principles and priorities that identify the EU's strategic policy in that area are the EU Action Plans. Currently, the 7th action plan (environmental action programme) "Living Well, Within the Limits of Our Planet" is in force. It provides the policy framework for protection of environment and nature until 2020. The said action programme is

¹ Available at <http://ec.europa.eu/green-papers/> (accessed on October 16, 2013)

oriented towards nine goals and priorities and it complements the series of strategic documents and action plans.²

The EU Biodiversity Strategy to 2020³ plays an important role for nature protection. It defines six main targets through twenty actions in order for the European Union to achieve the set targets concerning the protection of biodiversity by 2020. The Strategy is in line with the commitments undertaken in Nagoya in October 2010 at the Convention on Biological Diversity where a set of measures was adopted to solve the global biodiversity depletion in the decades to come.

1.1.1. Overview of the most important sources of EU law in the field of nature protection

What follows is a short overview with concise comments on the most important sources of EU law in the field of nature protection that are particularly important for the wind farm projects development.

The Birds and Habitats Directives

Birds Directive and Habitats Directive are the cornerstones of the EU's nature protection legislation. These two directives together present an ambitiously high standard of nature protection and conservation for all EU Member States.

The Birds Directive (Directive 2009/147/EC on the conservation of wild birds, the codified version of the Directive 79/409/EEC as amended) aims at providing protection for all bird species naturally occurring in the wild state in the European territory of the Member States, including their eggs, nests and habitats; it also governs their control and exploitation of selected species (Article 1). The Member States shall take the measures to preserve, maintain or re-establish a sufficient diversity and area of habitats for all the species of birds referred to in Article 1 including creation of protected areas; upkeep and management in accordance with the ecological needs of habitats inside and outside the protected zones; re-establishment of destroyed biotopes; creation of biotopes (Article 3). Special protection measures are specified for a plenty of bird species listed in Annex I; those measures apply also to regularly occurring migratory species. The same Directive also requires all EU Member States to identify the most important areas for 194 Annex 1 as well as all migratory species regularly occurring in any given EU Member State as Special Protection Areas (SPAs), paying particular attention to wetlands of international importance.

The Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) aims to contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States. The objective of all measures taken pursuant to this Directive is to maintain or restore, at favourable conservation status, selected habitat types and species of animals and plants (other than birds) which are endangered, rare, vulnerable, or represent typical characteristics of European habitats and fauna and flora. Those habitat types and species are listed in the annexes to the Directive. Out of them, habitat types from Annex I and species from Annex II require designation of Special Areas of Conservation (SACs) for their long-term conservation and protection, based on the selection criteria specified in another annex to the Directive. The

² Note: "Europe 2020: Strategy for Smart, Sustainable and Inclusive Development," "EU Climate and Energy Package", "Roadmap for Moving to a Low-carbon Economy in 2050", "The EU Biodiversity Strategy to 2020," "Roadmap to a Resource-Efficient Europe," Available at: <http://eur-lex.europa.eu/> (accessed on October 16, 2013)

³ Available at <http://ec.europa.eu/environment/nature/biodiversity/comm2006/2020.htm> (accessed on October 16, 2013)

other species from Annex IV require strict species protection at the entire territory of the EU Member States, while species from annex V may be subject to specific measures preventing their over-exploitation.

Natura 2000 - EU's ecological network

In the heart of the above-stated Directives lies a creation of an ecological network consisting of conservation areas throughout Europe – Natura 2000 network. Each EU Member State contributes to this network by designating the most important areas of occurrence of each individual species and type of habitat listed in the corresponding Annexes to the Directives. There is no specified percentage of the territory that the countries should include in the network: the final area is a result of expert evaluation of the distribution and quality of occurrences of particular habitat types and species and their spatial overlap.

Special Protection Areas (SPAs), designated according to the Birds Directive become automatically part of the Natura 2000 network. The selection and designation of sites under the Habitats Directive is subject to a supra-national control by the European Commission and has several stages during which the sites bear different names: “proposed sites of Community Importance” (pSCI) when the country submits their proposal to the EC; “sites of Community Importance” (SCI) after the sites will have been approved by the EC; and, finally, “Special Areas of Conservation” (SACs) after the SCIs will have been designated at the national level and provided with relevant protection required by the Directive. Both areas (SPAs and SACs) are usually simply called Natura 2000 sites since together they represent the EU's ecological network Natura 2000

The goal of conserving the Natura 2000 sites has already been set in the Habitats Directive: the Member States have the obligation to at least preserve the current status of the target species and habitats unless the governments have set a higher, more ambitious goal. So far, around 26,000 sites⁴ have been included into Natura 2000 network all over the EU which makes it the biggest network of protected areas in the world. It is important to note that Natura 2000 is not replacing the national protected areas systems. Instead, it is supplementing them since it frequently overlaps with the national protected areas, as well as the national ecological networks.

9

Appropriate Assessment

The most important mechanism for protecting the areas in Natura 2000 network is the appropriate assessment of the implications of plans and projects, including strategies, plans, programmes, projects, works and activities. Generally speaking, this assessment should secure the conservation of target species and habitats on Natura 2000 sites, so that this whole network should remain unchanged in long term and achieves its main goal – to efficiently contribute to conservation of biodiversity in the European Union. The obligation to assess the implications of plans and projects for Natura 2000 sites and the associated procedures has been stipulated in Articles 6(3) and 6(4) of the Habitats Directive (92/43/EEC). Article 6(3) specifies the proper assessment; Article 6(4) explains the procedure “imperative reasons of overriding public interest” (IROPI) and compensatory measures.

When new development plans or projects are proposed that may have effect on the sites of Natura 2000 network, i.e. on their conservation objectives and site integrity (such plans or projects may include, in addition to development construction projects, also for example significant changes in the traditional land use both within and around a Natura 2000 site such as planting commercial forest or turning the

⁴ Available at: http://ec.europa.eu/environment/nature/index_en.htm (accessed on October 16, 2013)

meadow into cultivated land), they will be subject to the procedure of the appropriate assessment in order to determine whether further development of the plan or project may be allowed or not:

Step 1: The first phase (often called screening) is to determine whether a plan or a project may have significant impact on the values of the Natura 2000 site. If no likelihood of any impact has been determined, the plan or project may be approved right away even though it will be carried out within the Natura 2000 site.

Step 2: If, on the other hand, the significant impact of a plan or project on a Natura 2000 site cannot be excluded, the plan or project has to be subject to the proper appropriate assessment. Should the outcome of that assessment say there is likelihood of significant adverse impact on the target habitat types and/or species of a Natura 2000 site the plan or project cannot be granted permission. In such a case, the project proponent is required to change the proposed intervention in order to remove those effects or to consider alternative solutions without the negative implications for that site. For example, that may involve changing the route of the proposed roads so that they pass outside the Natura 2000 sites.

Step 3: If there are no alternative solutions, and the plan or project is nevertheless deemed necessary for the imperative reasons of the overriding public interest, it can continue provided that all appropriate compensatory measures have been agreed ensuring the connectivity and coherence of the Natura 2000 network. Compensatory measures can, for example, consist of determining the equivalent area on a different location for the affected species or habitat types or establishing nearby areas of the potentially same or higher value. European Commission must be informed about all compensatory measures proposed for any plans or projects approved in step 3 in order to be able to check that the overall coherence of Natura 2000 network has not been affected [2].

10

There is another protection measure for the plans or projects that can affect the site hosting so-called priority habitat types and/or a priority species, i.e., those that are particularly endangered or vulnerable. In such cases, the plan or project holder must prove that the plan or project is necessary only for reasons relating to human health or public safety, or establishment of considerably more beneficial conditions of primary importance for the environment; in other cases the government has to ask European Commission for its opinion.

The national competent bodies in the EU Member State adopt the decisions pertaining to steps 1 to 3. The European Commission whose duty is to monitor the correct implementation of the EU law may intervene regarding these decisions only if there is an official complaint on the decision made by the Member State

Example:

Case study – Appropriate Assessment: „Medvědí skála” (Bear rock) wind park project in north Bohemia, Czech Republic, 2007

A big international construction company asked for a permission to build the wind park on the Krušné hory plateau in the Northwest Czech Republic in the middle of an extensive Special Protection Area (SPA) for the black grouse (*Tetrao tetrix*). Three options were proposed with respectively 18, 16 and 12 wind turbines. Pursuant to the Czech nature protection law, the appropriate assessment procedure was implemented by two independent groups authorized by the Ministry of Environmental Protection and the outcome showed that in proposed location the wind parks with 13, 12 and 10 wind turbines would have a significant adverse effect on grouse, due to their proposed location in bird mating places. Thus all three alternatives were unacceptable. At the investor's request however, the authorised groups helped develop another alternative with 13 wind turbines on a completely different location. Appropriate assessment revealed that five wind turbines would have only insignificant adverse effects. The investor agreed with the alternative and successfully continued with the environmental impact assessment. In order to mitigate the insignificant adverse effects, the investor took the obligation to rehabilitate the water regime in 150 ha of degraded bog next to the grouse mating place (important resting habitat) [3].

1.1.2. Overview of the most important sources of EU law in the field of environmental protection

11

What follows is a short overview with concise comments on the most important sources of EU law in the area of environmental protection relevant for the RES sector that are particularly important for the wind farm projects development.

• **Environmental Impact Assessment Directive (2011/92/EU)**

aims to establish and upgrade a system of environmental impact assessment regarding those public and private projects that may have significant environmental impact. The impact assessment is based on the principle that the best environmental policy is to prevent the occurrence of pollution and disturbances at the source. The EU Member States are undertaking the obligation to adopt all necessary measures to ensure that certain projects are subject to environmental impact assessment prior to issuing consent. A general provision specifies those as projects likely to have significant effect on the environment by virtue of their nature, size or location. In Article 4 the Directive refers to Annexes defining the types of projects that require the assessment or a decision on the need to do the environmental impact assessment. Environmental impact assessment will identify, describe and assess the direct and indirect effects on human beings, fauna, flora, soil, water, air, climate, landscape, material assets, cultural heritage and the interaction between these factors (Article 3).

• **Strategic Environmental Assessment Directive (Directive 2001/42/EC)**

aims to ensure a high level of environmental protection and create conditions to include all factors of relevance for the environment in the process of preparation and adoption of plans and programmes if their

implementation could have a potential considerable impact on the environment. Pursuant to the provisions of Article 2 of the Directive, the term “plans and programmes” shall mean plans and programmes subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared for adoption by an authority through an appropriate procedure. The strategic assessment is submitted along with the plan or programme and includes all necessary data, explanations and descriptions in textual and graphic form. The strategic study determines, describes and assesses the likely significant environmental effects that could be caused by the implementation of the plan or programme including the alternatives that take into account the goals and scope of the plan and programme.

- **Directive on public access to environmental information (Directive 2003/4/EC)**

aims to ensure freedom of access to, and dissemination of information on the environment held by public authorities and to set out the basic terms and conditions under which such information should be made available.

- **Directive on providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment (Directive 2003/35/EC)**

aims to facilitate the implementation of the obligations arising under the Århus Convention by providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment, improving the public participation and providing for access to justice concerning the environmental impact assessment activities for certain public and private projects and issuance of permits within the integrated pollution prevention and control.

- **Directive on environmental liability (Directive 2004/35/EC)**

aims to introduce liability with regard to the prevention and remedying of environmental damage between the operators and public authorities concerning the prevention of environmental damage and remedy of environmental damage after it occurs.

- **Directive on assessment and management of environmental noise (Directive 2002/49/EC)**

aims to define a common approach to avoiding, preventing or reducing the harmful effects of exposure to environmental noise, including the noise-related disturbances.

1.2. Overview of the legislative framework in the Republic of Serbia

By signing the Energy Community Treaty with the European Community the Republic of Serbia accepted the rules of expanding the EU's internal energy market to its region and compliance with the requirements to improve social, economic and ecological standards in the region. The Treaty that entered into force on July 1, 2006 (“Official Gazette of the Republic of Serbia” no. 62/06) and was entrusted for implementation to the Ministry in charge of energy, represents a key document between Serbia and the EU in the area of energy and involves the energy sector reforms necessary for the EU accession process, preparation of energy market for full application of European rules and application of EU directives and participation in a single European energy market.

Equally important as the obligation undertaken within the Energy Community framework is the environmental improvement, increase of energy efficiency and use of renewable energy sources in the region. The development of alternative options for production of electricity and making the comprehensive Investment

Plan publicly available are the results of the undertaken obligations. The above-mentioned is the basis for conducting public discussions concerning the revision of spatial plans and other accompanying planning documentation passed before the adoption of the Energy Community Treaty.

The Republic of Serbia ratified the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, Convention on Long-Range Transboundary Air Pollution (CLRTAP) and its protocol on long-term financing of co-operative programme for monitoring and evaluation of the long-range transmissions of air pollutants in Europe (European Monitoring and Evaluation Programme - EMEP). As a Non-Annex I Party to the Kyoto Protocol, the Republic of Serbia took the obligation to reduce emissions of greenhouse gases but without the binding targets.

The construction of wind farms and generation of electricity in those wind farms is regulated in numerous regulations of the Republic of Serbia. The sources of law of the Republic of Serbia in that area may be classified into two big sets of regulations [4]

- the first group consists of regulations governing construction of a specific energy structure and a way to obtain the construction permit for such structure, as well as the way to determine if the structure is suitable for use and obtaining of certificate of occupancy for the structure. The regulations governing the area of construction prescribe the procedure for obtaining the location permit, construction permit and certificate of occupancy and planning documents define the goals of spatial planning and development, i.e. spatial development.⁵ Special emphasis in this group of regulations belongs to those governing the protection of environment and nature as well as the legal status of wind and water⁶;

- the second group consists of regulations related to acquiring of rights for performing generation of electricity⁷.

13

Procedures for obtaining various permits granted by the state (administrative) bodies and other procedures necessary to obtain the accompanying documentation are administrative procedures. Deadlines for obtaining these acts are specified in the same regulation governing the procedure to obtain the specific administrative act. In case these deadlines are not identified in specific regulations, the Law on General Administrative Procedure ("Official Gazette of FRY" no. 33/97 and 31/2001 and "Official Gazette of RS" no. 30/2010) will be applicable for the deadline for issuing a specific administrative act.

Environmental targets pertaining to the emission of hazardous matters from generation and consumption of energy are contained in the energy policy of the Republic of Serbia. Along with that, certain environmental requirements are stated in the legislation that is being adjusted to the European standards and as part of the obligations under wider international agreements.

5 Note: Law on Planning and Construction, Law on Spatial Planning of the Republic of Serbia from 2010 to 2020 and bylaws adopted pursuant to these laws.

6 Note: Law on Environmental Protection, Law on Environmental Impact Assessment, Law on Nature Protection, Law on Integrated Pollution Prevention and Control, Law on Air Traffic, Law on Protection of Air, Law on Water, Law on Forests and bylaws adopted pursuant to these laws.

7 Note: Energy Development Strategy for the Republic of Serbia until 2105, Programme of Implementation of the Energy Development Strategy for the Republic of Serbia, The Energy Law, bylaws adopted pursuant to these laws and other regulations related to energy activities, structures and the like.

1.2.1. Obtaining the status of privileged power producer in development of wind farms

The Energy Law from 2011 ("Official Gazette of the Republic of Serbia" no. 57/2011, 80/2011 - corr., 93/2012 and 124/2012) defines the legislative framework for renewable energy sources (RES) and it transposes to great extent the main principles from the Directive 2009/28/EC such as the incentives for generation of electric and thermal power from renewable energy sources and production of biofuels, defining the privileged producers of energy from renewable sources, introduction of the guarantee of origin for generation of electric and thermal power from RES. In January 2013, the Government adopted the bylaws in line with the Energy Law that can be applied both to the RES sector and the wind farms⁸. Through the stated acts the installed capacity of incentivized energy production from wind farms have been raised to the maximum of 500 MW by 2020. Furthermore, a framework was adopted for contracting the purchase of electric power by the system operators from the privileged power producers using RES. The feed-in tariffs were also defined for various renewable energy sources which in the case of wind farms amounts to 9.20 €/kWh.

In order to build and use the wind farms in the Republic of Serbia as a privileged power producer, it is necessary to fulfill the following conditions: 1) to obtain the energy permit; 2) to obtain the location permit; 3) to obtain the construction permit; 4) build the structure and 5) perform the technical building inspection, obtain the certificate of occupancy and acquire the status of privileged producer.

A detailed description of administrative procedure for acquiring the status of privileged power producer for wind energy is provided in the publication "Construction of Wind Farms and Electricity Generation from Wind Energy in the Republic of Serbia – Guide for Investors" [5].

14

1.2.2. Nature protection legislation

Nature protection system in the Republic of Serbia, as well as the basic classification of protected resources, are defined in the Law on Environmental Protection ("Official Gazette of the Republic of Serbia" no. 135/04 and 36/09) and the Law on Nature Protection ("Official Gazette of the Republic of Serbia" no. 36/09, 88/10 and 91/10 – correction). These laws ensure the exercising of a man's right to live and develop in a healthy environment and balanced relation between economic development and environment in the Republic of Serbia; they regulate the integral environmental protection system, protection and conservation of nature, biological, geological and landscape diversity. Apart from the stated laws, the nature protection is regulated through bylaws (regulations, orders, rulebooks, decisions on protection of natural resources) as well as through ratified international agreements.

Other relevant laws in the area of biodiversity protection include: Law on Strategic Environmental Assessment ("Official Gazette of the Republic of Serbia" no. 135/04), Law on Environmental Impact Assessment ("Official Gazette of the Republic of Serbia" no. 135/04 and 36/09), Law on National Parks ("Official Gazette of the Republic of Serbia" no. 39/93, 44/93, 53/93, 67/93, 48/94, 101/05 and 36/09 – as amended), Law on the Spatial Plan of the Republic of Serbia from 2010 to 2020 ("Official Gazette of the Republic of Serbia" no. 88/10).

⁸ Regulation on incentive measures for privileged electricity producers ("Official Gazette of RS" no. 8/2013-4); Regulation on conditions and procedure for acquiring the status of privileged electricity producer ("Official Gazette of RS" no. 8/2013-9); Regulation on accounting and distribution of funds collected based on the fee for providing incentives to privileged electricity producers ("Official Gazette of RS" no. 8/2013); Regulation on the amount of the special incentive fee in 2013 ("Official Gazette of RS" no. 8/2013).

Law on Environmental Protection sets out the basic principles of nature protection and development, establishes criteria and conditions for sustainable management of natural resources and assets and introduces the measures and conditions of environmental protection.

Law on Nature Protection regulates the protection, conservation and development of biological (genetic, species and ecosystem), geological and landscape diversity, through harmonization of human activities, economic and social development plans, programmes, bases and projects with sustainable use of renewable and non-renewable natural resources and long-term conservation of natural ecosystems and a natural balance. That must be ensured through determination and monitoring of nature status and timely prevention of human activities and actions which may lead to permanent depletion of biological, geological and landscape diversity, as well as disturbances with negative consequences for nature. Wild species that are endangered or may become endangered and have special importance from the aspect of genetics, ecology, ecosystem, science, health, economy etc. are protected as strictly protected wild species or protected wild species. The list of protected species is defined in the Regulation on Proclamation and Protection of Strictly Protected and Protected Species of Wild Plants, Animals and Fungi ("Official Gazette of the Republic of Serbia" no. 5/10 and 47/11).

Areas of exceptional geological, biological, ecosystem, and/or landscape diversity can be declared as protected areas of general interest. The Law on Nature Protection and the Decree on the Ecological Network define the ecological network as a group of functionally related or spatially close ecologically important areas that significantly contribute through bio-geographical representation to conservation of biodiversity, including the ecologically significant areas of the European Union Natura 2000.

Protected natural resources in the Republic of Serbia are as follows:

- 1) protected areas (strict nature reserve, special nature reserve, national park, monument of nature, protected habitat, landscape of outstanding features, nature park);
- 2) protected species (strictly protected wild species, protected wild species);
- 3) mobile protected natural specimens.

Biodiversity Strategy of the Republic of Serbia for the period 2011- 2018 defines the targets in the area of biodiversity protection at the level of the state in line with the national requirements and possibilities, as well as the obligations of the Republic of Serbia as a signatory to the Convention on Biological Diversity (Biodiversity). The Strategy was adopted for the period of seven years (2011-2018), and the activities were defined for the short-term with the implementation period of 1-3 years, mid-term 3-5 years, long-term 5-7 years and continuously. The Strategy defines the basic principles of biodiversity in Serbia; it identifies the main pressures on biodiversity and describes the targets and activities for its conservation. As part of the Strategy, the Action Plan for Implementation of the Biodiversity Strategy of the Republic of Serbia for the period 2011 - 2018 was adopted together with activities, implementing entities and deadlines for execution as well as potential financial sources for Strategy's implementation.

The Republic of Serbia ratified the Convention on Biological Diversity in 2001 whose goals are conservation of biodiversity, sustainable use of biodiversity components, access to genetic resources and sharing the benefits arising from the utilization of genetic resources in a fair and equitable way. The Republic of Serbia recognizes and supports the global strategic goals of biodiversity – the Aichi Targets that were adopted at the Tenth Conference of the Parties to the Convention on Biological Diversity on October 2010 in Nagoya.

Furthermore, the Republic of Serbia is a signatory to numerous other international agreements regarding the protection of nature and biodiversity: Convention on Conservation of European Wildlife and Natural Habitats, Convention on the Conservation of Migratory Species of Wild Animals, Convention on Wetlands of International Importance especially as Waterfowl Habitat, Convention concerning the Protection of the World Cultural and Natural Heritage, Convention on International Trade in Endangered Wild Fauna and Flora – CITES[6].

1.2.3. Measures and conditions for nature protection relevant for wind farm project development

According to the Law on Nature Protection, the project holder i.e. legal entity, entrepreneur and natural person using the natural resources, performing construction and other type of works, activities and interventions in nature, is obliged to act in accordance with nature protection measures specified in the plans, bases and programmes in line with the project and technical documentation in such a way as to avoid or minimise endangering or harming the nature. After the works and activities have finished, legal entity, entrepreneur and natural person are obliged to conduct rehabilitation i.e. recultivation.

While performing activities that may have effect on protected areas and space within the ecological network, as stated in Article 9 of the Nature Protection Law, one must comply with the conditions for nature protection issued by the competent Institute for Nature Conservation (hereinafter: Institute).

The act on conditions for nature protection is issued by the Institute in form of a decision. In case the applicant does not commence with works and activities for which the act on conditions for nature protection was issued, he must obtain the new act. A fee is charged for collection and assessment of information necessary for issuing the act on conditions for nature protection.

An appeal may be filed pertaining to the act on conditions for nature protection to the Ministry in charge of environmental protection within 15 days and on the territory of autonomous province - to the body in charge of affairs concerning the environmental protection of autonomous province.

Pursuant to the Law on Nature Protection and Decree on Protection Regimes ("Official Gazette of RS" no. 31/2012) there is a priority ban on building structures for generation of energy in protected areas, depending on the degree of protection regime:

- 1) on areas with I and II degree protection regime the wind farms cannot be built;
- 2) on areas with III degree protection regime – construction of wind farms is allowed but limited only to construction in considerably altered, anthropogenic areas within border-line zones of outer limits of the territory with III degree protection regime.

The project holder is under obligation to report all planned works and activities, i.e. the realization of the project in writing to the protected area manager and the manager has to inform him about the possibilities to perform the above-said as well to tell him about the further procedure.

The competent institutions may grant consent to the wind farm project if they determine it will not have a negative impact on the integrity of the area designated for protection. If necessary, they can ask for changes in the proposed project or additional appropriate conditions under which that project may be implemented.

The competent Institute for Nature Conservation specifies the conditions for nature protection as well as the parameters for wildlife monitoring. Pursuant to Article 57 of the Law on Nature Protection, the Government may, in line with the law, allow for works and activities, i.e. projects in the energy sector on the protected area if they involve projects of general interest and national importance.

1.2.4. Environmental Impact Assessment with reference to wind farms

A set of environmental laws implies drafting of environmental impact assessment with reference to plans and projects with mandatory opinion of the competent Institute of Nature Conservation. In the procedure of obtaining the construction permit for wind farms of 50 MW power it is mandatory to conduct the Study on Environmental Impact Assessment with Reference to the Structure. And for wind farms of 1- 50 MW of total power the Study on Environmental Impact Assessment with Reference to the Structure may be required as specified in the Law on Environmental Protection (“Official Gazette of the Republic of Serbia” no. 135/04, 36/09, 36/09 – as amended and 72/09 – as amended)⁹, Law on Environmental Impact Assessment (“Official Gazette of the Republic of Serbia” no. 135/04 and 36/09) and the Rulebook on Content of the Request for Determining the Need for Impact Assessment and Content of Request for Determining the Scope and Content of the EIA Study (“Official Gazette of the Republic of Serbia” no. 69/2005 from August 9, 2005). As an exception, impact assessment may also be required for facilities up to 1 MW of power if the power plant in question is to be built on a protected area and protected environment of a cultural heritage and in other special purpose areas. The Republic of Serbia has also ratified the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) determining the obligations of states regarding information and mutual consultations on all major projects that are considered to have or could have significant negative effect on the environment of another state.

17

The competent body in the impact assessment procedure with reference to wind farm is the Ministry in charge of environment, i.e. the competent body of Autonomous Province if the power plant is located on the territory of Autonomous Province. The subject of environmental impact assessment with reference to the project is determined through two acts: decision of the competent body determining the scope and content of the environmental impact assessment and the environmental impact assessment itself. A more detailed overview of the procedure for assessing the environmental impact of wind farms in the Republic of Serbia can be found in the document “Instructions for Assessing the Impact of Wind Farms on the Environment¹⁰” [4].

Sector strategies, programmes, plans and bases must, in line with the integration principle, be harmonized with the goals of the environmental protection system¹¹ and other republic, autonomous and local plans and programmes of environmental protection (air, water, soil, waste etc.)

⁹ At the moment, the draft Law on Amendments to the Law on Environmental Protection which is subject to public discussion is posted on the website of the Ministry of Energy, Development and Environmental Protection (<http://www.merz.gov.rs/lat/dokumenti/nacr-zakona-izmenama-i-dopunama-zakona-zastiti-zivotne-sredine>)

¹⁰ Available at: http://rs.westernbalkansenvironment.net/documents/uputstvopuuvetroelektrane__jul_2010__latinica.pdf (accessed on October 16, 2013)

¹¹ Note: National Sustainable Development Strategy (“Official Gazette of RS,” no. 57/2008), National Environmental Protection Programme (“Official Gazette of RS,” no. 12/10), National Waste Management Strategy for the period 2010-2019 (“Official Gazette of RS,” no. 29/2010)

The Law on Strategic Environmental Assessment ("Official Gazette of the Republic of Serbia" no. 135/04 and 88/10) defines the obligations of the competent bodies of the Republic, province and local government to determine and assess the potential significant environmental effects of the proposed plans and programmes including the transboundary effects.

The Law on Protection from Noise in the Environment ("Official Gazette of the Republic of Serbia" no. 36/2009 and 88/2010) *inter alia*, regulates measures and conditions of protection from noise, i.e. the sound protection in the strategic environmental assessment procedure, assessment of environmental effects of the project, i.e. in the procedure of issuing integrated licence for operation of a facility and performance of activities.

Along with the above-stated Laws, an important role in the procedure of assessing the environmental effects of wind farms belongs to the right to access the information in order to ensure the right of the public to participate in decision-making regarding the state of the environment in line with the provisions of the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, and its Protocol on Pollutant Release and Transfer Registers - PRTR (Aarhus Convention). Besides the obligations taken over by ratifying this Convention in Serbia, The Law on Free Access to Information of Public Importance ("Official Gazette of the Republic of Serbia" no. 120/2004, 54/2007, 104/2009 and 36/2010) is in force ensuring the exercising of rights to access the information of public importance available to the state authorities.

1.3. Comparison of the legislative frameworks of the EU and Serbia

18

The approximation process is bringing new challenges in the area of environment to the EU candidate countries. EU demands detailed regulation of all issues in that field, with numerous legal, administrative and financial changes. At the same time, important changes in environmental human resources organization are necessary in line with *acquis communautaire*. The previous experience indicates that approximation of environmental policy and standards is extremely demanding and complex for candidate countries due to considerable differences in previous standards, differences in legislative and administrative systems and environmental state of the art. Through the ongoing harmonization of legislation in the area of environmental and nature protection with the EU laws in the area of environmental and nature protection, the European and international standards will be taken into account and applied. Furthermore, the enforcement of provisions and principles of international conventions signed by the Republic of Serbia is contributing to development and harmonisation of nature protection.

The Law on Environmental Impact Assessment ("Official Gazette of the Republic of Serbia" no. 135/04 and 36/09) and the Law on Strategic Environmental Assessment ("Official Gazette of the Republic of Serbia" no. 135/04 and 88/10) are transposing into the legal order of the Republic of Serbia the decision-making standards defined in the Directive 2001/42/EC and Directive 2011/92/EU. After enforcement of Directive 2011/92/EC, the revision of the Decree on Inventory of Projects Subject to Environmental Impact Assessment is planned.

The Republic of Serbia is implementing the activities for inclusion into the European ecological network Natura 2000, the project holder and coordinator being the Ministry of Energy, Development and Environmental

Protection. In order to strengthen the administrative capacities, a Twinning project was implemented in Serbia under the name "Strengthening Administrative Capacities for Protected Areas in Serbia (NATURA 2000)." Apart from the ministry in charge of nature protection, the key institutions and organizations in the area of nature protection and relevant sectors also took part in the project. The plan is to continue with the activities on establishment of Natura 2000 Network in Serbia with support of the European Instrument for Pre-accession Assistance – IPA 2012.

The Law on Nature Protection introduces a new instrument in the Serbian nature protection - appropriate assessment. Originating from the EU law, it represents the basic protection mechanism of the European ecological network Natura 2000. In Serbian legislation, appropriate assessment is closely connected to ecological network and it serves primarily to conserve the basic values of ecologically important areas defined by the Decree on Ecological Network. After accession to the European Union and after establishment of the Natura 2000 Network in Serbia, the European Commission will also get certain competencies in controlling the implementation of appropriate assessment procedure. Every legal entity and natural person may appeal to the European Commission and initiate the re-examination of the decision adopted by the national administration through the appropriate assessment procedure. Moreover, in order to declare the overriding public interest of a certain project affecting the Natura 2000 Network site, the opinion of the European Commission will be required. Drafting and adoption of the Decree on Appropriate Assessment that will specify the application of this nature protection instrument more closely is currently taking place in Serbia.

As for renewable energy sources, by accepting to implement the Directive 2009/28/EC, Serbia took on the obligation to reach the target of 27% of energy originating from RES in gross final energy consumption by 2020 compared to 21.2% RES share in 2009. Article 52 of the Energy Law adopted in 2011 specifies the adoption of the National Renewable Energy Action Plan (NREAP) by the Government in June 2013 together with revised measures of cooperation between the EU Member States and Parties to the Energy Community. Besides anticipated 27.3% of RES energy by 2020, the NREAP includes increasing the share of electric power from RES to 36.6% which should be generated from additional 1,092 MW plants using renewable sources. The legal framework for renewable energy sources can be found in several laws and bylaws. So far, there is no indication available on the potential intention to adopt a separate law to regulate the area of renewable energy sources within which all the obligations from the Directive 2009/28/EC would be transposed.

Through the Law on Nature Protection and adoption of bylaws the harmonization was executed with Directive 92/43/EEC, Directive 79/409/EEC (replaced by Directive 147/2009/EEC), Directive 1999/22/EC and Directive 83/129/EEC (replaced by Directive 85/444/EEC and Directive 89/370/EEC), Regulation 3254/91/EEC, Regulation 338/97/EC and Regulation 348/81/EEC.

Directive 2002/49/EC on assessment and management of environmental noise is implemented through the Law on Protection from Noise in the Environment and the bylaws.

2.

DEVELOPMENT
OF THE WIND POWER
SECTOR IN SERBIA - STATUS
AND OUTLOOK

2.1. Status and development of the wind power sector in the EU and Serbia

Increase in the wind farm capacity in the EU has been considerably intensified as of 2000.

Total installed capacities of wind farms throughout Europe in late 2012 are getting close to 110 GW. In 2012, the plans set in the National Renewable Energy Action Plan (NREAP)¹² (EU members in aggregate) were exceeded – the projected figure of 11,360 MW was overstepped by 2.9%. The said figure also includes the wind farms located offshore, the development of which is becoming increasingly important (9% of all new wind farms developed in 2012 are located offshore, i.e. in the sea).

The installed capacity by specific country is shown in Figure 1. Observed on a yearly basis, full (installed) power of wind farms is available approximately 25% of the time (or in other words – on average, a wind farm operates with 25% of the installed power). According to [7], in 2012, the share of electric power produced by wind farms in the EU amounts to some 7%, while the total installed power of wind farms accounts for 11.4% of total electric power production capacities.

¹² NREAP - National Renewable Energy Action endorsed by EU member states in keeping with Directive 2009/28/EC

Wind power installed in Europe by end of 2012 (cumulative)



	Installed 2011	End 2011	Installed 2012	End 2012
EU Capacity (MW)				
Austria	73	1,084	296	1,378
Belgium	191	1,078	297	1,375
Bulgaria	28	516	168	684
Cyprus	52	134	13	147
Czech Republic	2	217	44	260
Denmark	211	3,956	217	4,162
Estonia	35	184	86	269
Finland	2	199	89	288
France	830	6,807	757	7,564
Germany	2,100	29,071	2,415	31,308
Greece	316	1,634	117	1,749
Hungary	34	329	0	329
Ireland	209	1,614	125	1,738
Italy	1,090	6,878	1,273	8,144
Latvia	17	48	21	68
Lithuania*	16	179	46	225
Luxembourg*	1	45	0	45
Malta	0	0	0	0
Netherlands	59	2,272	119	2,391
Poland	436	1,616	880	2,497
Portugal	341	4,379	145	4,525
Romania	520	982	923	1,905
Slovakia	0	3	0	3
Slovenia	0	0	0	0
Spain	1,050	21,674	1,122	22,796
Sweden	754	2,899	846	3,745
United Kingdom	1,298	6,550	1,897	8,445
Total EU-27	9,664	94,352	11,895	106,040
Total EU-15	8,524	90,145	9,714	99,652
Total EU-12	1,140	4,207	2,181	6,388

European Union: 106,040 MW
 Candidate Countries: 2,492 MW
 EFTA: 753 MW
 Total Europe: 109,581 MW

	Installed 2011	End 2011	Installed 2012	End 2012
Candidate Countries (MW)				
Croatia	52	131	48	180
FYROM**	0	0	0	0
Serbia	0	0	0	0
Turkey	477	1,806	506	2,312
Total	529	1,937	554	2,492
EFTA (MW)				
Iceland	0	0	0	0
Liechtenstein	0	0	0	0
Norway	89	537	166	703
Switzerland	3	46	4	50
Total	88	583	170	753
Other (MW)				
Faroe Islands*	0	4	0	4
Ukraine	66	151	125	276
Russia*	0	15	0	15
Total	66	171	125	296
Total Europe	10,961	97,043	12,744	109,581

* Provisional data or estimate.
 ** Former Yugoslav Republic of Macedonia
 Note: due to previous year adjustments, 207 MW of project de-commissioning, re-powering and rounding of figures, the total 2012 end-of-year cumulative capacity is not exactly equivalent to the sum of the 2011 end-of-year total plus the 2012 additions.

Figure 1. Total net power of the installed wind farms by 2012 (expressed in MW) [7]

According to the report of the European Wind Energy Association [8], major development and deployment of wind-power potentials is expected in Central, Eastern and South-Eastern Europe. The said report splits the prospective development into the first, the second and the third wave according to the following 8 criteria: (1) degree of electric power market development, (2) the set goals of wind farm development, (3) support/incentive measures (feed-in tariffs), (4) available wind resources, (5) presence in the supply chain, (6) funding, (7) obtaining permits (construction, grid connection...), (8) electric power infrastructure. Legal stability, transparency and simplicity of licence approval procedures and exercise of the right to support mechanisms are claimed to be important factors, which is closely related to funding opportunities.

The first group of countries consists of relatively new EU member states witnessing the development, construction and deployment of wind farms. These are Bulgaria, Hungary, Poland, Turkey and Romania. The second group includes Czech Republic, Croatia and Ukraine, and the third group Serbia, Slovakia, Slovenia and Russia where the development of wind farms is yet to emerge. The report analyses the conditions in each of the aforementioned states, under the same model, and the conditions established in Serbia are presented in table below (Table 1):

Table 1. Basic information about the conditions in the Serbian wind power sector [8]

Electric power market	
EU accession negotiations lead to endorsing the goals related to renewable energy sources and adoption of similar market rules applicable in EU member states	+
Serbian wind power sector	
Attractive (abundant) incentive system (feed-in tariff)	+
Incentive system limited to 500 MW	-
Currently noted interest in the construction of wind farms of 2.6 GW capacity	+
Potential wind farm locations	
Serbia has good wind potential	+
Legal framework	
Partial non-conformity of legislation related to obtaining site construction right and the legislation related to renewable energy sources – which checks the progress of projects	-
Wind power integration potential¹³	
It is estimated that the system can sustain 900 MW of wind farms energy, and even up to 2000 MW subject to minor system extensions	+

One of the key obstacles for project implementation is the legal framework, i.e. its completeness and simplicity. According to the information from the Serbian Wind Energy Association (SEWEA), preparation of the entire set of laws and by-laws will be completed as late as this (2013) year. Although the key legislation has been adopted back in 2011, majority of by-laws required for the law implementation were adopted as late as in early 2013. In July 2013, a version of by-laws was prepared, defining the Power Purchase Agreement – PPA; however, in cooperation with international institutions (EBRD, IFC, OPIC) regulatory discrepancies have been noted, which should be remedied in the forthcoming period.

¹³ The technical capacity of wind power integration is related to the system operator capacity to balance the variable output power of wind farms, as the production depends on the current wind speed on each site. Other technical requirements required for work in the stated grid conditions, as well as temporary deviations in voltage and frequency, are generally no longer an issue for the contemporary wind turbine technology.

In addition to legal obstacles for the construction of a wind farm itself, Serbian Wind Energy Association (SEWEA) sets forth the remaining impediments:

- construction of a wind farm connection (who is to construct the same, how to deal with financing of construction)
- tight deadline envisaged for a wind farm construction (2 years), what is the requirement for retaining a temporary status of a privileged producer
- legally defined implementation of the Environmental Impact Assessment (EIA) only after the issued site permit and resolution of property-wise and legal relations. Such project development requirements in Serbia pose a big risk for investors, given the large previously invested funds in the project development, and the design terms may significantly change in the stage of Environmental Impact Assessment and thus make the entire project non-profitable.

According to the information obtained from the Serbian Wind Energy Association (SEWEA), the final arrangement of the complete legal framework is expected in early 2014.

Current limits of the total wind farm power, the production of which is planned to be promoted, equals 500 MW by 2020.

In view of the said terms, there is a significant gap between the wind farms under development from a technical aspect and that of obtained/valid permits.

2.2. Contemporary trends in the development of technology for the wind energy deployment

24

There are three major groups where the development in the wind power sector occurs. The first group refers to wind energy assessment and modelling, the second group to forecasting production and the third group to the wind turbines themselves.

Advancement of forecasting tools and their incorporation in the production management systems of both individual wind farms and the entire wind power sector are subject to further development. Precise production forecasts and better incorporation of the forecasting system in the management of the entire wind power sector can contribute to growth of acceptable share of wind farms, without large investments in power system regulation capacity, using fast responding powerplants (hydro or gas) to integrate wind power.

The wind turbine technology has seen a major breakthrough over the past decades. The design usually varies with regard to the generator type (synchronous/asynchronous), power transfer to generator (directly from the main shaft or through the gear box) and housing of equipment (converter, transformer – in the nacelle or at the bottom, or in case of a transformer alongside the wind turbine).

As it has been noted, the wind turbine dimensions grow in size, which brings restrictions in the transport of such big blades. Reputable manufacturers offer land-type (onshore) wind turbines in power classes of 1 x, 2 x and 3 x MW, while the towers reach as high as 140 m. The wind turbines set up in the sea (offshore) are not limited by so many requirements as the onshore ones (noise, visual impact), which is why wind turbines of up to 8 MW power and rotor diameter of up to 170 m.

Research is underway within the UpWind project where the goal is to design a 20 MW wind turbine with rotor diameter of some 250 m, but such power and size are still not available in the market.

Figure 2. shows a scheme of a typical wind turbine with the share of each component in the total wind turbine price [9].

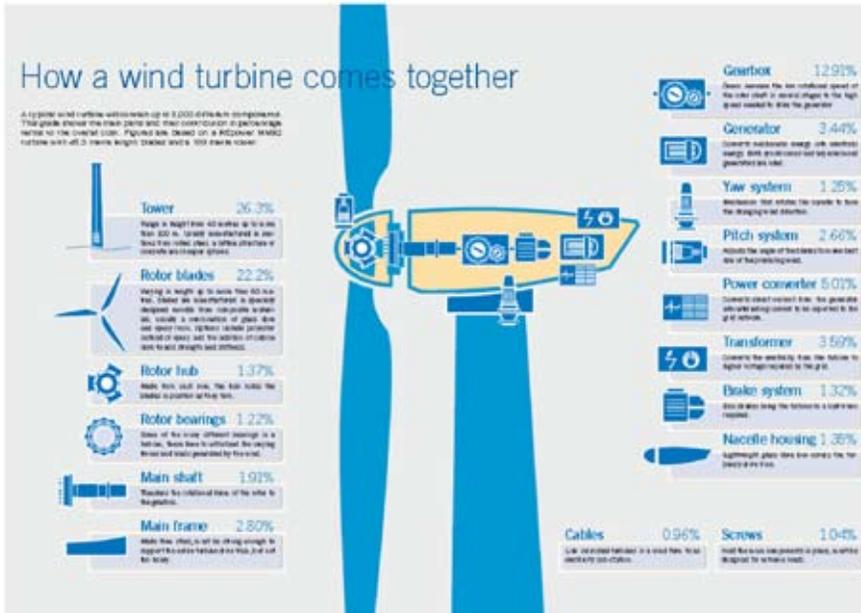


Figure 2. Typical wind turbine scheme [9]

2.3. Wind farm locations in Serbia

According to the official data from August 2013 [10], seven wind farms have applied for the incentive system (often the same wind turbine with several construction stages), majority of which has acquired only a status of temporary privileged producer. Total power of the seven wind turbine projects reviewed is around 50 MW.

On the other hand, a reputable institution European Wind Energy Association (EWEA) claims in its Serbia report [8] that total of 2600 GW wind farm projects is in the planning stage, with the following potential locations in the eastern part of Serbia: Stara Planina, Ozren, Vlasina, Rtanj, Deli Jovan, Crni Vrh, Pešter mountains, Zlatibor, Kopaonik, Divčibare, and Pannonian plane.

The locations analysed in a 2011 study [11] are roughly presented in the following graph (Figure 3.). According to the same source, 75% of the installed capacities are planned in Vojvodina. It is only company members of the Serbian Wind Energy Association SEWEA, (total of five companies) that develop wind farm

projects of 750 MW total power in the areas of municipalities of Kovin, Alibunar, Kovačica, Vršac, Kula, Plandište and Veliko Gradište.

According to the publicly available sources ([12], [13], [14]), there are many different wind farm projects in Serbia, yet their implementation is still waited for. Total power of the wind farm projects set out in sources ([12], [13], [14]), goes up to 1500 MW.

In any case, the interest shown by foreign and local companies testifies to the fact that there is a technical and economical usable wind potential, and the main prerequisite for the implementation of a number of projects is a full legislative regulation and conformity.

WPP	P (MW) per phase
Bela Anta	120
Belo Blato	10.5 + 10.5
Bela Crkva	37.5 + 150
Bavanistansko polje	188
Čibuk	50 + 250
Dolovo	150 + 200
Golubac - Krivača	112.8
Košava	50 + 67
Šušara	60
Vršac	100 + 300
Žagubica	63
Vrška čuka	189
Čestobrodica	50 + 230
Indija	20
Milevska	66
Verdenik	102

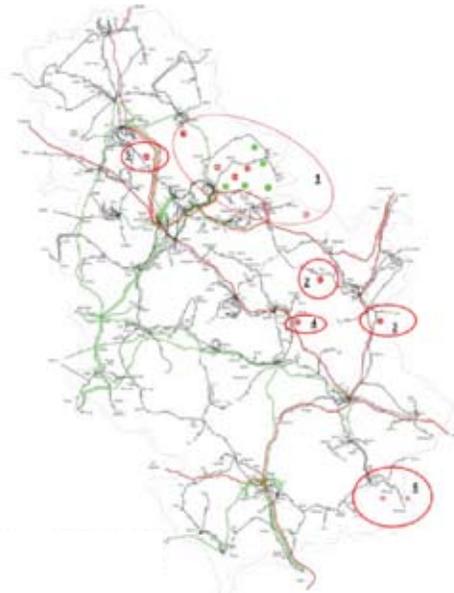


Figure 3. Wind farms analysed in 2011 [11]

Within the analysis of the wind power sector in Serbia, wind maps have been prepared [15]. Although the maps are relatively rough and based only on 10 m measurements from weather forecast stations and modelling in Wind Atlas Analysis and Application Programme (WASP)¹⁴, the results are indicative for a detailed assessment of certain locations. Map examples from literature [15] and [16] are shown in the following graphs (Figure 4, Figure 5.).

¹⁴ WASP - Wind Atlas Analysis and Application Programme.

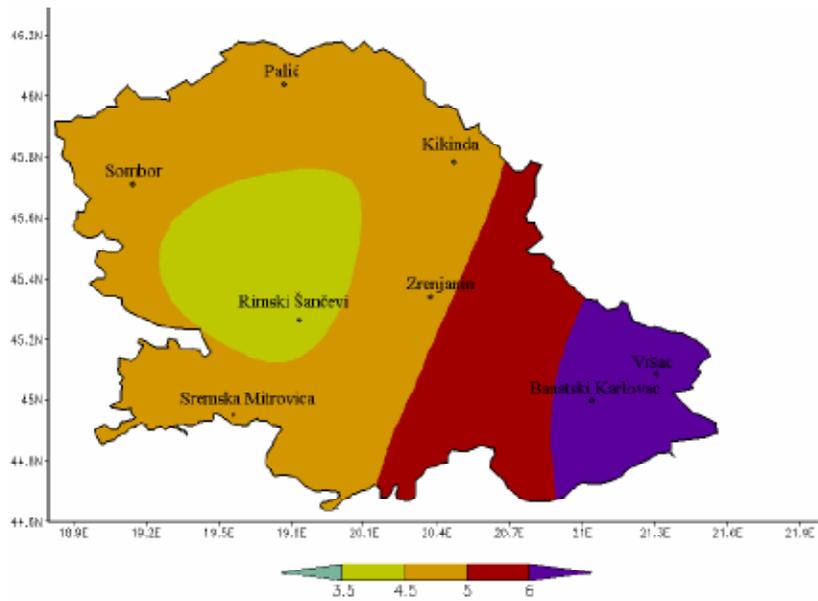


Figure 4. – Average annual wind speed (m/s) at 100 m above the ground (AP Vojvodina) [15]

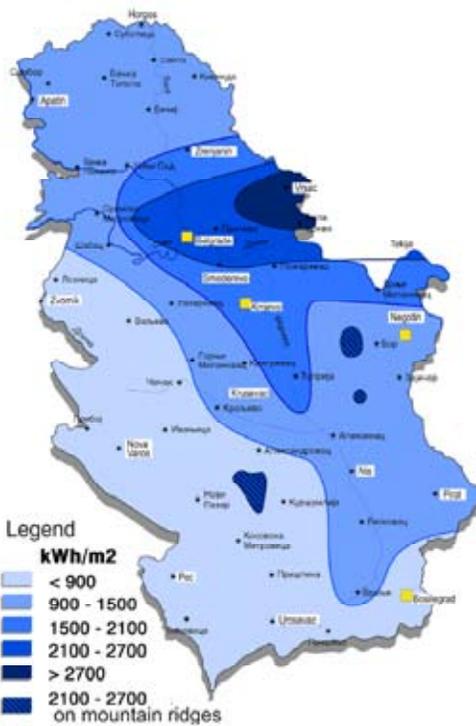


Figure 5. Average annual wind power at 100 m above the ground in Serbia. Yellow spots refer to some of the high-quality measurement sites [16]

The featured wind map of Serbia (Figure 5) provides general guidelines for site assessment, yet a pretty low resolution of results leaves room for examination in other areas, more precisely on higher hills and mountains beyond the darkest coloured areas, as reflected in high-quality measurements described in [16] (yellow boxes on the map). Out of four such measurements, the largest wind potential was measured at the site Bosilegrad located in the map segment marked by generally lowest wind potential, which indicates that apart from regional “rough” wind maps, field experience should be also relied on when making selection. Nevertheless, for project development, it is indeed necessary to perform quality measurements on the site itself.

In view of the aforesaid, in estimating the sites worth assessing and developing, it is important to bear in mind that sometimes even less windy sites have certain advantages provided that specific conditions are extremely favourable, and they relate to:

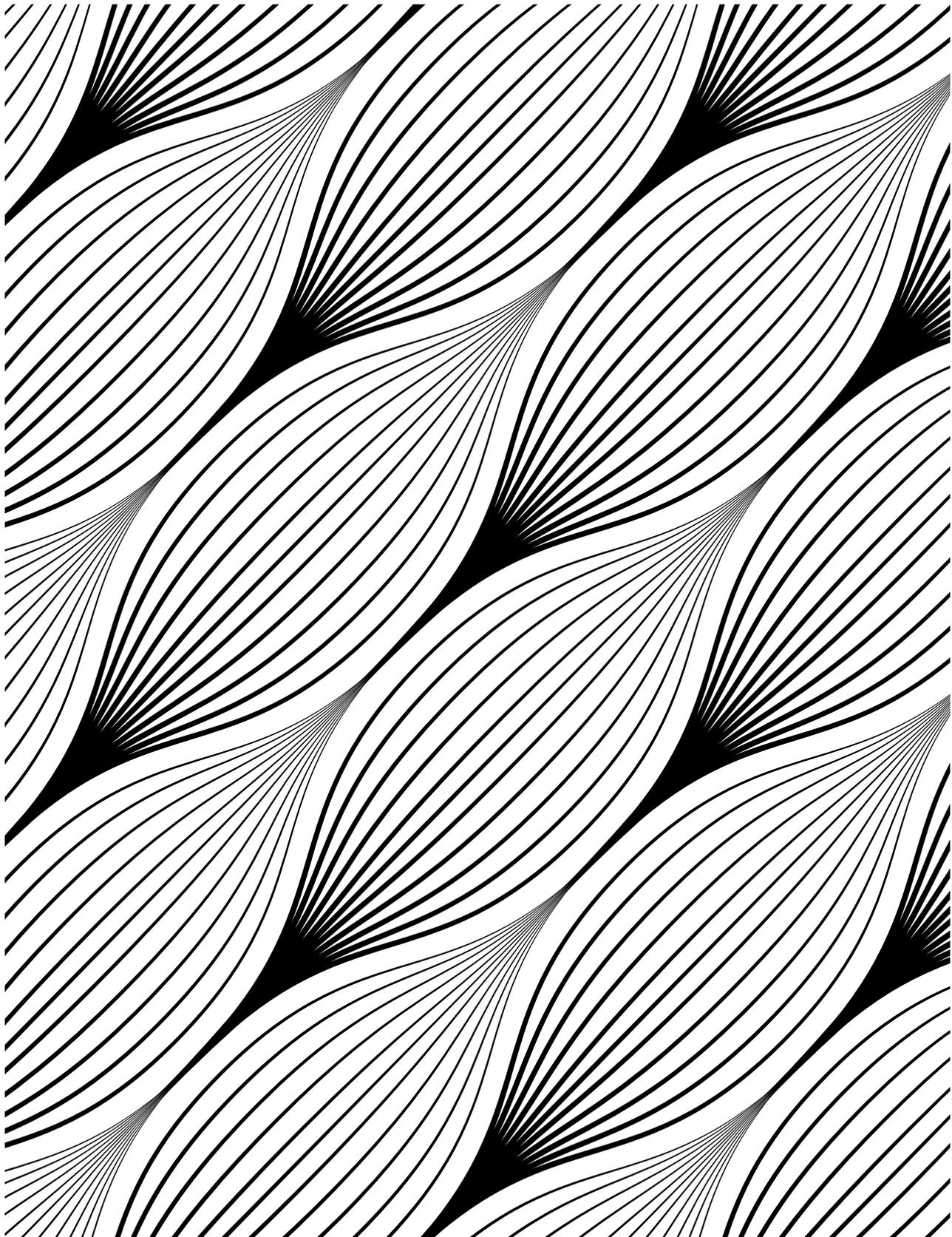
- site convenience:
 - as regards the possibility to set up high wind turbines
 - as regards accessibility and simple transport of wind turbines and convenient construction of access roads within the wind farm
 - as regards the possibility (speed) of resolving property-wise and legal relations at the desired sites
 - as regards laying of foundation
- proximity of a favourable point of connection to the electricity grid
- minimum environmental restrictions (visual impact, noise, habitat impact, birds, bats, etc.) which may result in a decreased number of wind turbines and/or deviations from the energy-efficient distribution and/or working conditions.

28

All the above-mentioned elements may have their respective roles either from financial or from temporal aspect of the project. A provisional distribution of costs of an average wind turbine presented in Table 2 points to the items, in addition to the wind potential itself, that need to be considered when selecting a site (2009 study [17])

Table 2. Share of particular cost items in a typical project with 2 MW wind turbines [17]

Cost item	Share in total investment
Wind turbine (without works)	75.6%
Grid connection	8.9%
Wind turbine foundations	6.5%
Construction right (property and legal related)	3.9%
Internal network	1.5%
Consultations	1.2%
Construction of access roads	0.9%
Management system	0.3%



3.

POTENTIAL IMPACTS
OF WIND FARMS
ON ENVIRONMENT,
HABITATS AND SPECIES

3.1. Status and outlook of biodiversity in the Republic of Serbia

The Republic of Serbia accounts for around 2% of the European land surface with great biodiversity (diversity of ecosystems, species and genetic diversity of species). Its territory hosts [6]:

- 39% of European vascular flora
- 51% of European fish fauna
- 49% of European reptile and amphibian fauna
- 74% of European bird fauna
- 67% of European mammal fauna.

Approximately 44,200 taxa have been registered. Considering the data are not complete the experts assume that the total number is 60,000. That number includes numerous regional or local endemic species as well as the species from the IUCN Red List of Threatened Species. The Red Books of endangered species on the national level exist only for flora (Red Data Book of Flora of Serbia, Volume I [18]) and butterflies (Red Data Book of Serbian Butterflies [19]). The production of books for other vertebrates is still in the process. In the category of protected and strictly protected species defined by the Regulation on Proclamation and Protection of Strictly Protected and Protected Species of Wild Plants, Animals and Fungi ("Official Gazette of the Republic of Serbia" no. 5/10) there are 868 protected and 1760 strictly protected species.

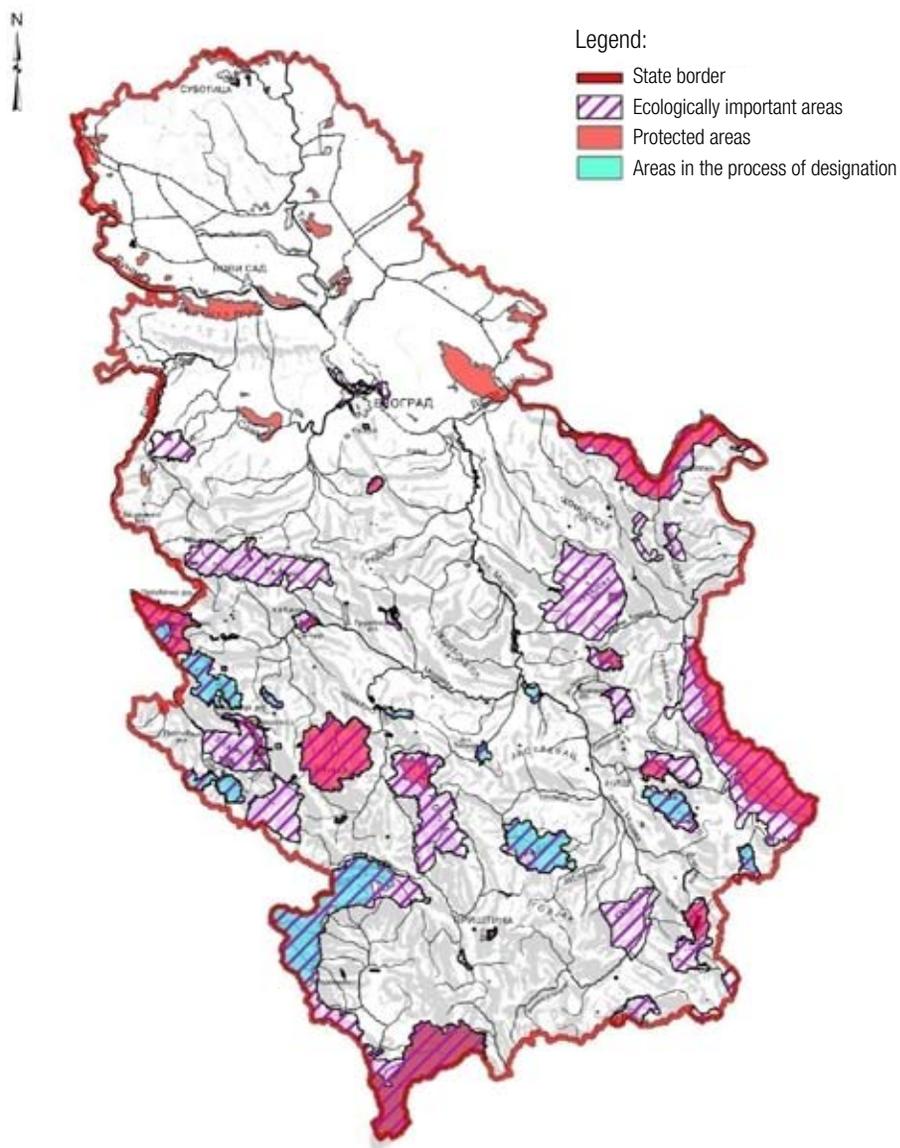
Significant geographic diversity is responsible for different ecosystems on the territory of the Republic of Serbia starting from high mountain tundras to deciduous oak and beech forests. The first integral Habitats Classification System for the Republic of Serbia compatible with the EUNIS system [20] has been elaborated as part of the project dealing with harmonization of national habitats classification system with the international systems. The Classification of National Habitats is on its way.

Such wealth of biodiversity is the indicator of healthy and conserved environment and a valuable source of ecosystem services on which agriculture, forestry, water management, energy, recreation and tourism rely.

In order to conserve and protect biodiversity, areas with particular geological, biological, ecosystem and/or landscape diversity may be declared protected areas of general interest (in one of seven categories based on the actual legislation: strict nature reserve, special nature reserve, national park, monument of nature, protected habitat, landscape of outstanding features, nature park). The total area covered by the protected area system in the Republic of Serbia amounts to 522.120 ha, i.e. 5.91% of the total territory (Figure 6. Map of protected areas in the Republic of Serbia; Source: Institute for Nature Conservation of the Republic of Serbia, 2013). Ecological network¹⁵ was established for conservation of biological and landscape diversity i.e. habitat types of special importance for conservation, restoration and/or development of disturbed habitats and conservation of certain species. The ecological network Natura 2000 that is placing an obligation upon the European Union Member States to ensure on their territories adequate conservation status for endangered species and habitat types listed in annexes to the Birds Directive and Habitats Directive must be established on the territory of the Republic of Serbia prior to its accession to the European Union.

¹⁵ Decree on Ecologic Network ("Official Gazette of RS," no. 102/10).

MAP OF PROTECTED AREAS AND AREAS IN THE DESIGNATION PROCESS



32

Figure 6. Map of protected areas in the Republic of Serbia
(source: Institute for Nature Conservation of Serbia, 2013)

Biodiversity Strategy of the Republic of Serbia for the period 2011- 2018 [6] identified the main pressures on biodiversity as both direct and indirect factors causing those pressures and being related to human activity. The most important pressures, i.e. symptoms of biodiversity degradation are:

- habitat loss and fragmentation
- habitat degradation
- population declines in wild species
- pollution/contamination
- invasive, non-native (allochthonous) species and GMO
- climate change.

Construction of wind farms, i.e. usage of wind energy, unless there is compliance with nature protection guidelines in planning and construction, can contribute to habitats loss and fragmentation. However, compared to conventional sources of energy, this reduces the pollution and slows down climate change.

The greatest number of initiated projects for the construction of wind farms, as well as those planned for immediate future is located on the territory of AP Vojvodina.

Two centuries ago the territory of AP Vojvodina was covered by wet habitats on big rivers' floodplains while steppe and saline habitats typical for the Pannonian region were found on higher grounds. Construction of channel network and hydro-reclamation of the area resulted in lowering the level of ground water and drying and withdrawal of wet habitats. Marshland forests of common oak were replaced by monoculture of fast-growing poplars, the remnants of earlier steppes were turned into arable land and saline land was turned into fish ponds. These changes had extremely negative effects on biodiversity. Thus, some species have completely disappeared from the area of AP Vojvodine while the other have considerably reduced populations. Changes in the habitat and habitat loss are the main causes of disappearance of species from this region.

According to the Regulation on Proclamation and Protection of Strictly Protected and Protected Species of Wild Plants, Animals and Fungi ("Official Gazette of the Republic of Serbia" no. 5/10 and 47/11), the territory of AP Vojvodina currently hosts 122 species of vascular flora, 166 species of nesting birds and 35 species of mammals listed as protected or strictly protected species. The most endangered species of birds from this area include the Eastern Imperial Eagle (*Aquila heliaca*) of which there are 3-4 pairs, Great Bustard (*Otis tarda*) of which there are around 20 birds and European Roller (*Coracias garulus*) with 60-80 pairs.

The basic protected area network consists of around 100 spatial units accounting for approximately 6% of the total provincial surface area. Most of other areas are arable land or urban infrastructure. In defining the new protected areas the priorities are: protection of waterways on coastal area, marshy and wet areas, specific saline terrains, remaining steppes and sands as well as protection of forests.

3.2. Impacts of wind farms on the environment, habitats and species

The production of electrical energy using renewable sources, such as wind, is considered ecologically more acceptable production than that from classical sources such as thermal power plants using coal or large hydroelectric plants. As they do not consume fuel to operate, wind farms, unlike thermal power plants do

not contribute to the increase of greenhouse gases that are one of the main drivers of climate change. As they operate, wind farms do not burden the environment neither by emitting other harmful gases like carbon monoxide, sulphur dioxide, nor the microscopic particles emitted into the atmosphere by other power plants. The study of the ESB National Grid [21] has shown that there has been a reduction in CO₂ emissions through the use of wind energy between 0.33 and 0.59 tons per MWh compared to using fossil fuels.

If we look at the entire life cycle of power plants – the making of parts, construction, production, fuel supply, waste management to decommissioning – we will see the results presented in the table below (Table 3):

Table 3. Polluter emissions by type of power plant [22]

	Wind farms	TP Coal	TP Lignite	TP NGCC ¹⁶	Nuclear	Photovoltaic	Biomass CHP
CO ₂	8	836	1060	400	8	53	83
Methane	8	2554	244	993	20	100	119
NOx	31	1309	1041	353	32	112	814
VOC ¹⁷	6	71	8	129	3	20	66
Particles	15	147	711	12	17	107	144
SO ₂	32	1548	3808	149	46	0	250

Wind farm can consist of a number of towers with turbines and therefore occupy large surfaces, but only a small part of the surface (around 1%) is completely occupied by turbine foundations, access roads and auxiliary facilities, while the rest of the surface underneath the turbine can be used for other activities, such as agriculture. As the largest part of the so-far planned wind power plants in Serbia is to be on agricultural land, mostly state property, it is important to know that with timely planning the land with wind power plants can (still) be used for agricultural production (and cattle feeding, by getting accustomed to grazing in the vicinity or even under the turbines).

The negative impacts that wind power plants can have on surrounding habitats, which are identified in the Guidelines on the environmental impact assessment for wind farms in the Republic of Serbia [4] are:

- Direct loss of habitat due to infrastructural development (such as turbine foundations, access roads, material disposal...)
- Habitat degradation due to changes or disturbances, especially due to hydrological regime disturbances which can change groundwater levels or habitat water supply (important for peat land and wet habitats)
- Habitat fragmentation and increased barrier effect (more barriers open)
- Degradation and loss of habitats outside the wind farm location caused by pollution, erosion and soil excavation on the construction site

The impact of wind farms on animal species (other than birds and bats that are covered in a separate chapter), occurs during the stages of construction and operation. During the construction stage, habitats

¹⁶ NGCC - Natural Gas Combined Cycle

¹⁷ VOC - Volatile Organic Compound

are disturbed by civil works and noise caused by the transport of parts, soil compacting and vegetation removal. These negative impacts are mostly localised and short. Fragmentation and potential loss of habitat due to spatial alterations caused by the construction of wind farms can have long-term effect on some species that are sensitive to this type of changes. Except for changes in habitat, some species also react to changes in the environment caused by the operation of wind turbines, which primarily refer to the noise, vibrations, turbine rotations, as well as the existence of new objects in space.

Noise emissions depend on the circumferential rotor speed, which is increased by the length of blades and the speed of wind. Rotation speed limit – data exist on maximum noise at the height of 10 m above ground¹⁸ – as a rule depends on the length of blades and moves on the scale from 14 rpm¹⁹ for rotors of 115 m and around 17 rpm for rotors of 90 m in diameter – the limit is for circumferential speed not pass above the speed of sound, i.e. it is designed for speeds below 300 m/s. Maximum noise of onshore wind turbines at 10 m above ground level (under the wind turbine) is rarely above 108 dB. All renowned producers offer different options for noise control, although lower noise levels come with lower production levels. However, with proper choice of location for the wind turbine the level of noise emissions can be ensured to be acceptable for the environment. Also, the sound of the wind often masks the noise of the wind turbine itself.

The following figure shows an overview of decrease in noise with distance, followed by comparison of noise intensity with other noise sources (Figure 7).

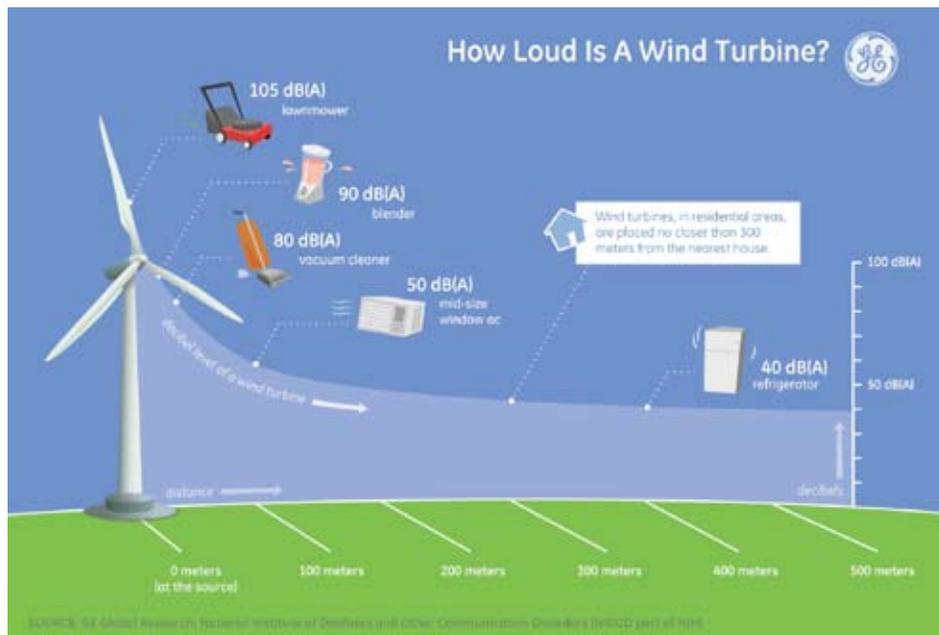


Figure 7. Decrease of noise with distance from wind turbine [23]

¹⁸ Height of 10 m above ground under wind turbine is standardized data provided for all types of wind turbines.

¹⁹ rpm - rates per minute

Each wind farm project usually includes noise analysis and the project must prove that in residential areas the noise is at acceptable levels, meaning below the legal limit.

Wind turbines are tall structures, relatively small in volume, but they can still block light, i.e. create shade around it. When they are in operation there can be an unpleasant flicker of shade that is visible from a distance up to 10 rotor diameters. These effects are the most prominent at dawn and dusk. By suitably locating the wind turbine, the effect of flickering and glinting can be avoided. In order to avoid negative impacts on the local population, the length of shade on office and private buildings within a 500 meter radius is recommended not to exceed 30 hours a year, or 30 minutes per day (recommendation based on PREDAC research conducted in Belgium, Denmark, Germany, Netherlands and France [24]).

The visual impact of wind farms on the landscape is undisputed. In the European Landscape Convention it is recognised as heritage and part of a community's identity [25], and the Convention also defines the need to assess landscape values and include landscape values as criteria in spatial planning – which enable or prohibit the construction of wind farms, and effects of wind farms should be evaluated at the stage of conducting the environmental impact assessment.

The visual impact is defined as subjective and variable over time (the attitude of the observer changes); it is also pointed out that wind farms are not permanent structures in space and that their removal after their life span (around 20 years) is evident [25]. As a rule, visual impact is divided by zones:

- Zone 1 – Wind farms are visually dominant. Zone reaches up to 2 km around the wind farm and wind turbines are clearly visible (including blades).
- Zone 2 – Wind farms are visually imposing. Zone reaches between 1 km and 4.5 km around the wind farm. Wind turbine blades are clearly visible (also as they turn), but the wind farm is not necessarily dominant in the observed scene.
- Zone 3 – Wind farms are noticeable. Zone reaches from 2 km to 8 km around the wind farm. The wind farm is a smaller part of the entire landscape scene and blades turning can in general be seen only when the visibility is good.
- Zone 4 – Wind farm is part of a remote landscape. Zone reaches above 7km around the wind farm. Wind turbines are barely visible elements in space.

Visual impact of wind farms can be specifically negative if they are in areas considered suitable for the development of tourism, because they can decrease the appeal of the offer based on a preserved natural landscape.

In addition to the turbines, the transmission network lines can also have certain negative impacts on natural values. They are mostly demonstrated as negative visual impacts because these are structures that stand out in space because of their size, rhythmic distribution and contrast with the surroundings. The greater the contrast in relation to the surroundings the more visible the impact. In order to reduce this impact, it is recommended to plan wind farms in the vicinity of existing power lines, and to plan all the necessary new components outside of visually attractive areas, or plan their construction near roads or industrial zones. Power lines do not occupy large parts of habitats physically, and the impact is significant only during construction.

3.3. Impact of wind farms on birds and bats

3.3.1. Negative impact of wind farms on birds

Negative impacts on birds fall within four known types:

1) Fatalities caused by collision (strike) with wind turbines

Collision fatalities of birds are the most intensive in zones with higher density of birds, both local populations as well as migrating flocks. Mountain passages or parts of the land around water surfaces, zones around shallow lagoons, corridors between feeding and nesting areas are particularly vulnerable. Factors influencing the probability of collision are the following: wind speed and direction, air temperature and humidity, type of flight (distance and height), time of day, topography of the terrain; as well as the species and age of birds and the time of their life cycle. The risk is the highest when flight conditions are unfavourable so birds fly at lower altitudes. The lighting of wind farms or some turbines can, especially under poor weather conditions, attract the birds closer to the turbines and increase the risk of collision. Species most-at-risk of potential collisions with turbines or connecting lines within the farms are migratory birds, large birds of prey and other birds using thermals to move [26], primarily because they choose for their habitats or migration corridors zones with high wind potential, suitable for harvesting wind energy. Death by collision is most often estimated by counting corpses of birds killed during wind farm operations monitoring, but this method can lead to underestimated effect because the corpses of small songbirds are hard to find and vultures quickly drag them away from the monitoring zone. In addition, low fatality rates (low absolute number of birds killed per turbine per year) can be a significant negative factor for the survival of some species' populations, especially rare species with low birth rates and slow development to reproductive maturity. Therefore the right selection of wind farm locations would be outside of the areas important for birds, Ramsar areas and other internationally and nationally important areas, migratory corridors, as key action to prevent this negative impact.

2) Disturbances of habitats and displacement

This negative effect on some bird species was proven in the radius of cca 600 m around the wind farms, and is reflected in the reduced use of habitats or total exclusion of some species (e.g. Whooper swan - *Cygnus cygnus*, Eurasian Curlew - *Numenius arquata*, and White-fronted Goose - *Anser albifrons*) from the zone around wind farms. Disturbance is caused by noise, appearance and vibrations of the turbines, as well as the activities related to their function and maintenance. Access roads to wind farms make entire areas more easily accessible and thus increase the level of disturbance. The magnitude of the effect also depends on the species and locations, as well as the amount of similar habitats in the vicinity that can take in the leaving populations. Although this effect for a single wind turbine or wind farm can be limited to a small surface, when assessing the magnitude of this impact we should also take into account cumulative effects with other wind farms and similar facilities in the vicinity.

3) The barrier effect

Wind farms that are found on migratory corridors or between feeding, resting or nesting areas can present barriers to bird movement. Instead of flying between turbines, some bird species (especially

wetland and migrating species) avoid wind farms or fly at higher altitudes, above the reach of the propellers. This effect can be positive over the short term, because avoiding wind farms reduces risk of collision, but changing usual flyway routes causes increased energy consumption and time for migration which can consequently have a negative impact on the population status parameters, such as survival and reproduction. The intensity of this effect increases cumulatively around other wind farms on the same migratory corridors, so these cumulative effects must not be underestimated when making assessments. The proper design of wind farms with correct distribution and alignment of turbines can significantly mitigate this type of negative effect.

4) Habitat loss or degradation

The intensity of this effect depends mostly on the quantity of occupied surface needed for wind farms with infrastructure. Unplanned or incorrectly placed and built infrastructure can lead to losses in nesting or feeding habitats for some bird species. This effect is especially pronounced in wind farms planned on the land under natural habitats. As such habitats can be found on a small portion of the territory of AP Vojvodina (around 6%), it is necessary to avoid planning and building wind farms in areas under any form of national or international protection.

The impact of transmission network lines on birds can be significantly negative if quality standards are not applied at the planning stage. This impact is manifested through bird collisions with poorly visible lines and electrocutions caused by poor insulations on poles that birds land on or too close to the installed wires. By placing power lines outside migration corridors reduces the risk of collisions, and by using good quality modern insulation, the risk of electrocution is eliminated. By installing lines underground, the risk of negative impact on birds is completely eliminated.

38

On the territory of AP Vojvodina, which is due to the high wind potential the most interesting area of Serbia for the construction of wind farms, there is over 300 species of birds registered, out of which 206 are under some protection regime. This is why, together with bats, birds are the key limiting factor for the planning of wind farms in this area. In the publication *The Establishment of Ecological Network in AP Vojvodina – overview of the situation, analyses and possibilities* [26] 10 bird species have been identified on which a very negative impact can be expected of unfavourably positioned wind farms, which can also lead to a significant decrease in populations and even complete disappearance of some of them:

- 1) Imperial Eagle (*Aquila heliaca*) – species of high international importance, in Vojvodina 3-4 couples nest in the area of Fruška gora. It is at risk because of the low number, large hunting areas and using thermals for moving.
- 2) Lesser Spotted Eagle (*Aquila pomarina*) – at risk because of the low number (7-8 pairs), large hunting territories and migratory corridor over Vojvodina.
- 3) Greater Spotted Eagle (*Aquila clanga*) – at risk because of high international importance, critically low numbers, large hunting territory, using thermals when moving and a number of young and inexperienced birds on migrations and wintering.
- 4) White-tailed Eagle (*Haliaeetus albicilla*) – at risk because of the high international importance and large area of movement of adult and young birds throughout the year.
- 5) Booted Eagle (*Hieraetus pennatus*) – at risk because of the critically low numbers (2-3 pairs), large hunting territories and using thermals during flight.

- 6) Saker Falcon (*Falco cherrug*) – at risk because of the high international importance, low numbers (around 20 pairs nesting in Vojvodina) and large hunting territory.
- 7) Peregrine Falcon (*Falco peregrinus*) – at risk because of the high number of inexperienced birds during migration and wintering.
- 8) Great bustard (*Otis tarda*) – at risk because of high international importance, critically low numbers (less than 30 birds), slow flight and high body mass.
- 9) Black Stork (*Ciconia nigra*) and White Stork (*Ciconia ciconia*) – because of using thermals during flight.

Except for these species, there have also been 67 species identified for which there is a great probability of negative impacts of wind farms. These are: 2 species of kites, Short-toed Snake Eagle (*Circaetus gallicus*), 4 species of harriers, Griffon Vulture (*Gyps fulvus*), 3 species of hawks and sparrow hawks, 3 species of buzzards, 4 species of falcons, 41 large species of wetland habitats and 8 species of owls.

The valley of the river Tisa, Fruška gora and the valley of the river Sava, are some of the most important migratory corridors in the Balkans, which are used each year by tens of thousands of cranes (*Grus grus*).

The same document includes a map of areas where birds would be endangered by wind farms in Vojvodina, which can be used as guidelines when choosing locations for wind farms (Figure 8). Areas marked as high risk should be avoided and it is highly probable that the institutions for nature conservation (Institute for Nature Conservation of Serbia and Institute for Nature Conservation of Vojvodina Province) would put a stop to potential projects in such areas.

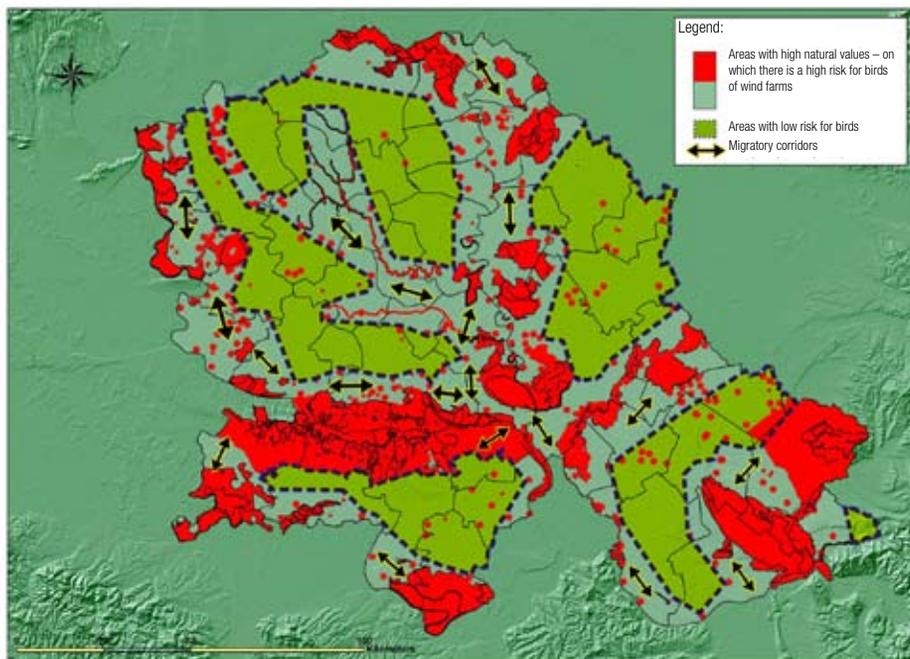


Figure 8. Map of areas where birds would be at risk of wind turbines in AP Vojvodina [26]

This map excludes from consideration for wind farm construction those areas that form an ecological network, as well as all other areas under international and national protection status, followed by areas with high bird density and world migratory corridors.

3.3.2. Negative impacts of wind farms on bats

Out of all the negative impacts of wind farms on bats, the greatest attention is given to fatalities in collision with propellers or towers and barotrauma caused by sudden change in air pressure near the rotating turbines. Because of relatively weak rates of reproduction and long life span, bat populations are sensitive even to relatively small additional fatalities due to negative impacts. All European bat species are on the list of Annex II to the 2007 Bonn Convention, Annex II (except *Pipistrellus pipistrellus* which is found in Annex III) to the 2007 Bern Convention, and in Annex IV to the Habitats Directive.

The highest fatality rates are marked in late summer during dispersions and migrations towards wintering places. Wind farm locations that mark the most fatalities are mostly those on the edges of forests, but collisions were also recorded in the open areas. There is a widely accepted theory that wind farms actually attract bats because the number of insects around them increases (drawn by light and/or heat of the wind farms), which consequently attract bats feeding on them.

The loss and disturbance of bat habitats can occur in wind farm locations inside or in the vicinity of forests, as well as in open areas that bats use as feeding places. The removal of trees for the construction of turbines or infrastructure development in addition to reducing the potential bat habitat, can also lead to new linear landscape elements that can attract bats to feed near the turbine.

40

Methodological guidelines for studying bats in environmental impact assessments [27] state the following potential impacts (Table 4.):

Table 4. Potential negative impacts of wind farms on bats [27]

Impacts during wind farm construction		
Impact	Local populations	Migrating populations
Loss of hunting habitats during construction of access roads, foundations etc	Probably small to mid-high impact, depending on the site and species present at that site	Small impact
Loss of hunting habitats during construction of access roads, foundations etc	Probably high or very high impact, depending on the site and species present at that site.	High or very high impact, e.g. loss of mating roosts.
Impacts during wind farm operation		
Impact	Summer populations	Migrating populations
Ultrasound emission	Probably a limited impact	Probably a limited impact
Loss of feeding areas because the bats avoid the area	Medium to high impact	Probably a minor impact in spring, a medium to high impact in autumn
Loss or shifting of flight corridors	Medium-high to high impact	Small impact
Collision with rotors and mortality caused by barotrauma	Weak to strong impact, depending on species	High to very high impact

3.3.3. Cumulative effects of wind farms

The cumulative effect of negative impacts of wind farms occurs when several such structures are located in a relatively small area, or distributed along the same flyway corridor. The cumulative effects are the result of a combination of individual effects of individual projects (wind farms or other), and can be more or less than their simple sum [28]. For instance, the first wind farm planned in an area may give rise to a small but acceptable level of bird mortality, which lies well within the size and capacity of that bird population. The impacts of other wind farms in the same area may be of equal or even smaller intensity, but their cumulative effect may exceed the capacity of the population for regeneration, in which case the bird population would go into decline. These effects must be taken into account when developing spatial plans.

Out of all the negative impacts of wind farms, cumulative effects (except for increased mortality due to increased number of turbines) can also occur with impacts that may not be significant individually, such as habitat disturbances or displacement, habitat fragmentation and barrier-effect which can be caused by series of wind farms. The worst case could be that failing to analyse cumulative effects during wind farm planning or in the stage of environmental impact assessment, may lead to closing in a protected area and completely surrounding it with wind farms that would individually be acceptable for biodiversity conservation, but due to the joint cumulative effect they can have devastating impacts.

Proper and good quality strategic and spatial planning that include the cumulative impacts of wind farms as parameters as early as in stage of potential location selection, is the most efficient way to avoid such negative impacts on biodiversity.

4.

SOCIO-ECONOMIC FRAMEWORK FOR WIND FARM DEVELOPMENT

4.1. Wind farm projects investment and profitability

Wind farm development projects are investments that turn out profitable for the investors over a period of several years through a feed-in tariff system (incentive tariff to privileged electrical power producer, set by the Ministry in charge of energy affairs), which is in Serbia at the moment set to 0.092 €/kWh [5], and also provided for 12 years as defined in the contract on renewable energy purchase. The exact period of investment return and breakeven point depend on the wind farm capacity, annual production (which depends also on the annual wind speed) and fiscal policy of the country where wind farms is constructed. Except for construction costs, which are estimated to be on average between 1,300 and 2,000 €/k [29], construction costs vary in countries like Serbia, where wind farm market is only starting and opening and where procedures to obtain all the necessary permits can be longer lasting and more expensive than in the countries with developed wind farm markets. Successful investments and timely launch of the first wind farms in Serbia can bring on a positive investment climate and also the simplification of administrative procedures and reduction of all costs related to faster and more efficient implementation of wind energy projects.

The advantages of investments in the development of wind farms are that maintenance costs are the only considerable costs after the project has been fully implemented. However, potential unexpected costs can occur and should be taken into consideration early in the initial stages of the project. Unexpected costs can be in the form of external costs, caused by the impact on the environment and biodiversity surrounding the wind farms, then the potential dissatisfaction of the local community in case when wind farm project implementation is not in accordance with their economic or social interests. For example, if the construction of a wind farm is planned in a forested area, objections can be expected (even before, and especially after the environmental impact assessment development, as the local population can react even after the project has gone through final stages of implementation) from the local communities, related to considerable increase in expenses due to deforestation.

Regarding the number of employees, the process of wind farm construction – depending on the capacity and size – can reach up to several hundred positions (for a 100 MW project the number can go up to 300 positions), and subsequent maintenance can require up to ten positions (the usual is 3-4 workers, again depending on wind farm size and capacity). In practice, the largest number of construction workers need not come from the local community, unless the local community members themselves initiate wind farm project and investments, or get directly involved in the early stages of the project through organised bodies.

Local community economic interest in wind farms is high on the political level – taxes would be paid by the investors to the local community (in this case municipality) for using the space. Fees are for now defined in the Cooperation Agreement with local self-governments, which determine that part of the annual wind farm profits belong to the municipality and go directly into the municipality's budget. On the citizens' level, reactions can vary from a high degree of acceptance and support to the part of the population that would potentially be the most critical, and these are property owners (mostly households) situated in the area in the vicinity of wind farms, but only in cases if they are immediately close to the installed wind turbines (less than 500 m), because of potential noise and (subjective) disturbance of the landscape surrounding the private structures. Although wind farms can in isolated cases cause negative reactions from the local population living in immediate vicinity of the farm, timely consultations with the local community and setting the minimum distance of wind turbines from the nearest households, would be possible solutions.

Government interests include taxes paid for location, building and environmental permits and investor licenses, improved road infrastructure, and contribution to the goal of 27% renewable sources in the energy consumption in Serbia by 2020. This would consequently lead to improvements in environmental policy by promoting green energy and to the reduction of greenhouse gas emissions. The role of the government in wind farm project investments is important also for the long-term profitability and stability of projects in the area of wind energy. In case of unstable markets, where tariffs often vary and drop, potential investors may be more sceptical, which would result in reduced interest. On the other hand, too high a level of tariffs and unpreparedness for giving wind energy subsidies, can in theory lead to problematic transfer of expenses on investors, which could cause further problems in investments and the development of wind energy in Serbia.

4.2. The impacts of wind farms on local, regional and national levels

4.2.1. Integration of wind farms with the local community

The main socioeconomic factors related to impacts of wind farms on the local community are, according to Prades and Gonzalez [30], divided into *environmental*, *psychosocial* and *institutional factors*.

Environmental factors:

- Visual impact
- Landscape characteristics
- Turbine colour and size
- Unity of the environment
- Wind farm design
- Turbine noise
- Distance from turbines
- Ecological characteristics (birds and wildlife with emphasis on birds and bats)

Environmental factors vary from those with the least potential impact on the local community to those where the potential risk of external costs for the investor is higher. The farther the wind farm from protected areas and areas with high biodiversity (especially if it is an area where protected species live), the less probability for protests by environmental protection organisations, negative media attention and spreading false information about wind farms. If wind farms are developed near protected areas, environmental impact assessment should be done with the participation of as many local NGOs as possible, and negative environmental impact should be reduced when designing the construction by choosing the optimum location, more precisely, the location that would to the least extent change the natural landscape surrounding the future wind farm (deforestation to the least possible extent, location with existing or partially existing road infrastructure and similar).

Psychosocial factors:

- Knowledge and familiarity with the project
- Perceived benefits and costs
- Social network impacts

Project transparency, especially in its financial and technological aspects, is one of the key encouragements to familiarize the local community with the project, in order for the gains and benefits of wind farms, such as employment and fiscal subsidies, to be clear, and potential losses either clearly defined or reduced to the minimum possible extent. Social network impacts are stronger when the local population joins forces and organises in unions or organizations, which can make their impact on wind farm development in the respective local communities greater and more significant. This can lead to positive communication between investors and local organizations in project development, study development and project implementation with official approval by the local community after systematically organised meetings, seminars, workshops and other methods of cooperation between investors, municipality representatives and local NGOs.

Institutional factors:

- Participation and engagement
- Local ownership
- Campaigns

The already mentioned active participation and engagement through local organizations and campaigns can yield positive results and help avoid conflict between the local community and investors after the wind farm construction. Through public-private partnerships or leases from local landowners, positive acceptance of the local community can be increased, if its interests are also met from the economic point of view.

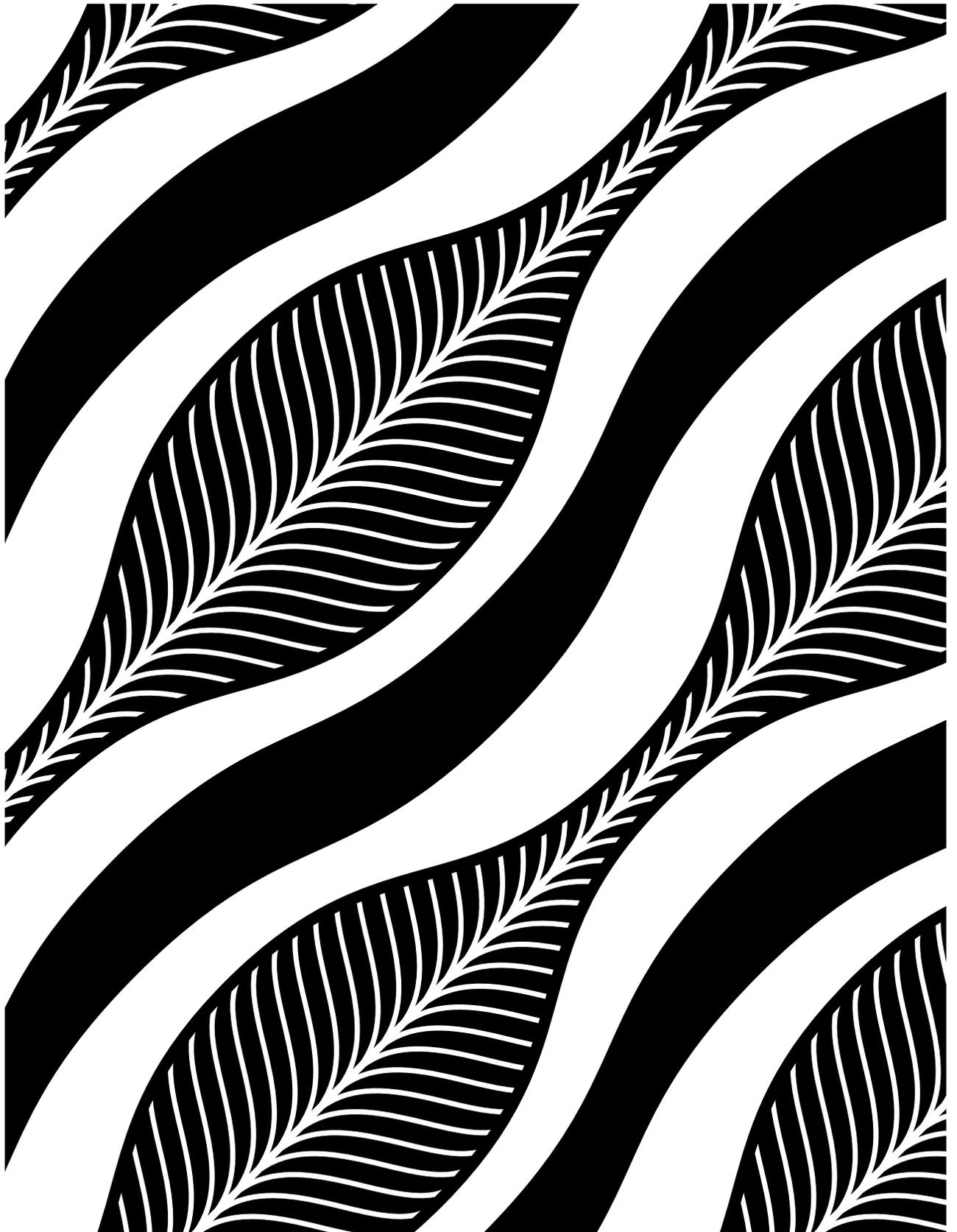
The impact of wind farms on health mainly relates to households situated right near to the wind farms, where people could complain of noise, light flashing effects caused by sunlight reflection against propeller blades, called blade glints, and flickering occurring periodically when the propeller throws a shade when revolving, called shade flickers, and electromagnetic radiation. The impact on health can also be subjective (irritation and discontent), and there is also the potential impact on sleep and concentration problems, followed by impact on hearing in case of noise, although long term effects on hearing have not been proven. Modern wind farms reduce sunlight reflection, reducing the impact of the glint. There are rather small chances for flicker impact on people suffering from epilepsy. All these factors can be additionally controlled by regulations of minimum distance of wind farms from households, by developing environmental impact assessments and other surveys that the local community could together give over to the investors and local self-government members.

4.2.2. Impact on agriculture and economic activities

From the employment perspective, the implementation of wind energy projects generates jobs. The construction of one wind farm can employ several hundreds of people. However, the participation of local workforce depends on the investors, wind farm location and overall economic situation. The higher the share of local investors and planners included in the project from the very beginning, the higher the probability that the local community will have an important role in the construction and further maintenance of the wind farm. If the wind farm construction is planned on lands near areas with tourism potential for which they would potentially be disturbing (primarily protected areas), additional distrust can be expected by the local community. On the other hand, wind farms can also present tourism potential as energy, management and nature-based tourism, in case if in the future Serbia becomes a model for other countries in the region whose wind energy projects are still in the beginning stages.

Wind farm construction projects in pre-implementation stages should not as usual practice go through the process of changing the use of land. The acceptance by agricultural producers, rangers and farmers in the area of turbine installation depends also on the capacity and number of wind turbines, but the impact of wind farms on agricultural output should be minimum or none. Agricultural producers who own the land can generate additional income from wind farms developed on their land through leases. Wind farms are usually not used for pumping water, water supply and fire protection measures, although this could also be an option for private investors and land owners on the land planned for wind farm construction. The impact of wind farms on forestry can have a certain role if the chosen location demands significant changes in the near ecosystems by introducing or building infrastructure. In order to avoid any external expenses related to the impact of wind farms on the local community in the economic or social sense, the inclusion of local representatives in project presentation before the beginning of construction (workshops with stakeholders, simple data availability and other measures of communication and education) is one of the potential solutions. The acceptance of the local community in the process of wind farm project implementation is therefore different than the general public acceptance on the regional and national levels, which is under lesser direct impact (positive as well as potentially negative) of wind farms.

On the national level, Serbia has set a target for the proportion of renewable energy sources in electrical energy consumption at 27% by 2020. Wind farms have socio-political support to achieve energy and climate objectives, which would be implemented in the most efficient way with cooperation and involvement of the local community.



5.

SOCIAL AND ENVIRONMENTAL REQUIREMENTS MATRIX

Green for Growth Fund, Southeast Europe (GGF), was established by the European Investment bank and KfW (the German Development Bank) in order to help Southeast Europe to face the challenge of adjusting their economies to be more sustainable. This is the first specialised fund to advance energy efficiency and renewable energy in this part of the world. The main objective of this fund is to achieve a reduction in energy consumption of 20% by 2020 and/or to reduce the emission of carbon monoxide in the atmosphere by 20%.

One of the areas in which the fund is investing large resources is the construction of wind farms as renewable energy sources. It was decided that resources would be invested in wind farm projects of 30 MW, which meet the technical criteria set by the Fund.

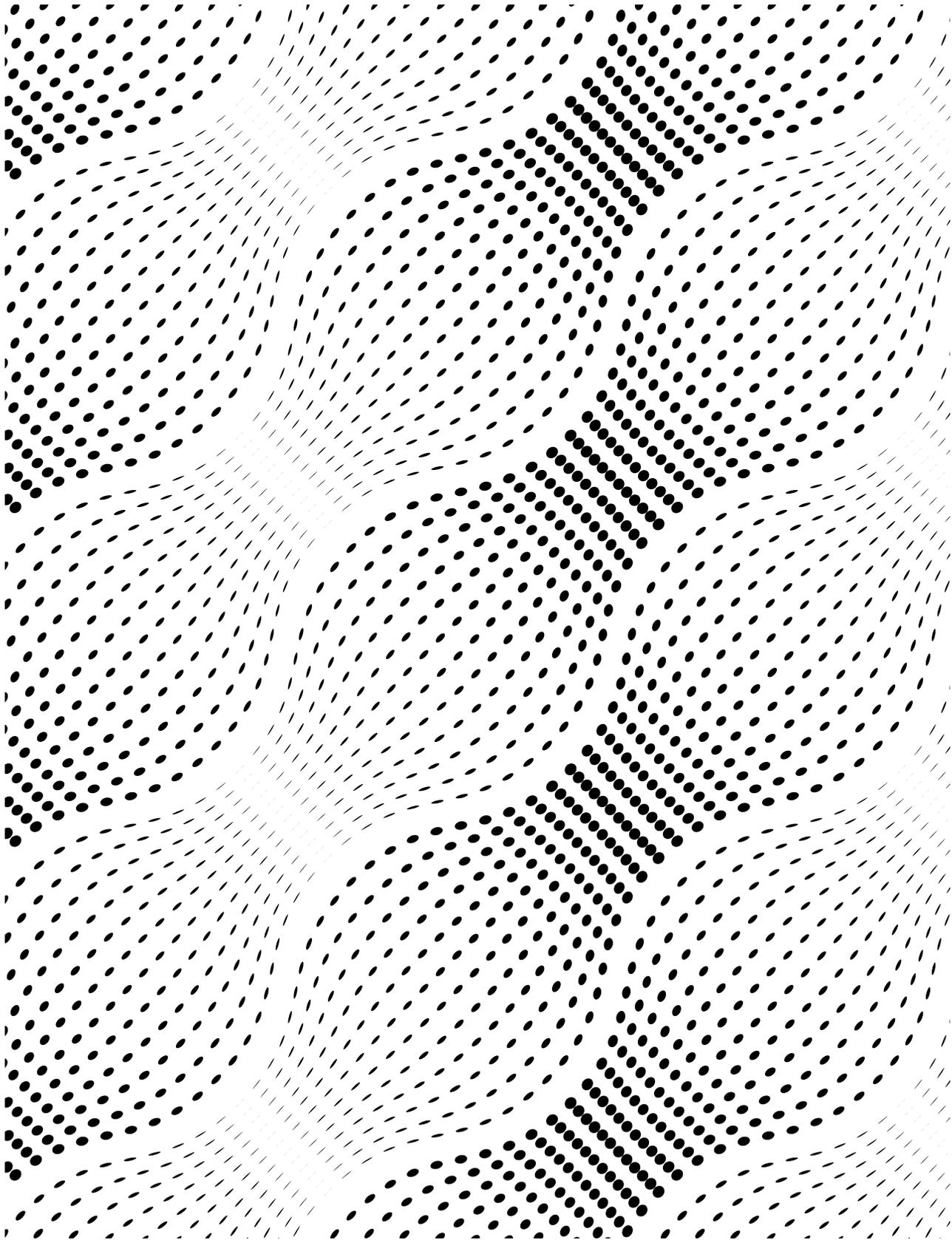
Table 5. was compiled in accordance with the Fund requirements related to environmental and social performance, published in the document Green for Growth Fund, Southeast Europe - Environmental and Social Performance Requirements²⁰ [31]. In order to streamline projects in accordance with good practices and respond to sustainability requirements for GGF funding, it is necessary to assess the risks that can be caused certain activities related to the development of the projects applying for funding. As stated in the Table, the most important risk categories are divided as parameters for risk assessment, showing GGF demand to reduce risks and take the necessary actions.

The Table below represents an example of requirements investors can encounter when the projects they are applying for funding with are assessed by the EU financial institutions.

²⁰ Available at <http://www.ggf.lu/media/public/pdfs/downloads/es-performance-requirements/ggf-es-performance-requirements.pdf> (accessed on 16/10/2013)

Table 5. Major parameters, risks and actions for wind farm construction project assessment

Parameter	Risk	Requirements	Actions
Impact on nature	Biodiversity	Legislation	Avoid
	Habitats	Sustainability	Minimize
	Birds		Mitigate
	Bats		Offset
	Protected areas		
Impact on the environment (excluding nature)	Noise	Legislation	Avoid
	Visual impact	Populated areas	Minimize
	Electromagnetic radiation	Land use	Mitigate
	Glint and flicker	Technical solution	Offset
	Construction of access roads and other infrastructure	Waste management	
Working conditions	Work safety	Legislation	Avoid
		Best practices	Minimize
		Prevention and education	Mitigate
			Offset
Environmental pollution	Waters Soil	Legislation	Avoid
		Best practices	Minimize
		Waste management	Mitigate
		Decommission	Offset
Population health and safety	Accidents Noise Electromagnetic radiations Glint and flicker	Legislation	Avoid
		Best practices	Minimize
		Prevention and education	Mitigate
			Offset
Cultural heritage	Cultural resources Tradition	Legislation	Avoid
		Identification and inventory	Minimize
			Mitigate Offset
Informing and including the public	Interest groups Local population	Legislation Project transparency Public involvement	Avoiding conflicts between stakeholders
Social effects	Local community Interest groups Tourism	Legislation	Avoid
		Employment	Minimize
			Mitigate Offset



6.

BEST PRACTICES AND
ACTIONS TO MITIGATE THE
IMPACT OF WIND FARMS

Actions for mitigation of negative impacts of wind farms can be divided into four categories:

- 1) Actions for total avoidance of adverse impacts
- 2) Actions for minimizing strength, duration and intensity of major adverse impacts, which can be applied in cases when negative impacts can be avoided
- 3) Actions to mitigate important adverse impacts that must be applied when these impacts cannot be avoided or minimized. In these cases it is inevitable that the negative impact will occur, but these impacts are attempted to be mitigated by rehabilitation (e.g. rehabilitation of destroyed habitats, feed supplements and similar)
- 4) Actions to offset significant adverse impact must be applied when these impacts are impossible to reduce. The aim of such actions is to replace the loss of biodiversity as a result of adverse project impacts

The best way to completely avoid negative impact of wind farms is their strategic positioning outside the potential zones in which negative impacts could occur, primarily outside of protected areas, ecological network areas (or Natura 2000 network) and areas important for birds and bats. This is possible to develop on the level of strategic assessments of environmental impact of spatial plans and special purpose plans (e.g. National Action Plan for renewable energy sources). In addition, by using multi-criteria analysis (where, for example, wind potential and presence of infrastructure overlap with sensitive areas), different levels of risk areas can be defined. Such assessments enable defining the so-called no-go zones in spatial plans for certain types of projects where the planning is not possible because of some limiting factors, as well as the zones in which the placing of such projects is desirable. Such an approach, in addition to guaranteeing efficient biodiversity protection, also helps potential investors to more simply choose favourable sites for their projects, with which they could access the necessary documentation (e.g. decision on the conditions for nature conservation from the relevant nature conservation institute) in a faster and simpler manner. Properly planned projects are also less likely to be disputed in the stage of environmental impact assessment, and fewer mitigation actions can be expected to be requested.

Examples of good and bad practice in wind farm planning in EU countries

Strategic Locational Guidance Note for Onshore Wind Farms in Scotland

The 2009 Strategic Locational Guidance Note for Onshore Wind Farms in Scotland [28] is shown as best practice in wind farm planning respecting the principles of nature conservation. By using syntetic maps that present sensitiveness of areas to different environmental criteria (areas important for recreation and landscapes, important bird species habitats, other important habitats) the territory was divided into three zones of sensitiveness. The lowest sensitivity zone holds the least probability for negative impact of wind farms (but cumulative effects should be taken into account), in medium sensitivity zone, the construction of wind farms is possible with additional planning and careful siting, while in the high sensitivity zone, the probability for adverse impacts is the highest so in these zones planning of such structures should be avoided. Strategic plans are often on a very rough spatial scale so there is probability that in low risk zones some limiting factors appear, but this probability should be very small.

Environmental impact assessment for wind farm Fužine

On 02 August 2013, the environmental impact assessment for the planned 56 MW wind farm Fužine, on the Zvirjak site in Croatia, which included also the appropriate assessment of acceptability of the project for ecological network, received negative appraisal from the Croatian Ministry of Environmental Protection and Nature because the scope was unacceptable for the environment and ecological network. The main evaluation demonstrated that the planned project could have significant negative impact on the conservation objectives (primarily on birds like the European Honey Buzzard, Crane, Griffon Vulture and the Goldern Eagle and several species of bats) and the entirety of the ecological network (Decision of the Ministry of Environmental and Nature Protection, Zagreb, 02 August 2013).

When planning the wind farm with 14 wind turbines Vrataruša above Senj in Croatia, the potential adverse impacts were not correctly anticipated and now this wind farm represents a significant and permanent damage for vultures, because it is located exactly opposite their colonies on islands Krk and Prvić, on top of the hill on a mild slope, which presents the greatest danger for vultures [32].

The adverse impacts of wind farm noise on the environment can be mitigated by adequate distribution of wind turbines (far from populated areas or in sheltered positions) as well as using technical solutions for noise control (which often results in decreased production).

Negative effects of glints and flickers on the local population can be avoided by planning wind farms on places remote from settlements, and it is recommended that the period of flickering shadows on neighbourhood dwellings and offices within a radius of 500 meters not exceed 30 hours/year or 30 minutes per day [24].

It has been perceived that the negative visual impact of wind farms can be mitigated in the following ways:

- all wind turbines should be the same or approximate size
- their colour should be light grey or white
- wind turbines should only have three-blade propellers
- all propellers should rotate in the same direction

- better to install fewer large than more small wind turbines
- their distribution should be in rows (possibly on flat terrains)
- underground cables should be used for internal networks
- reduced number of signal light for air traffic (installed only on more exposed wind turbines)

Actions for mitigating adverse impacts on birds are planned separately just in case, depending on the location and at-risk species on which the impact is possible or probable. However, there are several general actions that can similarly be recommended for nearly all wind farm projects.

The selection of location on which the risk of adverse impact on birds is small is the most efficient way of reducing adverse effects. The distribution and orientation of turbines inside the field, positioning them not perpendicular in relation to main flyway directions, and ensuring passages in between groups of turbines in large fields, can help to reduce the number of collisions. Also, it is necessary to position cables outside the main flyway routes and mark them with deflectors that can make them visible to birds. Construction works should be planned outside sensitive seasons (nesting). Painting propellers in contrasting colours and night lighting can make the turbines somewhat more visible to birds. By removing structures that attract birds (e.g. landfills, smaller water surfaces, agricultural crops that can serve as feeding ground) from the wind field area, can reduce its attractiveness to birds and therefore reduce the number of collisions.

Radars for early bird discovery, in combination with systems for immediate propeller halt can contribute to reduced collision mortalities.

Even more efficient than radars are modern automatic surveillance systems that allow detection of birds and bats flying over with automatic response to avoid collision in real time.

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Actions for mitigating adverse impacts of wind farms on bats are used to attempt to reduce the number of collision related mortalities, as well as to preserve migration and flyway routes that bats use during seasonal or daily migrations. They have to be planned depending on the respective type and location, but some general guidelines can be offered.

Activities around structure and infrastructure development should be performed during the day, so as not to disturb bat activities. During these activities, it is necessary to avoid unnecessary removal of trees and bushes, unless this is a part of the actions to decrease bat mortality.

Adverse impacts can be mitigated by distributing the turbines properly and by establishing no-go zones. As mentioned earlier in the chapter, adequate wind farm planning in areas with high numbers of bats is the best protection measure against adverse impacts.

Reducing rotor speed at low wind speeds can also influence to reduce the number of killed bats. The majority of fatalities occur at low wind speeds (up to 5-6 m/s), because bat activity is drastically reduced in strong wind. Stopping the rotor or drastically reducing its speed when the wind reaches critical speed can lead to reduced mortality by 60-90% with negligible losses in production on annual level.

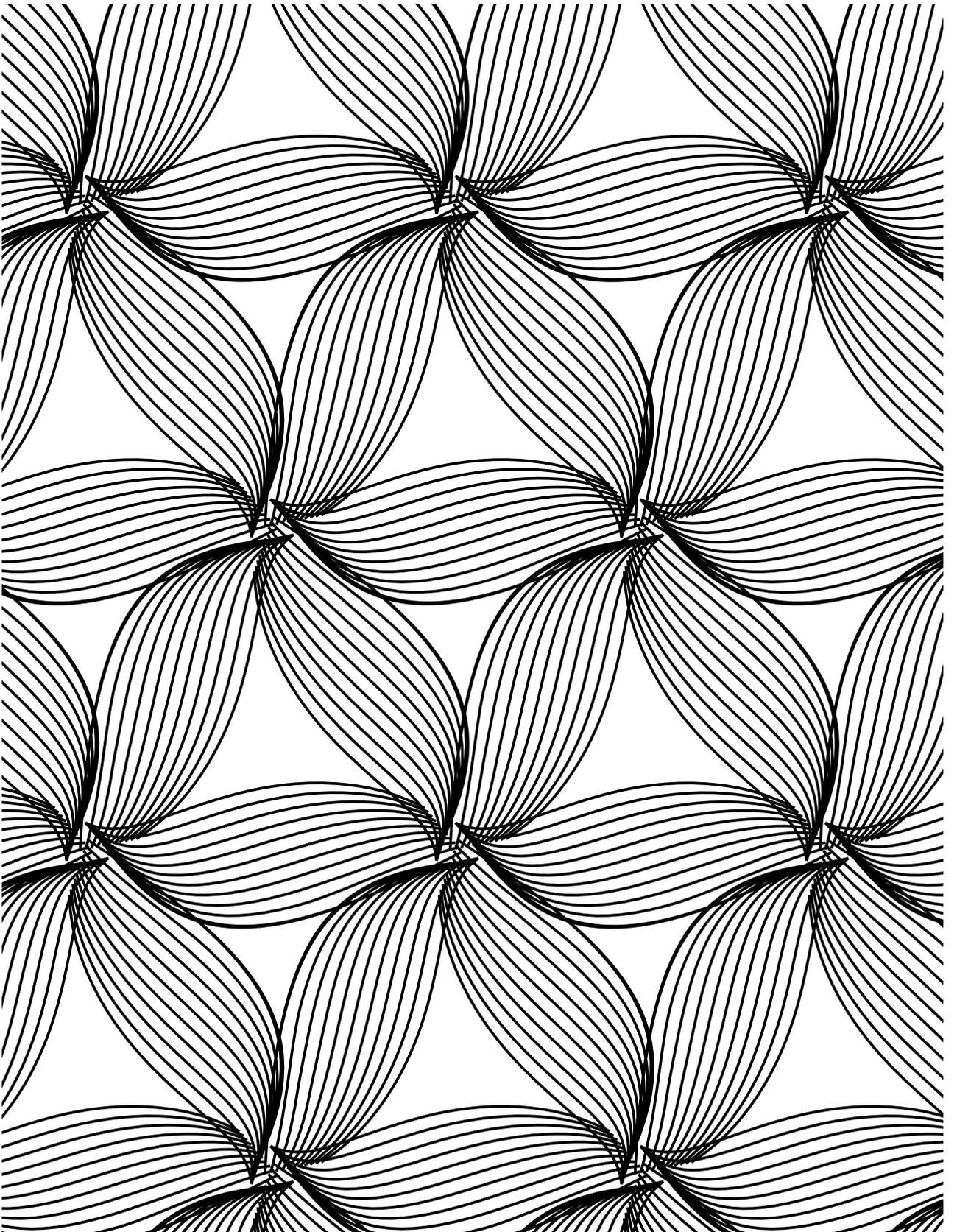
The proximity of roads and wind farms can lead to increased concentration of insects, which the bats feed on around the turbines, which can result in increased mortality. Actions to reduce the area suitable for bat feeding in the vicinity of turbines can be required in such cases in order to mitigate negative impacts.

Lights on wind farms can attract insects, but also some species of bats (while others will attract a large number of insects) and so increase the risk of collision. In order to mitigate this adverse impact, it is recommended to switch the lights on wind farms occasionally on and off and use types of lighting that attract insects less.

All environmental impact assessments of wind farms should include the requirement for decommissioning wind farms after expiry. It is recommended to include removal and disposal of towers, fences, access roads and other structures.

According to the Law on environmental impact assessment, all actions required for mitigation of adverse impacts should be monitored over a longer period of time, using suitable methodology, in order to estimate their efficiency.

Offset actions are required in order to replace the irreplaceable losses caused by a plan or project. They are provided for plans that have inevitable strong adverse impacts, but have to be implemented because of the prevailing public interest. Their aim is to ensure the integrity of the Natura 2000 network, and they should relate to compensating damages for concrete species or habitats for which the negative impact is assessed. Unlike the negative impact on habitats, where offsets can be determined for each lost hectare with a hectare of lost habitat outside the catchment area, offset actions for mortalities are difficult to determine. One of the possible ways is to protect or revitalise relevant habitats outside the impact zone in order to create conditions to move endangered species or form a new feeding area. For now there are few available data on the success of implementation of offset actions for wind farm projects.



7.

WIND FARM POSITIVE
AND NEGATIVE IMPACTS
MATRIX AND PROJECT
CATEGORISATION

In earlier chapters of this document, the most important positive and negative effects of wind farms on the environment, nature and society were described. During the environmental impact assessment study, the effects of all stages of planned projects are assessed, for which in the majority of countries an adapted standardised matrix methodology development is used from Leopold et al [33]. In this way, the assessed impact can be more clearly presented and systematised into a matrix (Table 6.) that brings together assessed impacts of each phase on different components of the environment, nature or society. Such an approach enables us also to present and evaluate the impacts on different components of the environment.

An example of such a matrix for wind farm projects is presented here, but it could and should be adapted to the specific requirements of each analysed project.

Table 6. Impact assessment for each stage of project development on different components of the environment, nature or society

	Work force and employment	Local economy	Land use	Cultural heritage	Visual impact	Citizen safety	Climate/CO ₂ emissions	Air quality	Environment pollution	Water pollution	Habitat degradation	Birds	Bats	Other animals
Planning and construction stage														
Location preparation														
Access roads development														
Connecting infrastructure development														
Turbine erection														
Unexpected events/ accidents														
Operational phase/ electricity production														
Decommission and waste management														

Each of the impacts in the matrix is in each stages marked from +2 (very positive) to -2 (very negative), whereas 0 denotes the absence of such impact, and ? means that it is not possible to assess the impact.

The existence of impacts assessed as extremely negative if the given project is implemented on the selected location can be a limiting factor and lead to the rejection of such a project in the proposed form. Then it is necessary to restart planning or defining mitigation or compensation measures for these impacts in order to mitigate or entirely avoid them.

8.

ENVIRONMENTAL IMPACT MONITORING PLAN

In order to successfully evaluate the quality of wind farm assessment and proposed mitigation or elimination measures during the environmental impact assessment study, it is required (pursuant to the Law on environmental impact assessment) to monitor the effects on the environment after putting the wind farm in operation. Data collected by monitoring are needed in order to contribute to existing knowledge about the positive and negative effects of wind farms on nature, especially on birds and bats. New knowledge received from data collected in this way will contribute to improve the quality of future studies of wind farm impacts on the environment.

In order for it to be efficient and give the most precise results, impact monitoring programme must be planned and implemented with the purpose to really assess the intensity of the selected most important impacts or their mitigation measures. It is mandatory, provided in the Environmental Impact Assessment, funded by the investors and implemented by certified professionals – experts in the area of required surveillance (most often these are birds and bats).

The most important monitoring results should be published, in a form that would not jeopardize the investor nor discover sensitive information about the environment (e.g. location of nests of rare and endangered species), in order to be able to refer to them after study development.

The methodology for practical monitoring negative effects of wind farms on birds is described in literature in details, and the main guidelines we give below are described in the document Guidance on Methods for Monitoring Bird Populations at Onshore Wind Farms developed by the Scottish Natural Heritage [34].

Monitoring methods include monitoring the behaviour and flight of birds near the turbine and searching and counting corpses of birds killed by collision with turbines. Counting corpses, or determining collision mortality rates, serves as a direct measure of adverse impact, parameter for risk assessment, but also for understanding environmental conditions causing the increase or reduced number of collisions. Some of the limiting factors when using this method are:

- Collisions are rare events and monitoring is not constant, so the probability of finding killed birds is relatively small
- Killed birds can fall outside the search zone in case death is not instant (if the turbines hurt them and they manage to leave the zone)
- The probability of finding killed birds also depends on the terrain and bird species, so data from different terrains cannot be compared
- Different scavengers (animals) can also be attracted by the high number of birds killed and be more efficient than the observer in discovering and removing them

Using well trained dogs increases the efficiency of search for killed birds because it reduces the time needed to find the corpse and increases the probability of finding it.

The main goal of counting is to determine whether after the wind farm was built there have been disturbances or displacement from the area of birds that had previously been there, by monitoring the size of the population and spatial distribution of individual birds. Counting methods are weak because in short time (several outings) a large surface should be covered.

Changes in bird behaviour (change in the altitude and manner of flight, changes in space use) are monitored by following the flight in the zone around the wind farm.

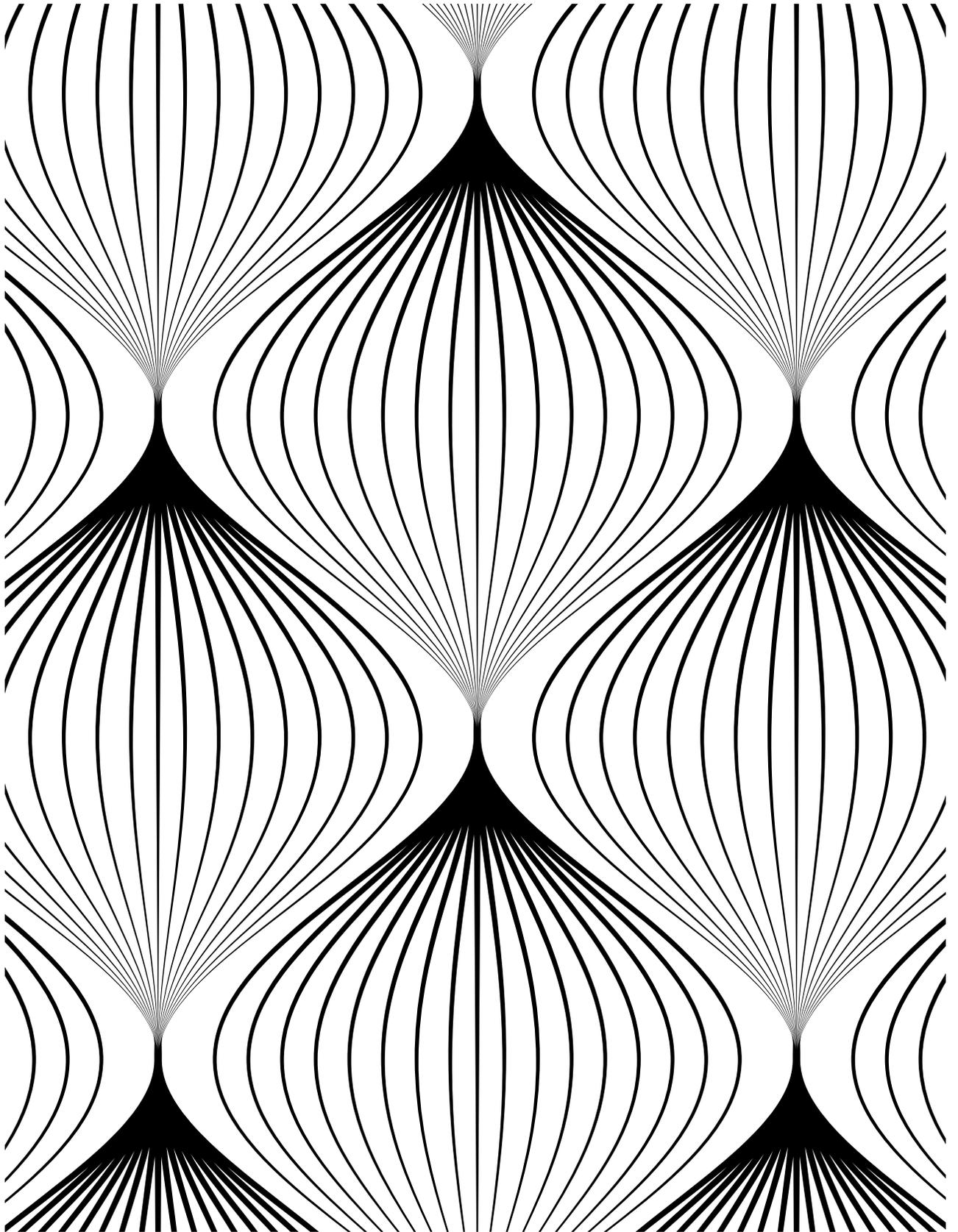
As not to attribute any of these effects to the wind farm wrongly, if there is some other cause, it is necessary to define control areas outside the expected impact of the wind farm for parallel monitoring.

With monitoring of wind farm effects on bats, the situation is similar with birds. Monitoring should be performed using standard methodology provided by the UNEP - EUROBATS [35] Guidelines in order to be able to compare and join together results in order to assess cumulative effects. Data collected through monitoring are scientifically fully relevant only if the condition before the construction of the wind farm is determined, i.e. if the so-called BACI (Before-After-Control-Impact) approach is used. Also, in order to set the wind farm effects aside, it is necessary to perform, in parallel to the wind farm monitoring, also the monitoring on a control zone of similar characteristics only without the expected impact of wind farms.

Good quality monitoring of wind farms should follow these four main groups of effects on bats:

- Loss of habitat
- Mortality
- Migrations
- Behaviour

Technological development has led to new possibilities for monitoring wind farm effects. Therefore, cameras with sensors can be used for monitoring purposes to detect over flights and collisions, radars to detect individual birds or flocks, sound recordings to count and identify species. The latest automatic monitoring systems enable the detection of birds and bats flying over and automatic actions to avoid collisions. These systems offer continuous monitoring in real time, automatic report generating and data exchange, they are more precise than radars, simpler to install and use. However, even though they are getting cheaper, the instalment of automatic monitoring systems still considerably increases investment costs.



9.

RECOMMENDATIONS

There is good wind potential in the Republic of Serbia for power production, which is together with attractive tariff systems, motif for a growing number of interested investors. According to available data, on the territory of Serbia there is a plan to build 2.6 GW wind farms, around 75% of which on the territory of AP Vojvodina. Partial discrepancies between the legislation related to obtaining rights for construction on a location and legislation related to renewable energy sources can result in projects' halt. The harmonization of legislation with the aim to accelerate and facilitate project initiation should be completed by early 2014.

In spite of the positive progress for wind farm project development achieved by adoption of by-laws related to the Energy Law, there is still a certain number of obstacles to investors slowing down the start of implementation of large wind farm projects. The condition to keep the temporary status of privileged power producer according to Article 56 of the Energy Law is to build a wind farm and make it operational within two years of the date of the decision on the status. The above does present high risk for investors because currently no law provides for the situation of a natural force majeure, so if there is a flood or an earthquake during the construction period, the investor will lose the temporary privileged power producer status (PPP status) because they have not completed the construction within the legally set deadline.

Further, the existing environmental and natural legal framework determines the implementation of an Environmental Impact Assessment (EIA) only after issuing the location permit. Such conditions for project development in Serbia present great risks for investors because up to that moment the investor has already had to develop the detailed regulation plan for the wind farm, resolve all property-rights related issues on the lots needed, and to develop the conceptual design of the wind farm, which already demands high investments. Initiating environmental impact assessment procedure after all the mentioned activities, and if it is rejected or actions are required that demand extensive alterations to the project, can make the project unprofitable or ban the construction of the wind farm on the proposed site altogether. Therefore the environmental impact assessment should come much sooner in the process, and it is certainly recommendable to require it before issuing the location permit.

For wind farms that do not require an environmental impact assessment, the Study of environmental and social impacts is recommended (see Chapter 5), which in the majority of cases is required by international financial institutions in order to verify whether proposed projects respond to their sustainability standards.

It is recommended to clarify some other current obstacles in the development of wind farms, as well, such as the possibility for investors to build connecting infrastructure themselves.

Project transparency is one of the key incentives for the local community to learn as much as they can about the project, in order for the advantages and benefits of the wind farms, such as employment and fiscal subsidies to be clear, and potential negative aspects clearly defined and brought down to a minimum. It is recommendable to establish positive communication between investors and local stakeholders during the process of project development, study development and project implementation by systematically organising meetings, seminars, workshops and other information sharing methods and ways to involve the public in the project development.

During wind farm project planning, it is necessary to take into account their potentially most intense adverse impacts on the environment related to noise emission, flickering and glinting, as well as negative visual impacts on the space. Because of specific and intense adverse impacts on birds and bats that can be killed

in collision with rotating turbines, all wind farms should be planned outside of protected areas, ecological network areas and other areas with high concentration of these species.

The selection of location on which the risk of adverse impact on birds is small is the most efficient way of reducing adverse effects. The distribution and orientation of turbines inside the field, positioning them not perpendicular in relation to main flyway directions, and ensuring passages in between groups of turbines in large fields, can help to reduce the number of collisions. Also, it is necessary to position cables outside the main flyway routes and mark them with deflectors that can make them visible to birds. Construction works should be planned outside sensitive seasons (nesting). Painting propellers in contrasting colours and night lighting can make the turbines somewhat more visible to birds. It is recommended to remove from the wind farm area structures that attract birds and bats like waste landfills and water surfaces.

Planning and introducing measures for eliminating or reducing adverse impacts should come early – at the stage of selecting potential sites for wind farms, on the level of strategic environmental impact assessments. Then, by overlapping maps of areas with highest wind potential and maps of areas with ecological networks and protected areas, can determine the zones in spatial plans in which such projects should be placed. Such an approach can guarantee efficient biodiversity protection and simplify the selection of favourable locations for potential investors. When there are no plans with these zones defined, consultations with the relevant institutes for nature conservation (Institute for Nature Conservation of Serbia or Institute for Nature Conservation of Vojvodina Province) have proved as best practice when choosing locations for wind farms.

Accession of the Republic of Serbia to the European Union and the establishment of Natura 2000 ecological network, as well as introduction of its basic protection mechanism – appropriate assessment, should standardise and accelerate wind farm planning and construction processes. Appropriate assessment analyses in detail all adverse impacts, and for each individual goal, which would lead to a negative impact, mitigation or offset measures are provided. Based on the appropriate assessment, the relevant entity can give consent to implement the project if it has shown not to have negative impacts on the defined conservation objectives. If it turns out that there is a great probability that the implementation of the given project would lead to significant negative impacts, the consent can be denied at this early stage. It is recommended to introduce this mechanism in Serbia also, and for this purpose it is necessary to define conservation areas and objectives, train experts, and integrate the entire process in the legal framework.

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ANNEX I: LIST OF RELEVANT LEGISLATION OF THE REPUBLIC OF SERBIA

- Constitution of the Republic of Serbia

Strategic documents:

- Biodiversity Strategy of the Republic of Serbia for the period 2001 – 2018 (Official Gazette RS, No. 13/2011)
- National Environmental Protection Programme (Official Gazette RS, No. 12/10)
- Waste Management Strategy for the period 2010 – 2019 (Official Gazette RS, No. 29/2010)
- National Sustainable Development Strategy (Official Gazette RS, No. 57/2008)
- National Strategy for Sustainable Use of Natural Resources and Goods (Official Gazette RS, No. 33/2012)
- Serbian Energy Sector Development Strategy by 2015 (Official Gazette RS, No. 44/05)
- Serbian Energy Sector Development Strategy Implementation Programme (Official Gazette RS, No. 17/07)

Laws:

- Energy Law (Official Gazette of RS, No. /11, 80/11 - correction, 93/12 , 124/12)
- Law on ratification of the Treaty Establishing the Energy Community between the European Community and the Republic of Albania, Republic of Bulgaria, Bosnia and Herzegovina, Republic of Croatia, Former Yugoslav Republic Macedonia, Republic of Montenegro, Romania, Republic of Serbia and United Nations Interim Administration Mission in Kosovo in compliance with the United Nations Security Council Resolution 1244 (Official Gazette RS, no. 62/06)
- Law on Environmental Protection (Official Gazette RS, No. 135/04, 36/09, 36/09 – other law and 72/09 – other law)²¹
- Law on Nature Protection (Official gazette RS, No. 36/09, 88/10 and 91/10 – correction)²²
- Law on National Parks (Official gazette RS, No. 39/93, 44/93, 53/93, 67/93, 48/94, 101/05 and 36/09 – other law)
- Law on Strategic Environmental Impact Assessment (Official gazette RS, No. 135/04 and 88/10)
- Law on Environmental Impact Assessment(Official gazette RS, No. 135/04 and 36/09)
- Law on environmental noise protection(Official gazette RS, No. 36/2009 and 88/2010)

21 Currently the draft Law on Amendments to the Law on Environmental Protection is available at the Ministry of energy, development and environmental protection web page, which is now on public discussion (<http://www.merz.gov.rs/lat/dokumenti/nacr-zakona-o-izmenama-i-dopunama-zakona-zastiti-zivotne-sredine>)

22 Currently the draft Law on Amendments to the Law on Nature Protection is available at the Ministry of energy, development and environmental protection web page, which is now on public discussion (<http://www.merz.gov.rs/lat/dokumenti/nacr-zakona-o-izmenama-i-dopunama-zakona-o-zastiti-prirode>)

- Law on waters (Official Gazette No. 30/10 and 93/12)
- Law on forests (Official gazette RS, No. 30/10)
- Law on game and hunting (Official Gazette RS, No. 18/10)
- Law on Agriculture and Rural Development (Official Gazette RS, No. 41/09)
- Law on geological survey (Official gazette RS, No. 44/95 and 101/2005);
- Law on free access to information of public importance (Official gazette RS, No. 120/2004, 54/2007, 104/2009 and 36/2010)
- Law on air traffic (Official gazette RS, No. 73/10 and 57/11)
- Law on telecommunications (Official Gazette RS, No. 44/2003 and 36/2006)
- Law on public enterprises (Official Gazette RS, No. 119/12)
- Law on planning and construction (Official Gazette RS, No. 72/2009, 81/2009 - corr., 64/2010 – CC decision, 24/2011, 121/2012, 42/2013 – CC decision and 50/2013 – CC decision)
- Law on Republic of Serbia Spatial Plan from 2010 until 2020 (Official Gazette RS, No. 88/10)

By-laws:

- Decree on Privileged Electricity Producers (Official Gazette RS, No. 99/2009)
- Decree on incentive measures for the Production of Electricity from Renewable Energy Sources and Combined Heat and Power Production (Official Gazette RS, No. 72/09)
- Decree on amendments to the Decree on Establishing the Energy Sector Development Strategy Implementation Programme of the Republic of Serbia until 2015 for the period of 2007 to 2012 (Official Gazette RS, No. 72/09)
- Decree on Conditions of Electricity Delivery (Official Gazette RS, No. 107/05)
- Decree on establishing the list of projects which require environmental impact assessment and list of projects which may require environmental impact assessment (Official Gazette RS, No. 114/2008 of 16 December 2008)
- Decree on the ecological network (Official Gazette RS, No. 102/10)
- Decree on the level of fees for the use of waters, fees for water protection and fees for material extracted from water courses for 2009 (Official Gazette RS, No. 27/07)
- Decree on protection regimes (Official Gazette RS, No. 31/12)
- Regulations on the criteria for issuing energy permits, the content of applications and procedure for issuing energy permits (Official Gazette RS, No. 23/2006, 113/2008 and 50/2011)²³
- Regulation on requirements regarding professional staff and terms of issuing and revoking licenses for energy-related activities (Official Gazette RS, 117/05, 40/06 and 44/06)
- Regulation on the content of environmental impact assessment (Official Gazette RS, No. 69/2005)

²³ Currently the proposal of the Regulation on detailed conditions for issuing energy permits, the content of applications and procedure for issuing energy permits, as well as the consent for energy sector structures that do not require energy permit (<http://www.merz.gov.rs/lat/dokumenti/predlog-pravilnika-o-blizim-uslovima-za-izdavanje-energetske-dozvole-sadrzini-zahteva-i>)

- Regulation on the contents of the impact assessment request and content of the request to determine the scope and content of the environmental impact assessment (Official Gazette RS, No. 69/2005)
- Regulation on the procedure of public insight, presentation and public discussion about the environmental impact assessment (Official Gazette RS, No. 69/2005)
- Regulation on the regulation on proclamation and protection of strictly protected and protected species of wild plants, animals and fungi (Official Gazette RS, No. 5/10 and 47/11)
- Regulation on distinguishing criteria of habitat types, habitat types, sensitive, threatened, rare and priority habitats for protection, as well as protection measures for the conservation of habitat type (Official Gazette RS, No. 35/10)
- Regulation on compensation tariffs for determining compensation levels for damage caused through an unauthorized act in relation to strictly protected and protected wild species (Official Gazette RS, No. 37/10)
- Regulation and special technical and technological solutions that enable undisturbed and safe communication of wildlife (Official Gazette RS, No. 72/10)
- Regulation on the content of technical documentation submitted in the procedure to acquire water industry consent and water industry permit (Official gazette RS, No. 3/78)
- Regulation on contents and operational methods of the Protected Areas' Register (Official Gazette RS, No 81/10)
- Regulation on content, development procedure, expert control over the urban plan, as well as the conditions and procedure for public access to the plan (Official Gazette RS, No. 12/2004)

International Conventions ratified by the Republic of Serbia important for nature protection:

- Law on the ratification of the Convention on Biological Diversity (Official Gazette SRJ – International Agreements, No. 11/2001)
- Law on ratification of the International Convention for the Protection of Birds (Official Gazette SFRJ, No. 6/73)
- Law on the ratification of the Convention on Preservation of Migratory Species of Wild Animals (Official Gazette RS – International Agreements, No. 102/2007)
- law on ratification of the Convention on Conservation of European Wildlife and Natural Habitats (Official Gazette RS – International Agreements, No. 102/2007)
- Law on ratification of the Convention on Environmental Impact Assessment in Transboundary Context (Official Gazette RS – International Agreements, No. 102/2007)
- Law on the ratification of the United Nations Framework Convention on Climate Change, with Annexes (Official Gazette SRJ – International Agreements, No. 2/97)
- Law on ratification of the Kyoto Protocol of the United Nations Framework Convention on Climate Change (Official Gazette RS, No. 88/2007 and 38/2009)

- Law on ratification of the Vienna Convention for the Protection of the Ozone Layer, with Annexes I and II (Official Gazette SFRJ – International Agreements, No. 1/90)
- Law on ratification of the Convention on Long-range Transboundary Air Pollution (Official Gazette SFRJ – International Agreements, No. 11/86)
- Law on ratification of the Protocol with the Convention on Long-range Transboundary Air Pollution and Long-Term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP) Official Gazette SFRJ – International Agreements, No. 2/87)
- Law on ratification of the Convention concerning Prevention and Control of Occupational Hazards caused by Carcinogenic Substances and Agents (Official Gazette SFRJ – International Agreements, No. 3/77)
- Law on ratification of the Convention Concerning the Protection of the World Cultural and Natural Heritage (Official Gazette SFRJ – International Agreements, No. 8/74)
- Law on ratification of the European Landscape Convention (Official Gazette RS – International Agreements, No. 4/2011)
- Law on ratification of the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Official Gazette RS – International Agreements, No. 38/09) – so-called Aarhus Convention
- Decree on the ratification of the Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Official Gazette SFRJ – International Agreements, No. 9/77)
- Decree on the ratification of the International Plant Protection Convention (Official Gazette FNRJ – International Agreements, No. 7/55)
- Montreal Protocol on Substances that Deplete the Ozone Layer (Official Gazette SFRJ – International Agreements, No. 16/90 and Official Gazette SCG – International Agreements, No. 24/04)
- Convention on the cooperation for protection and sustainable use of the river Danube (Official Gazette SCG International Agreements, No. 4/2003)

