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UKRAINE SUSTAINABLE ENERGY LENDING FACILITY (USELF)

Strategic Environmental Review: Scoping Report

January 2011

USELF
Ukraine Sustainable Energy Lending Facility

USELF STRATEGIC ENVIRONMENTAL REVIEW: SCOPING REPORT

Document Overview

The European Bank for Reconstruction and Development (EBRD) has launched the Ukraine Sustainable Energy Lending Facility (USELF). In co-operation with the national authorities in Ukraine, the USELF has commissioned a Strategic Environmental Review (SER).

The purpose of the SER is to lay out a path to streamline the environmental review process for renewable energy developers by focusing the scope and providing relevant guidance for later environmental reviews of specific renewable energy projects within Ukraine (hydropower, on-shore wind, solar, biomass, and biogas technologies). This SER Scoping Report provides a framework for undertaking the USELF SER.

Areas with good potential for renewable energy development in Ukraine have been identified and are included in this scoping report (located at the end of this document). A short-list of technologies likely to be deployed in the near-term under USELF and other bank programmes is also described. Scenarios for renewable energy development will be refined further and assessed for their environmental effects in the next stage of the SER.

The SER is being developed in compliance with the EBRD's Environmental and Social Policy and its Public Information Policy, as well as being guided by the EU Strategic Environmental Assessment (SEA) Directive. Stakeholder consultation has been ongoing during scoping, and will continue throughout the SER process. In line with EBRD requirements, a Stakeholder Engagement Plan is being developed, that will set the scope and timescales for further consultation throughout the SER.

A review of environmental topic areas to identify the key baseline conditions, future trends and data needed to inform the assessment of effects of each renewable scenario has been conducted. The review also identifies potential constraints and opportunities associated with implementing renewable energy in relation to each topic area.

SER objectives have been developed for each SER environmental topic as part of the scoping stage. The SER objectives will help ensure that scenarios being tested within the SER satisfy the overall aim of USELF; 'to provide development support and debt finance to renewable energy projects which meet required commercial, technical and environmental standards'.

The next stage of the SER process is to identify the 'likely significant effects' on the environment of the USELF renewable energy scenarios and their implementation. The scenarios that have been developed, will be refined as part of this next stage. Mitigation measures to prevent, reduce and offset significant effects will be developed through the assessment process.

This SER Scoping Report will be published for comment, to ensure that the proposed scope of the next stage of the SER is acceptable to all stakeholders. Questions are included at the end of the document to help those providing comments.

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Abbreviations

CHP	Combined Heat and Power
DNI	Direct Normal Insolation
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EU	European Union
GHG	Greenhouse gas
GIS	Geographic Information System
kW	Kilowatt
kWh	Kilowatt hour
MFE	Ministry of Fuel and Energy of Ukraine
MPC	Maximum permissible concentrations
MW	Megawatt
MWh	Megawatt hour
Mtce	Million ton coal equivalent
NAER	National Agency of Ukraine for the Efficient Use of Energy Resources
NASU	National Academy of Science Ukraine, Institute of Renewable Energy
NERC	The National Electric Energy Regulatory Commission
ODPM	Office of the Deputy Prime Minister
OVOS	Assessment of environmental impacts
PJ	Petajoule
PV	Photo Voltaic
SEA	Strategic Environmental Assessment
SEI	Sustainable Energy Initiative
SEP	Stakeholder Engagement Plan
SER	Strategic Environmental Review
USELF	Ukraine Sustainable Energy Lending Facility
W/m2	Watts per square metre
WWF	World Wildlife Fund

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USELF STRATEGIC ENVIRONMENTAL REVIEW: SCOPING REPORT

NON-TECHNICAL SUMMARY

Introduction and Project Context

To encourage businesses to pursue sustainable energy projects, the European Bank for Reconstruction and Development (EBRD) has launched the Ukraine Sustainable Energy Lending Facility (USELF). In co-operation with the national authorities in Ukraine, the USELF has commissioned a Strategic Environmental Review (SER) focusing on renewable energy technologies in optimal areas of Ukraine. The renewable energy technologies specifically reviewed in this SER include hydropower, on-shore wind, solar, biomass, and biogas technologies.

The purpose of the SER is to lay out a path by focussing the scope and providing relevant guidance for later environmental reviews of specific renewable energy projects within Ukraine. When specific projects are proposed under USELF, a project level environmental review is required. After the SER, the necessary project level environmental reviews can use the mitigation strategies laid out in the SER.

This SER Scoping Report provides a framework for undertaking the USELF SER and a review of the issues to be addressed in the SER, and describes the methods to be adopted for completion of the SER. To gain feedback on the relevant issues in the SER and the methods to be adopted, the SER scoping report will be subject to consultation with a range of stakeholder groups.

The SER Process

EBRD's environmental and social policy requires compliance with both European Union (EU) directives and national law for projects and programmes funded through EBRD. Therefore, the SER will be guided by the EU Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (usually known as the SEA Directive). The SER will provide a high level overview of potential environmental effects along with recommendations and guidance for renewable energy development in Ukraine. The key stages of the SER are as follows:

- Stage A (Scoping) - this stage: Setting the context and objectives, establishing the baseline, and deciding the scope;
- Stage B: Developing and refining alternatives and assessing effects;
- Stage C: Preparing the SER; and
- Stage D: Consulting on the draft plan or programme and the SER.

Renewable Energy Scenarios

Areas with good potential for renewable energy development in Ukraine have been identified and are included in this scoping report. A short-list of technologies likely to be deployed in the near-term under USELF and other bank programmes is also described. The renewable energy technologies specifically reviewed in this SER include hydropower, on-shore wind, solar, biomass, and biogas technologies. Further analysis of potential locations, technologies and operating conditions of the renewable energy resource scenarios will be undertaken as part of subsequent stages of the SER, and will be considered in the main 'assessment of effects' stage.

Stakeholder Engagement

The SER is being developed in compliance with the EBRD's Environmental and Social Policy and its Public Information Policy as well as being guided by the EU SEA Directive. Stakeholder consultation has been ongoing during scoping, and will continue throughout the SER process. In

line with EBRD requirements, a Stakeholder Engagement Plan (SEP) is being developed, that will set the scope and timescales for further consultation throughout the SER and beyond.

A "Project Overview" flyer describing the USELF SER was circulated to key organisations in December 2010, along with a request for available data to inform the SER (Appendix A). The flyer was translated into Ukrainian and Russian. Initial stakeholder consultations were undertaken from 22 November to 10 December 2010. In total, the team interviewed 51 stakeholder groups, including 12 stakeholders in Crimea and 11 in the western part of Ukraine (Lviv and Carpathian area). The USELF SER stakeholders are represented by a number of groups, including central authorities, local and regional authorities, other regulators, NGOs, and academic institutions and organisations.

Several reoccurring topics were, explicitly or implicitly, discussed during most of the consultations. Comments on the political and technical obstacles and benefits of renewable energy, and expectations and concerns in relation to the environmental and social issues surrounding renewable energy are summarised in this scoping report. These comments represent the views of stakeholders, and not necessarily USELF or its project team.

Other Relevant Plans, Programmes, and Environmental Protection and Enhancement Objectives

A review of relevant international and Ukrainian law and policies has been undertaken to identify their relevant environmental protection objectives. This review focuses on energy and environmental law and policy and is provided as part of this Scoping Report.

Key Environmental Conditions and Issues

A review has been conducted according to a range of environmental topic areas to identify the key baseline conditions, future trends and data needed to inform the assessment of effects of each renewable scenario. The review also identifies potential constraints and opportunities associated with implementing renewable energy in relation to each topic area. Constraints and opportunities are summarised in the table below.

SER Topic area	Constraints	Opportunities
Climate and Air Quality	• For wind power: possible changes in wind characteristics (speed, constancy, etc) • All renewable energy types: climate change will increase frequency and scale of hazards and disasters • The economic decline will cause manufacturing reduction and an improvement of air quality; that may decrease the interest of the local authorities in renewable energy projects development • Climate-change driven alterations to wind and rainfall patterns could alter the business case for wind, solar and small hydropower schemes.	• All renewable energy types: Reduction in GHG and other air pollutants compared to energy generated by non-renewable means • Wind conditions in Ukrainian Carpathian and Crimean Mountains (wind) • Good indexes of insolation in the southern part of Ukraine (Solar PV) • Changing structure of agricultural cropping (biomass) • Increasing air pollution may stimulate development of green technologies • See climate change under 'constraints'.
Surface water and Groundwater	• Small-hydro power: interaction with risk of flooding in areas of high renewable energy potential • Small-hydropower: insufficient state	• Small-hydropower development might be seen and promoted as an alternative to large power station (re)construction, the latter are one of

SER Topic area	Constraints	Opportunities
	of water-related infrastructure (including reservoirs, channels, aqueducts) • Small-hydropower: uncontrolled land use in water intake zones	the causes of water shortage in some parts of the country • The wide net of small rivers with high potential for small hydro-power development • The possibilities to use existing hydropower facilities (with necessary upgrading)
Geology and Soils	• High value of Chernozem soils might limit siting options for all renewable energy projects • High level of soil pollution, including heavy metals could limit development of all renewable energy projects • Seismic activity and landslides could limit siting options for all renewable energy projects	• Possibility of siting for all renewable energy projects on land formerly used for minerals extraction or that is contaminated • High soil productivity often relates to significant nearby biomass potential • Significant mineral resources could support a steady demand in electricity production for all renewable energy projects.
Landscape And Biodiversity	• Expansion of protected areas could reduce the amount of land available for all renewable energy projects • High density of existing protected areas are located in the most promising for renewable energy project areas (Carpathian region (hydropower), Crimea (wind, solar)) • Low productivity and land degradation in certain areas of the country could prevent development of bio-mass and bio-gas projects • Small hydro: minimum flow requirements to protect biodiversity • Bird migration corridors, important breeding grounds for large birds, or areas favourable for bats (wind, mainly).	• Compensation measures such as creation of protected territories or natural parks may be readily acceptable to the authorities and communities and may facilitate solving the conflicts over the land use for all renewable energy projects • Degraded lands could be used for wind or solar renewable energy projects.
Community and Socioeconomics	• Presence and condition of electricity grid and connections • Absence of qualified staff • High migration level that has caused staff turnover • Possibility of ethnic conflicts around land use	• Increased employment opportunities • High level of employees' education • Low employment costs • Necessity and high priority for the development of new advanced technology for potential economic growth basis
Cultural Heritage	• Possible conflicts with local communities and authorities over the land use • Probability of extension of cultural heritage sites' territories or creating new ones, thus limiting potential renewable energy project siting	• Opportunity to support cultural heritage development as one of mitigation measures within renewable energy projects • Siting of renewable energy projects on natural heritage sites for demonstration purposes

SER Objectives

'Objectives' are a recognised tool for describing, analysing, and comparing the environmental effects of alternative options. They usually reflect the desired direction of change. It therefore follows that the objectives may not necessarily be met in full by a given scenario, but the degree to which they do will provide a way of identifying preferences when comparing scenarios. In this case, the SER objectives will need to satisfy the overall aim of USELF; 'to provide development support and debt finance to renewable energy projects which meet required commercial, technical and environmental standards'.

SER objectives have therefore been developed for each SER environmental topic as part of the Scoping stage. These objectives have been formulated through the review of best practice guidelines and review of relevant baseline data for the USELF SER. Scoping consultation has also helped to inform the development of the SER objectives, and it is anticipated that these will be refined through further consultation and review of baseline characteristics.

Next Stages of the SER

The next stage of the SER process is to identify the 'likely significant effects' on the environment of the USELF renewable energy scenarios and their implementation. The scenarios that have been developed, will be refined as part of this next stage.

The SER will therefore assess the potential significant effects of each renewable energy resource scenario upon each of the various environmental topics. The method for determining the likely significant effects upon the environment is described in this scoping report. The assessment will consider location-specific and oblast scale effects of each renewable energy resource scenario for these environmental topics where possible or applicable.

Mitigation measures to prevent, reduce, and offset significant effects will be developed through the assessment process. The mitigation measures will be used to refine the proposed renewable energy scenarios, in agreement with EBRD.

Each of the renewable energy resource scenarios will then be assessed for compliance against the SER objectives, and then assessed against the SER objectives in combination with each other as well as other major proposed developments to determine the potential for cumulative effects upon the environment. Where necessary, further mitigation will be developed to reduce any cumulative effects.

USELF STRATEGIC ENVIRONMENTAL REVIEW: SCOPING REPORT

1. INTRODUCTION AND PROJECT CONTEXT

1.1 Project Background

To encourage businesses to pursue sustainable energy projects, the European Bank for Reconstruction and Development (EBRD) has launched the Ukraine Sustainable Energy Lending Facility (USELF). USELF aims to '*provide development support and debt finance to renewable energy projects which meet required commercial, technical and environmental standards*'. USELF not only provides tailor-made financing, but also provides technical assistance for businesses and local authorities based on information gathered and analysed by consultants to promote projects that are often challenging to finance and implement,

USELF is part of the EBRD's Sustainable Energy Initiative (SEI) which addresses the challenges of climate change and energy efficiency. Since the launch of the SEI in 2006, the EBRD has remained at the forefront in helping countries from Central Europe to Central Asia secure sustainable energy supplies and finance the efficient use of energy that will cut demand and imports, reduce pollution, and mitigate the effects of climate change.

In co-operation with the national authorities in Ukraine, the USELF has commissioned a Strategic Environmental Review (SER) focusing on renewable energy technologies in optimal areas of Ukraine. The renewable energy technologies specifically reviewed in this SER include hydropower, on-shore wind, solar, biomass, and biogas technologies. The SER will comply with the EBRD's Environmental and Social Policy and its Public Information Policy.

A location map is provided showing the major cities, provinces (known as oblasts), infrastructure and major watercourses of Ukraine is provided as Figure 1.1 (figures are located at the end of this document).

1.2 The Strategic Environmental Review (SER)

The purpose of the SER is to lay out a path by focussing the scope and providing relevant guidance for later environmental reviews of specific renewable energy projects within Ukraine. When specific projects are proposed under USELF, a project level environmental review is required. After the SER, the necessary project level environmental reviews can use the mitigation strategies laid out in the SER. The scope of the SER is discussed in more detail in Section 2.

Throughout the SER process, the project team will conduct public consultation to seek existing information and stakeholder input on environmental impacts and mitigation measures. The scope of the Stakeholder Engagement Plan is discussed further in Section 4.

The SER will evaluate the general impacts of developing renewable energy projects on environmental resources, communities, and the economy and identifies strategies to avoid, minimise, and mitigate those impacts while moving projects forward. The SER will mainly use existing information to describe the environmental setting in Ukraine and identify areas and natural resources that could be impacted by renewable energy development (discussed further in Section 6).

The SER will also provide guidance to technical evaluators of proposed renewable projects by identifying areas of good potential and the nature and scale of technologies that can be applied in different parts of the country. The SER will also be valuable to

evaluators of environmental and social impacts because it will identify key receptors that could be vulnerable in specific areas, in part through identifying constraints and opportunities, but also by compiling information and identifying information sources.

1.3 SER Scoping Report

This SER Scoping Report provides a framework for undertaking the USELF SER and a review of the issues to be addressed in the SER, and describes the methods to be adopted for completion of the SER. To gain feedback on the relevant issues in the SER and the methods to be adopted, the SER scoping report will be subject to consultation with a range of stakeholder groups.

This SER Scoping Report has been developed in accordance with good practice guides, including the UK's '*A Practical Guide to the Strategic Environmental Assessment (SEA) Directive*' (Office of the Deputy Prime Minister (ODPM), 2005) (as detailed further in Section 2). Table 1.1 details the structure of the SER Scoping Report:

Table 1.1: Structure of this Scoping Report

Section	Description
1. Introduction and Project Context	Explains the purpose of the USELF SER and Scoping Report
2. The SER Process	Describes the proposed SER framework and how it aligns with the SEA Directive.
3. Renewable Energy Scenarios	Summarises the renewable energy scenarios being considered for the USELF SER
4. SER Scoping Consultation	Provides an overview of consultation on the SER to date, a summary of the proposed scope, and timeframes for the Stakeholder Engagement Plan.
5. Other Relevant Plans, Programmes, and Environmental Protection and Enhancement Objectives	Identifies key legislation applicable to renewable energy and the SER
6. Key Environmental Conditions and Issues	Summarises the key baseline conditions for each of the key environmental topics considered in an SEA-type report and identifies potential issues for each of these.
7. SER Objectives	Describes the SER objectives and how they were formulated.
8. Next Stages of the SER	Summarises how the assessment of effects will be undertaken and how the SER will be prepared. This section also describes the on-going consultation process.

2. THE SER PROCESS

2.1 Alignment of the EU SEA Directive and the SER Process

Ukraine does not presently have legislation or regulations developed that require the development of an SER for programmes such as the USELF. However, EBRD's environmental and social policy requires compliance with both European Union directives and national law for projects and programmes funded through EBRD. Therefore, the SER will be guided by the European Union (EU) Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (usually known as the SEA Directive) and the UK's Practical Guide to the SEA Directive (ODPM, 2005).

The USELF SER in itself will not constitute a statutory Strategic Environmental Assessment (SEA), as Ukraine does not fall within the EU. Further, it is not yet possible to define the locations and specific characteristics of the projects that will apply for funding to USELF. Consequently, the SER will provide a high level overview of potential environmental effects along with recommendations and guidance for renewable energy development in Ukraine.

Building on standard SEA practice, the stages adopted for this SER are described in more detail below and in Table 2.2.

- **Stage A (Scoping) - this stage**: Setting the context and objectives, establishing the baseline, and deciding the scope;
- **Stage B**: Developing and refining alternatives and assessing effects;
- **Stage C**: Preparing the SER; and
- **Stage D**: Consulting on the draft plan or programme and the SER.

2.2 SER Environmental Topics

Annex I of the EU SEA Directive identifies a broad range of environmental and social topics that should be considered within an SEA. Therefore, it provides a benchmark for the scope of this SER. Table 2.1 shows how these topics have been addressed within the USELF SER Scoping Report.

Table 2.1: SEA Directive Environmental and Social topics in the SER

SEA Directive Topic	Comparative USELF SER Scoping Report Section
Biodiversity	Section 6.5; Landscape and biodiversity
Population	Section 6.6; Community and socio-economics
Human health	Section 6.6; Community and socio-economics
Flora and Fauna	Section 6.5;Landscape and biodiversity
Soil	Section 6.4; Geology and soils
Water	Section 6.3; Surface water and groundwater
Air	Section 6.2; Climate and air quality
Climatic Factors	Section 6.2; Climate and air quality
Material assets	Section 6.6; Community and socio-economics
Cultural heritage, including architectural and archaeological heritage	Section 6.7; Cultural Heritage
Landscape	Section 6.5;Landscape and biodiversity

Table 2.2: USELF SER Process Framework

SER Stages and Tasks	Purpose	USELF SER Outputs
Stage A (Scoping) This stage: Setting the context and objectives, establishing the baseline and deciding the scope		
A1. Identifying other relevant plans, programmes, and environmental protection objectives.	To establish how the plan or programme is affected by outside factors, to suggest ideas for how any constraints can be addressed, and to help to identify SER objectives.	Stage A tasks have been captured within this Scoping Report, as detailed in Table 1.1.
A2. Collecting baseline information	To provide an evidence base for environmental problems, prediction of effects, and monitoring; to help in the development of SER objectives.	
A3. Identifying environmental problems.	To help focus the SER and streamline the subsequent stages, including baseline information analysis, setting of the SER objectives, prediction of effects and monitoring.	
A4. Developing SER objectives	To provide a means by which the environmental performance of the plan or programme and alternatives can be assessed.	
A5. Consulting on the scope of SER	To ensure that the SER covers the likely significant environmental effects of the plan or programme.	
Stage B: Developing and refining alternatives and assessing effects (SER)		
B1. Testing the plan or programme objectives against the SER objectives	To identify potential synergies or inconsistencies between the objectives of the plan or programme and the SER objectives and help in developing alternatives.	Stage B tasks will input to the SER and be reported under Stage C. The proposed activities are as follows: The objectives of USELF will be assessed at a high-level for consistency with the SER Objectives. This will allow for the early elimination of alternatives (also known as scenarios) that clearly conflict with the SER objectives.
B2. Developing strategic alternatives	To develop and refine strategic alternatives.	This process commenced as part of Stage A, with an evaluation of potential locations, feasible technologies, and operating conditions for the implementation of renewable energy scenarios (discussed in Section 3).
B3. Predicting the effects of the plan or programme, including alternatives	To predict the significant environmental effects of the plan or programme and alternatives.	At Scoping stage, potentially significant issues associated with generic renewable energy scenarios have been identified. During the full SER, the significance of environmental effects

SER Stages and Tasks	Purpose	USELF SER Outputs
B4. Evaluating the effects of the plan or programme, including alternatives	To evaluate the predicted effects of the plan or programme and its alternatives and assist in the refinement of the plan or programme.	of the scenarios will be assessed fully in relation to each environmental topic. Where the risk of significant environmental effects has been identified, the implications for the SER objectives will be considered. Further details of the SER assessment methodology are in Section 8.
B5. Considering ways of mitigating adverse effects	To ensure that adverse effects are identified and potential measures to *prevent, reduce, or as fully as possible, offset* those effects are considered.	The SER will identify potential generic measures to prevent, reduce and offset likely adverse effects. Location or technology-specific measures will be identified where possible.
B6. Proposing measures to monitor the environmental effects of plan or programme implementation	To detail the means by which the environmental performance of the plan or programme can be assessed.	The SER will provide a high-level framework for envisaged monitoring measures, which can be applied to the renewable energy scenarios under consideration.
Stage C: Preparing the Strategic Environmental Report		
C1. Preparing the SER	To present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers.	The proposed Draft SER contents is summarised in Section 8.
Stage D: Consulting on the draft plan or programme and the Strategic Environmental Report		
D1. Consulting the public and Consultation Bodies on the draft plan or programme and the Environmental Report.	To give stakeholders an opportunity to express their opinions on the findings of the Environmental Report and to use it as a reference point in commenting on the plan or programme. To gather more information through the opinions and concerns of the public.	The Draft SER will be issued for public consultation and feedback in accordance with the Stakeholder Engagement Plan, for example on the scope of the SER, the SER Objectives, key environmental issues, and cumulative effects etc.
D2. Assessing significant changes	To ensure that the environmental implications of any significant changes to the draft plan or programme at this stage are assessed and taken into account.	Any significant changes that are made to the renewable energy scenarios arising from consultation will be taken into account within the Final SER.
D3. Making decisions and providing information	To provide information on how the SER and consultees' opinions were taken into account in deciding the final form of the plan or programme to be adopted.	Following the public consultation period, the final SER will be issued detailing this information.

3. RENEWABLE ENERGY SCENARIOS

3.1 Introduction

This section of the SER Scoping Report identifies areas with good potential for renewable energy development in Ukraine and a short-list of technologies likely to be deployed in the near-term under USELF and other EBRD programmes. This forms part of Stage B of the SER process (as outlined in Section 2.1) as it involves identifying and developing the scenarios for renewable energy under the USELF programme. This section helps to focus the scope of the SER and provides useful guidance for developers seeking funding through the bank. Further analysis of potential locations, technologies and operating conditions of the renewable energy resource scenarios will be undertaken as part of the SER. The renewable energy technologies specifically reviewed in this SER include hydropower, on-shore wind, solar, biomass, and biogas technologies. This is not intended to preclude or limit the future development of other renewable energy resources or technologies that have not been identified here for review; they are simply outside of the scope of this SER.

Black & Veatch is in the process of conducting the following analysis and is awaiting additional data to finalize the scenarios.

- Identify areas of good potential for renewable energy development given resource quality, geographical constraints, existing infrastructure, and transmission considerations.
- Identify list of technologies that are more likely to be developed in the near term.
- Develop scenarios of renewable energy development for SER.

3.2 Background of Renewable Energy in Ukraine

Historically, renewable energy development in Ukraine has been focused on large hydroelectric generation with over 4,000 MW of conventional hydropower and 750 MW of pump storage (an additional 650 MW of pump storage is under construction). There are a number of small hydropower projects (<10 MW) in operation in the country that were built approximately 50-90 years ago. In addition, over 80 MW of wind power capacity are on-line, most were developed in the late 1990's and early 2000's. The first biogas Combined Heat and Power (CHP) project in Ukraine, utilising cow manure at the Ukraine Milk Company, came on-line in 2009 with 625 kW of power and 686 kW of thermal capacity. Aside from these projects, there are limited examples of other renewable energy power projects operating in Ukraine. Photographs of some example renewable energy schemes in Ukraine are provided below:

		
The Sutisky hydropower plant and its impoundment.	The Vinnysia hydropower facility and impoundment on the Buh River.	Donuzlovskaya windfarm, near the town of Novoozerne.

Ukraine established the Energy Strategy of Ukraine in 2006 with a goal of achieving 19% of primary energy supply from renewable energy by 2030. In support of that goal, a Green Tariff for electricity generated from renewable energy sources was established by the

National Electric Energy Regulatory Commission (NERC) in 2008 and was amended with higher prices in 2009.

Green tariffs are an important factor in alternative energy investment decision making. Nations seeking to incentivize renewable energy investment, such as European Union countries and Ukraine also, have established higher electricity sales prices (and therefore revenues) for alternative energy power compared to traditional fossil fuel based power. Green tariffs provide higher revenues for renewable energy power projects and assurance of a long-term revenue stream, which allow otherwise less competitive projects to be more attractive to investors.

The Green Tariff in Ukraine is available to eligible projects until 2030, thus providing long term assurance to organisations that may wish to fund such projects. Projects that come on-line by 2014 will receive the full Green Tariff amount. The Green Tariff is reduced for facilities put into operation (or upgraded) after 2014, 2019 and 2024 by ten, twenty and thirty per cent respectively from the 2009 prices. The types of renewable energy projects that are eligible and their associated rates are listed in Table 3.1.

Table 3.1: Minimum Green Tariffs and the Latest Green Tariffs
Source: EBRD, 2010

	Minimum Green Tariff (NERC Resolution 857)		**Green Tariff for Jan 2010 (NERC Resolution 1591)**
Type of Renewable Energy	**kopek/kWh (excl VAT)**	**€ct/kWh**	**kopek/kWh (excl VAT)***
Wind farms (below 600kW)	70.15	6.46	
Wind farms (above 600kW and below 2000 kW)	81.84	7.54	
Wind farms (above 2000 kW)	122.77	11.31	129.71
Power plants on biomass	134.46	12.39	142.07
Photo voltaic modules on ground	505.09	46.53	
Photo voltaic modules on roofs (above 100kW)	484.05	44.59	
Photo voltaic modules on roofs (below 100kW)	463.00	42.65	
Small hydropower facilities (<10 MW)	84.18	7.75	88.94

**** Note:*** *Green Tariff resolutions issued by NERC are intended to set individual tariffs for each facility qualified for the Green Tariff. As an example, in January 2010, there were three categories of tariffs established – wind farms above 2000 kW, small hydropower and biomass generators. All producers within a category get the same tariff, which must not be below the "minimum" tariff fixed by the NERC Resolution 857. The fixed minimum value of the green tariff shall be established by converting the rate of the green tariff into euro calculated as of 1 January 2009 at the official exchange rate of the National Bank of Ukraine for the stated date. [EBRD, 2010]*

Biogas and landfill gas projects currently do not qualify for Green Tariff, but legislative changes to the biomass definition are being considered.

It is clear that Ukraine's new Green Tariff has attracted foreign investors' interest despite the present financial downturn. According to Ukrenergo, over 14,000 MW of wind projects have been proposed with 1150 MW of which having received technical requirements from Ukrenergo. Table 3.2 shows the oblasts where interconnection to the national grid has been requested for wind projects. Furthermore, at least 300 MW of solar

photovoltaic (PV) projects are being planned in Crimea. However, not all of these proposed projects will progress fully through the development process to completion.

Table 3.2: Total Wind Project Interconnection Requests by Oblast
Source: Ukrenergo, Black Sea Regional Transmission Planning Project, 2010

Oblast	MW
Crimea	5,279
Donetsk	1,620
Zaporizhzhya	3,045
Kyiv	100
Lugansk	250
Mykolaiv	2,500
Odessa	900
Kherson	400
Total	**14,094**

3.3 USELF Programme Considerations

In identifying the types of renewable energy resources and technologies to be assessed through the SER, projects that may apply or be eligible for the USELF programme were given special consideration. Since the lending facility seeks renewable energy projects that are technically and economically viable, similar parameters were taken into account in developing the list of technologies for the SER. Factors considered include:

- Smaller projects are likely to apply to USELF due to its focus on smaller schemes. Primary energy production must be electricity, rather than as thermal energy (space heating, hot water, etc.). Some thermal energy production is permitted, but cannot be the primary energy output[1];
- Projects should qualify for the Green Tariff under present or future legislation so that there is a guaranteed revenue stream to support the project;
- To qualify for Green Tariff, projects must sell the electricity output to Energomarket, who is obligated to purchase all renewable energy not sold elsewhere at Green Tariff rates. [2] In order to sell to Energomarket, the project must be interconnected to the transmission grid[3];

[1] Cogeneration or CHP projects, where thermal energy production is the primary output and electricity production is secondary, are not the key focus of the USELF program.

[2] Energomarket is the Wholesale Buyer/ Wholesale Supplier of electricity in Ukraine and is a state enterprise. Projects under 20 MW are not obligated to sell to Energomarket, but Energomarket is required to purchase electricity from renewable energy projects at Green Tariff rates, which is typically higher than alternative avenues.

[3] To sell to Energomarket, generators must obtain a generation licence (issued by NERC), sign the Wholesale Electricity Market Members' Agreement – WEMMA (the multi-party contract which specifies the rules of trades and settlement), and sign an electricity purchase-sale agreement with Energomarket (template contract, approved by NERC).

- To be technically and economically viable in the near-term, projects are more likely to use available technologies with proven performance records in commercial application; and
- Projects are owned or primarily owned by private companies. Government entities are not eligible, except as partial owner only.

3.4 Renewable Energy Resource Scenarios

Based upon current renewable energy opportunities in Ukraine and the USELF Programme considerations, five types of renewable energy resources are being reviewed as part of this SER. These have been termed 'scenarios' for the SER to distinguish them from specific projects. The five resource scenarios are categorised as:

- On-shore Wind;
- Biomass;
- Biogas (because changes to the Green Tariff Law to include are under consideration);
- Solar photovoltaic (PV); and
- Small hydropower (<10 MW).

The following technologies are not included for SER review because they are not currently listed as eligible types under the Green Tariff, and are not being considered for future inclusion under the tariff:

- solar thermal power;
- geothermal power;
- co-firing of biomass with conventional fuels; and
- incremental hydro at existing facilities (increase in installed capacity).

Technologies that are in development stages or that are not commercially available on a wide scale, such as biomass gasification, are not included in this SER review because they are assumed to be less likely to be developed in the near-term. Furthermore, offshore wind is not included in the review because of the availability of more cost-effective wind options on-shore that could be developed first. Additionally, the Green Tariff for wind is insufficient to support offshore wind projects in the near-term.

The scenarios for each renewable energy resource type (i.e., wind, solar, small hydro, biomass and biogas) are being developed in the following steps. Preliminary findings for Steps 1 and 2 are included in the discussion below. The SER process will help refine each renewable energy scenario.

1. Indentify areas of Ukraine in which these resources can technically and realistically be utilised based upon a high level assessment. Certain locations will not be considered, for example, if the available resource is insufficient to support the viable development of a project;
2. Characterize typical projects, for example, in terms of likely size, footprint, and technologies utilized; and
3. Determine special factors that would influence the scale, grouping of projects, or type of development in these areas.

Table 3.3 provides an overview of the renewable energy resource characteristics and technologies that are likely to comprise each resource scenario, and that will be reviewed

as part of the SER. More detailed discussions for each resource scenario are included below.

Table 3.3 Description of Resource Scenarios

Resource scenario	Resource characteristics	Areas with good potential	Grouped Technologies or "Projects"
Wind	Wind resources with wind density above 250 W/m^2.	Crimea, Southern Coastal Ukraine, Luhansk, Donetsk, Western Ukraine- especially along the edge of the Carpathians (Lviv), and Central Ukraine (Dnieper River)	Comprised of modern wind turbines of 2.0-3.0 MW each. • Small farms (<20 MW or 7-10 turbines) • Medium farms (20-100 MW or 10-50 turbines) • Large farms (>100 MW or 50 plus turbines)
Solar (PV)	Solar Insolation for Optimal Tilt and Tracking PV	Southern Ukraine (Crimea and Odessa) has highest insolation, though Green Tariff may allow for projects to be economic in most areas in Ukraine	Utility-scale, mounted on ground projects. • Small (1-5 MW) • Medium (5-20 MW) • Large (>20 MW) Rooftop installations not included in this SER
Small Hydro	River Flow and Existing Hydro Project Sites	Carpathian area (Dniester, Tissa River Basins) and Central Ukraine area (larger tributaries of Dnieper)	Hydro projects are constrained by Green Tariff definition of Small hydropower (<10 MW of capacity) • Small hydropower without Impoundments Small hydropower with Impoundment. Could possibly be low discharge (diversion dam and/or river intake structure) with high head in Carpathian area • Hydro Retrofit/Rehab at retired/existing hydro sites
Biogas	Landfill Gas (LFG)	Anywhere near high population centres with sufficient sized landfills.	Minimum size will be limited by available LFG at site. • Microturbines (30 – 250 kW) • Internal combustion engines (ICE) (500 kW– 3 MW) • Single-cycle gas turbines (>3 MW) ** Pending Green Tariff rule change to qualify LFG for tariff.
	Animal Waste	Where larger cattle, pig, and poultry farming operations exist. Higher density of animal population in north central and northwest part of	Anaerobic digester coupled with ICE. (250 kW to 5 MW). Power only or CHP. ** Pending Green Tariff rule change to qualify biogas for tariff.

Resource scenario	Resource characteristics	Areas with good potential	Grouped Technologies or "Projects"
		country, as well as Dnipropetrovk.	
Biomass[4]	Wood Residue	Higher concentrations in northern Ukraine (Zhytomyr, Kiev, and Chernihiv, and Zakarpattia)	Direct-fire in power-only or CHP configurations. • Small CHP (<5 MW) • Stoker (20-50 MW) • Bubbling fluidized bed (20-50 MW) • Replacement Boiler at Existing Fossil Fuel Facility (20-50 MW)
	Agricultural Residue (wheat, barley, straw, rapeseed straw, corn and sunflower)	Preliminary data shows good concentrations across most of Ukraine.	Direct-fire in power-only or CHP configurations. • Small CHP (<5 MW) • Stoker (20-50 MW) • Bubbling fluidized bed (20-50 MW) • Replacement Boiler at Existing Fossil Fuel Facility (20-50 MW)

(a) Wind

The better wind resources in Ukraine are located in Crimea, Southern Coastal Ukraine, Luhansk, Donetsk, Western Ukraine- especially along the edge of the Carpathians (Lviv), and Central Ukraine (along Dnieper River). Initial technical limitations (or exclusions) for development of wind projects include: steep slopes greater than 20% where construction would be challenging; wind resource areas with wind power density of less than 250 watts per square meter (W/m^2) which likely would not be economic given current wind Green Tariff; and urban areas where there is insufficient land area for these projects. The areas that have been identified as having good potential for wind power are shown in Figure 3.1. Future technical exclusions may include distance to high voltage transmission lines and export constrained areas, when this information becomes available.

The types of wind projects identified for the SER all utilise 2.0-3.0 MW turbines. While smaller turbine sizes are available and are feasible, most new projects proposed today use turbines 2.0 MW or greater to maximize wind resources. This defines the size (height and span) of single turbine installations for environmental review. The types of wind projects are grouped by wind farm size as defined in Table 3.3.

(b) Solar (Photovoltaic)

The better solar resources, based on solar insolation data in Ukraine, are located in Crimea and Odessa. The remainder of southern Ukraine also has good insolation and relatively flat areas for development of large solar facilities. Solar insolation in central Ukraine is also good but the region is hilly in some parts which is a problem for site selection. The resource potential for solar power is shown in Figure 3.2.

[4] Co-firing biomass with non-renewable fuels does not qualify for Green Tariff.

With better resources, more output (higher capacity factors) are expected, so projects are more economical. The Green Tariff for land-based solar PV projects is relatively generous and will likely support most utility-scale solar PV projects in the country. An initial exclusion for development includes areas with a slope greater than 5% where placement of solar facilities would not be optimal. Future exclusions may include distance to transmission lines and export constrained areas, when this information becomes available.

There are many variations of solar PV technologies based on different types of solar cells (monocrystalline, polycrystalline, amorphous, thin film, etc.) and mounting structures (fixed tilt, tracking, etc.). From an environmental perspective, these variations are similar and, thus, treated generically as solar PV in this SER. They are grouped according to overall project size, as defined in Table 3.3. Only utility-scale, ground-mounted projects greater than 1 MW are included. Smaller projects or projects on existing rooftops are not considered in the SER.

The potential of concentrated solar thermal power has also been evaluated, but found the Direct Normal Insolation (DNI) in Ukraine to be insufficient for developing such projects economically. Furthermore, this type of technology does not qualify under the existing Green Tariff programme.

(c) Small hydro

Economically and technically feasible small hydropower potential (<10 MW) in Ukraine is mainly in the Carpathian area (Dniester River Basin, Tissa River-tributary of the Dniester). Other regions have small hydropower potential that may be developable, for example the Central Ukraine (tributaries of Dnieper). Historically, there has been extensive development of both large and small scale hydropower, as well as pumped storage, in these major watersheds. However, there are still opportunities to develop new small hydropower facilities, as well as refurbishing/ rehabilitating disused or existing projects.

The existing hydropower projects are shown in Figure 3.3, along with major watershed areas. More specific areas and sites along these major tributaries with higher development potential still need to be identified and will depend on the level of information available. The high potential areas will also factor in proximity to transmission lines if available and other upstream and downstream operating and planned hydro projects. The small hydropower technologies (<10 MW) that are anticipated include:

- Small hydropower without impoundment;
- Small hydropower with impoundment, for example low discharge (diversion dam and/or river intake structure) with high head; and
- Hydro retrofit/rehab at disused or existing hydro sites.

(d) Biogas

For the biogas resource category, there are two types examined. One form of biogas is from landfills, generated by the decomposition of organic material in closed landfill cells. The other form of biogas results from the anaerobic digestion of animal manure. One key benefit of using biogas for power and heat production is to capture and burn the methane component in the gas. Methane is a major greenhouse gas (GHG) emission and can escape into the air if not flared or captured in some way.

Generators using landfill gas (LFG) are usually located at or adjacent to municipal landfills. Often, private developers lease or pay for the LFG from the municipal landfill operators or establish arrangement for on-site usage of the power or heat. A landfill

should be of a sufficient size to produce enough gas to support a properly-sized generator for 15-20 years. Some landfills are too small or too old, so that there may not be enough gas available for a project to be economical. There is limited information available at this time regarding the location and size of existing landfills in Ukraine, but those of sufficient size are typically located near large population areas. The amount of landfill gas that can be generated at a site will also determine the type of technology used for power generation, though landfill gas projects do not usually exceed 20 MW. For the SER, the following landfill gas technologies are included:

- Microturbines (30 – 250 kW);
- Internal combustion engines (ICE) (500 kW– 3 MW); and
- Single-cycle gas turbines (>3 MW).

According to the Institute of Renewable Energy (National Academy of Science Ukraine (NASU, 2010)), the theoretical potential for biogas production from animal waste in Ukraine is 3.5 Mtce (103 PJ) and an economic potential of 0.35 Mtce (10.3 PJ). This potential would be distributed among many small projects that would be located close to farms where the animal waste is generated. A review of poultry, cattle and pig farm operations in Ukraine shows greater population and, thus, higher density of animals in the northwestern and central part of the country as well as Dnipropetrovk (as shown in Figures 3.4-3.8). Other areas also have the potential to develop biogas generation projects, as long as there is sufficient waste being generated in close proximity to support individual projects.

For manure digestion on farms, the resource is readily accessible and modifications to existing manure management techniques are required to produce biogas suitable for power generation and heat production. The capture of methane also helps mitigate GHG emissions. In some cases, economies of scale may be realised by transporting manure from multiple farms to a central digestion facility. For central plant digestion of manure from several sources, the availability and proximity of a large number of livestock operations is necessary to provide sufficient manure feed rate to the facility. However, the larger size of regional facilities does not necessarily guarantee better economic returns, because of higher manure transportation costs.

In general, biogas projects associated with animal waste would require an anaerobic digester to convert the waste material to biogas and a generator to use the biogas for power production. In many cases, thermal energy is also produced in a CHP configuration that would be used on the farm in greenhouses or other thermal applications. Typical project sizes range from 250 kW to 5 MW, depending on whether all the waste material is available on-site or need to be transported.

In addition to animal waste, there is potential of deriving biogas from waste water treatment facilities. However, given the USELF requirement that projects are to be owned by private companies, municipally-owned waste water treatment facilities will likely not qualify, and, thus, are not included in this SER.

(e) Biomass

For this assessment, biomass is classified into three types; wood residue, agricultural residue, and energy crops. NASU has estimated the potential of these three types of biomass fuels for Ukraine, as shown in Table 3.4.

Table 3.4: Biomass Potential
Source: Institute of Engineering Thermophysics, NASU, 2010

	Theoretical Potential	Technical Potential	Economic Potential
Wood Residues[5]	2.5 Mtce (74 PJ)	2.1 Mtce (60 PJ)	1.7 Mtce (49 PJ)
Agricultural Residues[6]	38.5 Mtce (1,128 PJ)	22.6 Mtce (663 PJ)	14.2 Mtce (416 PJ)
Energy Crops[7]	12.1 Mtce (354 PJ)	10.3 Mtce (302 PJ)	--

Based on preliminary review of biomass production areas, high density areas of wood residue production are concentrated in northern Ukraine (Zhytomyr, Kiev, and Chernihiv, and Zakarpattia). Agricultural residue has much higher potential because this group is comprised of multiple crops, so there are sufficient combined quantities to support power generation in most oblasts.

While estimated technical potential for energy crops are relatively high, these fuels are higher cost relative to wood and agricultural residue due to the additional capital, resources, fuel, and labour needed to grow the crops. Furthermore, there does not appear to be subsidies or agricultural incentives in place to support energy crops in Ukraine currently. Therefore, energy crops will not be further assessed in the SER.

While there appears to be a significant amount of biomass potential from wood and agricultural waste, the quantities available for power generation are highly dependent on the cost of harvesting and transporting the fuel, as well as competing options for the use of the fuel. Ukraine is developing its biomass energy sector for a number of purposes including: heating fuel, export fuel, and power generation (and cogeneration). Agricultural residue can also be used as fertiliser in fields and feed for animals. Therefore, biomass fuels for power generation will be competing with alternative uses for the biomass material, which will determine the availability and cost-effectiveness of the fuel for power generation. Additionally, to manage transportation costs, the sources of the fuels should be in close proximity to the power plant, typically within 50 to 100 kilometres.

Compared to coal, biomass fuels are generally less dense, have lower energy content, and are more difficult to handle. Thus, intermediate steps can be used for processing biomass material to help make them easier to handle and fire as a fuel. These include pelletisation, torrefaction, pyrolysis, and gasification. These intermediate steps add to the cost of the fuel. Also, these processes are generally in development and pilot stages, so are less likely to be deployed for USELF. One process that has significant interest in Ukraine is pelletisation of biomass material, but the end uses for pelletised biomass are primarily for heating applications and export, not power production. Therefore, these intermediate processes will not be further assessed in the SER.

[5] Wood residues include material of primary and secondary wood processing (and firewood) from cutting area.

[6] Agricultural residues include wheat, barley and other grains such as straw, rapeseed straw, and residues of corn and sunflower.

[7] Energy crops include poplar, miscanthus, acacia, alder and willow

The power technologies that use solid biomass fuels are typically direct-fired technologies. These can be configured for power-only or cogeneration applications. The technologies to be considered are categorized as small CHP (<5 MW), Stoker (20-50 MW), and bubbling fluidized bed (20-50 MW). These technologies have somewhat different conversion efficiencies, tolerances for different biomass fuels, and emissions depending on mitigation measures that are used. Also, the input fuels themselves will impact the efficiency conversion, emissions, and ash production.

The power technologies that use solid biomass fuels are typically direct-fired technologies. These can be configured for power-only or cogeneration applications. The technologies to be considered are categorized as small CHP (<5 MW), Stoker (20-50 MW), and bubbling fluidized bed (20-50 MW). Replacement of entire boilers at existing fossil fuel plants to utilize 100 percent biomass more efficiently will also be included in the review. These technologies have somewhat different conversion efficiencies, tolerances for different biomass fuels, and emissions depending on mitigation measures that are used. Also, the input fuels themselves will impact the efficiency conversion, emissions, and ash production.

Finally, co-firing of biomass in conventional power plants, such as in coal power plants, is often viewed as a cost-effective option for utilising biomass fuels. However, this option does not appear to qualify for the Green Tariff according to NERC. Therefore, co-firing is not included in the SER.

3.5 Potential Obstacles and Benefits to Implementing Renewable Technologies

During an initial review of literature on renewable energy in Ukraine, existing legislation supporting renewable energy, and preliminary discussions with stakeholders, some common technical and economic issue and benefits have been cited and would require additional review during the SER.

General Renewable Energy:

- The Law of Ukraine on Amendments to Electricity Law No.1220-VI of 1 April 2009 (Green Tariff Law) states that electricity suppliers who carry out the transmission of electricity by means of their own electricity networks: 1) may not refuse renewable energy producers access to such networks; 2) should provide for the costs incurred by connecting renewable energy producers to their networks and NERC should include such costs in full when approving the submitted investment programmes (Art.24 section 7). Currently developers experience problems in obtaining connections. This is mainly due to the restrictive implementation of network tariff methodologies, which do not allow, in practice, for network companies to recoup the investments needed for connecting renewable energy producers (EBRD, 2010). Therefore, developers are currently covering the cost of connection until they are able to recoup costs from transmission owners;
- Depending on the size of renewable energy projects, the cost to interconnect to the grid may be proportionally high relative to the cost of the project, resulting in some projects being economically non-viable;
- Stakeholders are concerned that there is insufficient compliance monitoring in place for projects that receive the Green Tariff, which may undermine the programme; and
- It is challenging for small developers /projects to obtain the equity needed to qualify for USELF assistance.

Wind projects:

- Though there are many wind projects in the transmission interconnection queue, it is unclear how many of the projects will proceed through to completion. Furthermore, potential transmission constraints resulting from extensive wind development have not been studied; and
- Stakeholders are concerned about the operation and reliability of the grid as wind development increases in the country.

Solar projects:

- Ukrainian solar panel manufacturers could benefit from the development of solar projects in the country; and
- There is some concern with competing uses for arable land.

Small hydropower projects:

- In general, the potential for small hydropower development is considered high. There are no obvious technical obstacles for small hydropower development in the country; and
- There is a state programme for small hydropower rehabilitation, which is targeted towards rehabilitation of the Soviet-era small hydropower (<1 MW) facilities. Small developers could potentially interact with this, and it may be possible for USELF to be linked to it.

Biogas projects:

- Currently, biogas projects do not qualify for the Green Tariff, so there is uncertainty regarding the economic viability of these projects. Changes to the biomass definition under the Green Tariff are being reviewed by the legislature, so it is possible biogas could be included;
- To maximise the better economic benefits, biogas projects are often configured as CHP with relatively higher thermal energy production compared to electricity production. It is uncertain whether these projects would qualify for the USELF programme;
- Due to the size of these projects (usually less than 5 MW), the cost to interconnect to the grid may be proportionally high relative to the cost of the project.

Biomass projects:

- Biomass fuels have competing end uses (heating, export, biofuel production, power production, and fertiliser) which impact the cost and availability of the biomass material for electricity production in the long-term.
- There is significant potential in the agricultural sector to grow energy crops, but currently no subsidies available to promote it.
- The potential non-sustainability of certain biomass fuels may be a concern.

4. SER STAKEHOLDER CONSULTATION

4.1 Introduction

The SER is being developed in compliance with the EBRD's Environmental and Social Policy and its Public Information Policy as well as being guided by the EU SEA Directive. The Stakeholder and Public Consultation process is specifically governed by EBRD's Environmental and Social Policy Performance Requirement 10 "Information Disclosure and Stakeholder Engagement" (PR10), which stipulates the requirements for information disclosure and stakeholder engagement. In line with the requirements of PR10, a Stakeholder Engagement Plan (SEP) is being developed, that will set the scope and timescales for further consultation throughout the SER.

Stakeholder consultation has been ongoing throughout the scoping process, and will continue throughout the SER process.

4.2 Stakeholder Consultations during Scoping

A "Project Overview" flyer describing the USELF SER was circulated to key organisations in December 2010, along with a request for available data to inform the SER. The English-language version of the flyer is provided in Appendix A. The flyer was translated into Ukrainian and Russian.

Initial stakeholder consultations were undertaken from 22 November to 10 December 2010. The interviews, meetings, and consultations were performed by combined Black & Veatch and Ecoline EA Centre teams. All team members were engaged in the stakeholder meetings and interviews. In total, the team interviewed 51 stakeholders, including 12 stakeholders in Crimea and 11 in the western part of Ukraine (Lviv area). Appendix B contains a full list of stakeholders interviewed. Stakeholders were identified prior to the initial site visit, as well as via referrals during stakeholders' interviews.

The USELF SER stakeholders are represented by a number of groups, including central authorities, local and regional authorities, other regulators, NGOs, and academic institutions and organizations.

Several reoccurring topics were, explicitly or implicitly, discussed during most of the consultations. Comments on the political and technical obstacles and benefits of renewable energy are identified in Section 3.5. General comments, expectations and concerns in relation to the environmental and social issues surrounding renewable energy are summarised below.

<u>General comments</u>

- In general, comments and attitudes towards renewable energy sources were positive;
- It will be necessary to take the interest of local communities into account when developing projects supported by USELF; and
- A systematic approach towards regional planning is needed to facilitate renewable energy projects in Ukraine.

Expectations

- Capacity building[8] and targeted information dissemination on EBRD procedures, practices, requirements is needed;
- Renewable energy projects could serve as focal points for underdeveloped rural or small urban areas;
- Projects supported by USELF might (indirectly) facilitate technological development; and
- The SER materials and reports should be made available to the professional community.

Concerns

- Possible negative environmental impacts of renewable projects were raised, specifically:
  a. Wind projects: birds, bats, insects, local infrastructure (access), protected areas, noise;
  b. Small hydropower: fish migration and spawning, increased sedimentation;
  c. Biomass/biofuel: air pollution, loss of soil fertility, changes in vegetation type;
  d. Indirect and cumulative impacts that are not covered by national procedures;
- Projects that fall under USELF criteria might not be economically feasible;
- Local investors (small and medium Ukrainian businesses) do not have sufficient funds to invest into renewable energy projects.

Expressed Opinions

- Biogas is not included in the Green Tariff, which is seen as a disadvantage of the current regulatory system; otherwise, the regulations for renewable energy in Ukraine are well developed;
- It is necessary to support national production of equipment for the projects using renewable energy;
- Generation of electricity from renewable sources for on-site consumption has very big potential and it is unfortunate that it is not supported by Green Tariff;
- The current market situation is favourable towards renewable energy projects;
- The SEA process in general is potentially a very useful instrument for Ukraine;
- National grid connection is one of the biggest problems for all energy projects, including renewable energy schemes;
- Ukraine does not have, and will likely not have, deficit in electrical power in the near future, however, there is a deficit in heat availability.
- Renewable energy shall be developed according to Germany's or the United States' policies (the state buys the electricity produced on-site using Green Tariff and sells it back to the population at regular prices); and
- The national OVOS (assessment of impacts on the environment) system provides for adequate level of environmental protection during construction and operation stages of renewable energy projects, but has certain limitations.

[8] Capacity building refers to assistance that is provided to developing countries, which have a need to develop a certain skill or competence.

In general, almost all stakeholders expressed their interest in the USELF SER, as well as a willingness to participate in further stakeholder engagement process, and confirmed that they would like to receive project updates and other materials.

4.3 Stakeholder Engagement Plan (SEP)

The primary objectives of the SEP are to map the strategies for engaging various stakeholder groups and the public in the activities of the SER by: identifying key SER stakeholders, establishing communication methods, disclosing SER project information and, collecting comments and feedback.

The SEP will also continue through the USELF's life after completion of the SER. Consultations will be required for individual projects financed by USELF, and thus require a SEP of their own. The intention is that this SEP will provide a framework for subsequent project-level consultation.

The final SEP document will be publically available and will contain the following:

- Analysis of initial stakeholder identification and engagement activities and identification of the Project Supervision Group, to be further agreed with EBRD;
- An overview of regulations and requirements for stakeholder engagement and public consultations, under the EU SEA Directive, under EBRD policy, and in the Ukrainian local legislation context;
- A summary of other previous stakeholder engagement and public consultations within the USELF framework;
- The methodology for stakeholder engagement and public consultations for the SER;
- A stakeholder engagement/consultation programme for the SER, containing the timetable for further consultations, and the types of further consultations;
- The communication methods and grievance mechanism for processing stakeholders' feedback and comments; and
- Outline of the resources and responsibilities which will be used to respond to the feedback received as part of the consultation process.

A public website is being developed where information and guidance can be made available to all stakeholders and where details on the Scoping Study, the SEP, the SER, and public meetings will be placed.

Table 4.1 provides a summary of the SER consultation process.

Table 4.1: The USELF SEP Consultation Process

Stage of SER consultations	Activities	Timeframe	Location
Initial consultations	• Meetings with the state authorities • Meetings with scientific organizations and leading experts • Meetings with NGOs	October – December 2010	Kyiv, Crimea and Lviv region
Draft SER stage	• Establishing interactive web-site communication • Follow-up meetings with identified stakeholders: - Capacity building workshop, in cooperation with USELF - Regional presentation meetings - Small-group meetings, if necessary. Regional feedback meetings.	January – April, 2011	Kyiv, Crimea and Lviv region
Formal 120-days public consultations	• Release of Public Draft SER • Preparation for public meetings • Public meetings • Gathering feedback and comments • Processing of grievances	May – August, 2011	Kyiv, Crimea and Lviv region
Final SER stage	• Responses to comments and feedback • Preparation of final SEP • Preparation of Summary of Public Consultations	September – October, 2011	N/A
Project implementation	• Implementation of project-level SEPs, adopting the framework set-out in the USELF SEP.	October, 2011 onwards	N/A

5. OTHER RELEVANT PLANS, PROGRAMMES, AND ENVIRONMENTAL PROTECTION AND ENHANCEMENT OBJECTIVES

5.1 Ukraine Legislative Renewable Energy Framework

Note: On December 9, 2010, the President of Ukraine announced significant changes to the organization and responsibilities of energy-related national agencies and authorities. The information provided below is subject to change based on how the new structure is put in place. However, for most of the purposes of this SER Scoping Report, the description of pre-existing conditions is still appropriate.

(a) Administrative framework

The Ministry of Fuel and Energy of Ukraine (MFE)

MFE is the central executive authority responsible for managing the electricity generation sector in Ukraine. MFE is the main body within the system of executive power that ensures the implementation of the state policy in the electric energy, nuclear industry, and oil/gas industry sectors. Its mission includes the following:

- Managing the country's fuel and energy sector;
- Ensuring the implementation of the state policy in the fuel and energy sector; and
- Ensuring the country's energy security

To achieve its mission, MFE conducts the following core functions:

- Participation in drafting the national, sectoral, and local programmes on alternative energy sources and fuels.
- Supervises compliance with the approved electricity and heat consumption regime and technical standards/rules regulating the operation of power generation plants and equipment, electricity networks, and alternative energy facilities connected to the energy grid of Ukraine.
- Prepares electrical energy balances for the energy grid of Ukraine, and balances estimates for natural gas, oil, alternative energy sources and fuels.
- Undertakes the monitoring of energy markets.

State Inspectorate for the Supervision of the Electricity and Heat Consumption Regime

The main state authority responsible for the supervision of the electricity and heat consumption regime, technical condition and operation of electrical and heat plants (both generating and consuming), and networks owned/operated by electric power generation/distribution companies, has been the State Inspectorate for the Supervision of the Electricity and Heat Consumption Regime (State Inspectorate for Energy Supervision).

This structure was in place in Ukraine until 9 December 2010. By the Decree of the President of Ukraine, the Ministry of Fuel and Energy of Ukraine and the Ministry of Coal Industry of Ukraine have been reorganized as the Ministry of Energy and Coal Industry of Ukraine. The implementing regulations forming this Ministry are yet to be prepared and adopted by the Cabinet of Ministers of Ukraine.

Currently, Ukraine has three national companies dealing with energy generation;

- National Joint Stock Company "Energy Company of Ukraine" (NJSC "Energy Company of Ukraine");
- National Nuclear Power Generation Company "EnergoAtom"; and
- National Joint Stock Company "NaftoGaz Ukraine".

The National Electric Energy Regulatory Commission (NERC)

NERC is the main regulatory body in the electric energy sector. Having 25 territorial branches, NERC is responsible for regulating business entities operating in the gas, oil, and oil product market. NERC is a central executive authority enjoying a special status and is responsible for exercising the following functions and activities:

- Regulatory functions with respect to natural fuel/energy monopolies and their pricing policies;
- Setting rules that govern core business activities of these monopolies through the application of licensing procedures;
- Taking part in the formulation of a coherent state policy on the development and management of wholesale energy markets;
- Fostering the development of a competitive market environment; and
- Protecting the consumer's rights.

The National Agency of Ukraine for the Efficient Use of Energy Resources (NAER)

NAER was a central executive authority whose activities are managed and coordinated by the Cabinet of Ministers of Ukraine. NAER was a specially authorized central executive authority in all matters relating to the implementation of the state energy efficiency and energy saving policy. One of key NAER functions was ensuring an increased proportion accounted for by alternative fuels in the energy supply and demand pattern.

By the Decree of the President of Ukraine adopted on 9 December 2010, this Agency was reorganised as the State Energy Efficiency and Energy Saving Agency of Ukraine.

(b) National Renewable Energy Legal framework

The national energy legislation is a relatively complex and well developed suite of laws and regulations. It is closely intertwined with other sectoral laws and regulations, including environmental legislation (which is briefly reviewed in further sections of this document) and civil law. Presented below is an overview of key regulations that are of relevance to alternative energy activities.

"The Law of Ukraine on the Electric Energy" of 16 October 1997 No. 575/97

The Law defines the legal, economic and institutional framework for energy sector activities. In 2008, the Law was amended to incorporate the definition of the Green Tariff. The Law stipulates some guarantees for those electricity generating entities that utilise alternative energy sources. For example, electricity distribution companies are not allowed to deny access to their networks by alternative energy generators.

The Law specifies the list of state supervisory authorities in the electric energy sector, the licensing authority that handles licensing procedures applied to electricity generating, transmission and distribution companies, and also approved the Green Tariff scheme.

All wholesale electricity purchases and sales are carried out in the Ukrainian wholesale electricity market. No other wholesale electricity markets are allowed to operate in Ukraine. The Ukrainian wholesale electricity market is required to apply the Green Tariffs to the electricity generated by plants using alternative energy sources. Specific Green Tariff rates are set for each entity that uses alternative energy sources to generate electricity, for each type of alternative energy, and for each power generating facility.

The Law of Ukraine "On Amending Certain Laws of Ukraine Relating to the Establishment of Green Tariff" of 25 September 2008 No. 601-V

This Law, apart from amending the Law on Electric Energy by defining the notion of the Green Tariff, also amends the Law on Alternative Energy Sources in the sense that it provides the definition for the term "alternative energy source".

The Law of Ukraine "On Alternative Fuels" of 14 January 2000 No. 1391-XIV

Before May 2009, this Law was titled the "Law on Alternative Liquid and Gaseous Fuels" but its scope was later expanded to encompass solid fuels. The Law defines qualifying criteria for alternative fuels and the list of alternative liquid, solid, and gaseous fuels. The Law stipulates the achievement of the alternative fuel usage target of 20% throughout Ukraine by 2020. The eligibility for alternative fuel status is required to be confirmed by the fuel identification document. All biological fuels intended for sale are required to have a relevant certificate.

The Law of Ukraine on Alternative Energy Sources of 20 February 2003 No. 555-IV

This Law provides the legal, economic, environmental, and institutional framework for activities involving the use of alternative energy sources. It defines such key terms as alternative energy sources, alternative energy, and alternative energy facilities. It also sets out key provisions of the state policy with regard to alternative energy sources, including the provision that the output and consumption of alternative energy should be increased in a manner that is safe to environment and human health. The notion of alternative energy facilities refers to power generating and other equipment that is used to generate energy from alternative sources if it accounts for at least 50% of the plant's total installed capacity.

(c) **National Renewable Energy Policies and Plans**

Ukraine's Energy Strategy for the Period until 2030

This comprises a statement of country's energy dependence. As of 2005, the level of dependence was estimated at 54.8% and was exacerbated by insufficient diversification of energy supply sources, especially oil, natural gas, and nuclear fuel. Ukraine's level of energy intensity per unit of GDP is 2.6 times higher than the world's average. This is mainly attributed to excessive consumption of energy resources per unit of product output, leading to a proportional growth in fuel imports.

The Strategy also includes energy consumption projections showing that energy demand is expected to increase from 176.9 billion kWh in 2005 to 395.1 billion kWh in 2030, an increase of 123% or 218.2 billion kWh. It is anticipated that thermal power plants will continue to remain the main element and foundation of Ukraine's electric energy system up to 2030, though it is planned to gradually phase out excessive thermal power generating capacities to achieve their optimal level in 2015-2017.

The current utilization of alternative and renewable energy sources is apparently insufficient, and their proportion in the country's energy balance is only 7.2% (of that, 0.8% is accounted for by renewable energy sources). The most promising areas for alternative/renewable energy development in Ukraine were identified to be bioenergy, extraction and use of coal bed methane, use of secondary energy resources, off-grade fossil fuel deposits, wind and solar energy, thermal energy present in the environment, and economically viable development of hydropower generation capacity associated with small Ukrainian rivers.

The Concept of the State Earmarked Scientific and Technical Programme for Promoting the Production and Use of Biofuels

While Ukraine imports about 50% of its energy needs, the potential level of biofuel usage is 0.8%. The Programme aims to address and reduce the country's economy reliance on energy imports and minimize anthropogenic and technical impacts on the environment. The document outlines four options for reducing its energy reliance:

1. Development of coal industry ,
2. Development of oil and gas industry,
3. Development of nuclear energy, and
4. Development of biofuel-based power generation technologies.

Bioenergy is considered among the most promising options for alternative energy development in Ukraine, with its potential for economically viable production being estimated at about 24 million tonnes of conventional fuel per year. The Programme's implementation timeframe is 2010-2014.

(d) Renewable Energy Decrees

The Resolution of the Cabinet of Ministers of Ukraine "Issues Relating to the Organisation of Biogas Production and Use" of 12.02.2009 No. 217-r

This Resolution sets out specific actions to be taken by various executive authorities in order to promote the development and use of biogas. Such actions include, among others, analysis of demand for biogas generation/utilization equipment and organization of its manufacture at the Ukrainian enterprises. Other required actions include the preparation of changes and amendments to those laws and regulations that govern the permitting procedure for the design and construction of facilities generating alternative fuels and using renewable energy sources.

The Resolution of the Cabinet of Ministers of Ukraine of 19.02.2009 No. 126 "On the Specifics of Connection to the Electricity Grid of Power Plants Generating Electricity from Alternative Energy Sources"

This Resolution specifies organizational and technical arrangements required to facilitate the transmission of electric energy to the local electricity networks from power plants generating electricity from alternative energy sources and having the installed capacity of up to 10 MW.

The sample contract[9] for the connection of a power generation plant to the electricity network is approved by the NERC. The point of connection is defined as the site/property boundary set for a power generation plant or, subject to the site owner consent, part of site allocated for the installation of such connection. The plant owner is able to sell any surplus energy exceeding internal power needs in the wholesale electricity market or via energy suppliers based on a regulated tariff, or directly to the customers on the basis of

[9] The NERC Resolution of 16 July 2009 No. 838 "On the Approval of Sample Contracts for Companies Engaged in Energy Generation Activities with the Use of Alternative Energy Sources" sets out a sample contract for connection to the electricity network of power plants generating electricity with the use of alternative energy sources; a sample contract for the purchase/sale of electricity between a customer, a supplier and a company generating electricity from alternative energy sources; and a sample contract for the purchase/sale of electricity between the EnergoRynok (Energy Market) State Company and a power generating company using alternative energy sources

contract for the purchase/sale of electricity generated with the use of alternative sources and in accordance with the procedure stipulated by the current legislation.

The NERC Resolution of 22.01.2009 No. 32 "On the Approval of Procedure for Setting, Revising and Abolishing the Green Tariff for Economic Entities"

This Resolution specifies the list of documents required to be submitted as part of the Green Tariff Application. Each submitted application is considered within the period of 30 days and the tariff approval date is set at an open meeting of the Commission. Those companies that use the Green Tariff to sell electricity generated from alternative energy sources report to the NERC on the use of revenues raised through the sale of electricity on a quarterly basis. The Resolution also specifies the terms and conditions for abolishing the Green Tariff.

(e) Future Trends in Renewable Energy Legislation

Trends in recent restructuring of the bodies of executive power demonstrate certain centralisation policy. Regulatory reform in the energy sector could aim to develop a framework document covering all aspects of energy generation, transmission, and distribution in the country. Energy Strategy of Ukraine foresees a possibility to develop a generic legislative act (or a set of acts, in a form of Energy Code) on energy policy that would replace existing laws regulating individual sectors of the fuel and energy complex of Ukraine. However, no draft law in the energy sector is currently registered by Ukraine's Parliament (Verchovna Rada).

(f) Potential Legal Constraints to Developing/Implementing Renewable Energy Projects

The notion of alternative energy sources is defined in the Law of Ukraine "On Alternative Energy Sources". It refers to renewable energy sources, including solar power, wind power, geothermal power, wave and tidal power, hydropower, biomass, gas derived from organic waste, and wastewater treatment sludge and biogas. It also includes secondary energy resources including blast-furnace and coking gas, coal bed methane, and recovered surplus process heat.

However, the Law of Ukraine on the Electric Energy in its Article 17-1 only sets the Green Tariff factors for those companies that generate electricity from wind power, biomass and solar power, and companies operating hydropower plants with a capacity of less than 10MW.

In other words, while existing legislation stipulates the use of the Green Tariff for the purchase of electricity generated at the facilities using biogas, geothermal energy, wave and tidal power, biomass, organic waste and wastewater treatment sludge derived gas, and excess heat from industrial processes, it does not specify a tariff factor or calculation methodology to be used to set the Green Tariff for these types of facilities.

5.2 Ukraine Environmental Legal Framework

(a) Administrative framework

Pursuant to the Presidential Decree, the Ministry of Environment and Natural Resources has been established to manage and coordinate the activities of the State Service of Ukraine for Geology and Mineral Resources, the State Agency for Water Resources of Ukraine, the State Environmental Investment Agency of Ukraine, and the State Environmental Inspectorate of Ukraine.

The Ministry is the main central executive authority responsible for environmental protection; sustainable management, reproduction and conservation of natural resources; control of the use and conservation of land resources; environmental safety, nature reserve planning and management, waste management; development, conservation and management of ecological network, and geological exploration and sustainable management of mineral resources.

(b) National Environmental Legal framework

The environmental legislation of Ukraine is rooted in the Constitution of Ukraine. The main piece of framework legislation is the Law of Ukraine on Environmental Protection. Other key resource-specific documents include the Land Code, Water Code, Forest Code, Mineral Resource Code; the Laws of Ukraine "On Nature Reserves and Protected Areas", "On Ambient Air Protection", "On Animal Life"; and the Law of Ukraine "On the Environmental Review". In addition, there are numerous regulations issued by various executive authorities with environmental management functions and local self-governance bodies.

The Ukrainian environmental legislation often sets forth stricter standards and requirements than the respective international standards and guidelines. However, the effectiveness of this legislation is hampered by poor compliance.

The Ukrainian legislation requires an operator to obtain permits for various types of natural resource use, including in particular, emissions into the air, general-purpose and special water resource use, discharges to water bodies, and waste generation and disposal.

(c) National Environmental Laws Applicable to the Project

National SEA, Environmental Impact Assessment (EIA) Law

The EIA of economic projects is required by the Law of Ukraine "On Environmental Review", and according to international obligations of the country (e.g. the Espoo Convention [1991]). The Ukrainian EIA system includes two related procedures: (1) assessment of environmental impacts (OVOS) carried out by the proponent, and (2) environmental review that is a part of investment integrated expert review conducted by designated state authorities.

The OVOS procedure is compulsory for all new economic projects that are "potentially hazardous to the environment". OVOS is a formal procedure regulated by a State Construction Standard (SCS) DBN A.2.2-1-2003. The SCS contains a list of project and activity types which are associated with potential environmental hazards and are therefore subject to a compulsory OVOS/SER procedure. The existing OVOS procedure was designed by taking into account the requirements of the Aarhus Convention, to which Ukraine is a party. The SCS provisions on public engagement in the process of OVOS generally comply with international best practices in the field.

Environmental Review (ER) is mostly focused on the evaluation of a proposed project's compliance with environmental legislation, based on the OVOS materials provided by the proponent, but also considers broader issues of cumulative and long-term environmental impacts. The ER procedure is an integral part of the state permitting mechanism for economic projects.

An important feature of the Ukrainian legislation is the possibility of conducting an OVOS for a certain/specific stage(s) of the project cycle. Although the primary legislation requires conducting an EIA for the entire project lifecycle, the existing practice of project

preparation, approval, and implementation is based on a staged approach toward assessment and permitting.

SEA in Ukraine, in the form of Environmental Review and public discussion of the draft laws, programs, and policies, is regulated by the Law of Ukraine "On Environmental Review". ER of strategic documents is carried out by the central Ministry; results are made public through the ministerial website.

In addition, Ukraine has signed and is preparing ratification of the SEA Protocol to the Espoo Convention. This will allow SEA to become a part of strategic planning process in Ukraine. EU SEA directive is one of the four environmental directives whose requirements, according to the Ukraine – EU agreement, are to be incorporated into Ukrainian legislation in the nearest future.

Air and Climatic Factors

In Ukraine, air quality standards are established by the national Ministry of Health. Those standards define maximum permissible concentrations (MPCs) of pollutants for residential areas and air quality within the workplace. For certain pollutants, Ukrainian legislation defines more stringent MPCs for residential areas than those established by the European Union.

Industrial emissions in Ukraine are regulated by establishing maximum permissible emissions for each industrial facility. This approach is closely related to the concept of a buffer area (a health protection area). It is assumed that pollutant concentrations at the outer limit of such an area, taking into account dispersion processes, should not exceed air quality standards established for residential areas. However, this approach is currently being phased out, and measurements of the emission at the source, according to best European practice, are required for newly developed enterprises.

Soil and Geology

The main legal provision applicable to mining activities is the Code of Ukraine on Subsoil Resources. According to the Code, subsoil resources are the sole property of the people of Ukraine, and legal entities and individuals can only use those resources in accordance with the legislation, but not own them. Companies, institutions, organizations, and citizens of Ukraine, as well as foreign legal entities and citizens can be users of subsoil resources in Ukraine and are required to pay for the use of those resources.

According to the Law of Ukraine "On Licensing Certain Types of Economic Activity", extraction of subsoil resources of national significance, included in the State Mineral Resource Fund, is subject to licensing. In order to commence mining operations, a company should be granted both a mining lease and a land plot. The procedure of allocation of land plots is regulated by the Land Code of Ukraine. Currently private companies operating in Ukraine can either lease or purchase land plots for their activities.

Water

The legal requirements of water resource use are set forth by the Water Code of Ukraine, which distinguishes between general-purpose and special water resource use and establishes a procedure for obtaining permits for various types of special water resource use, including wastewater discharge into water bodies. The quality of surface and ground water is regulated by establishing MPCs for pollutants. For the same pollutant, different MPCs apply to water bodies used for service and utility purposes and for fisheries. Similar to the air quality standards (see above), the Ukrainian water quality standards may differ from the respective EU standards.

Coastal zones of the sea and the river banks are called 'water protection zones' (the width varies depending on the type of the water body) where any economic activates, including construction, are prohibited. Unfortunately these requirements are not fully enforced and significant part of the Black and Azov Seas are under illegal or partly legal construction of recreational facilities.

Landscapes and Biodiversity

The Law of Ukraine "On Nature Reserves and Protected Areas of Ukraine" provides the framework for the establishment, protection, and management of nature reserves and protected areas, and the classification of these areas. Some protected areas are allowed to be held in private ownership.

All biodiversity conservation activities in Ukraine are governed by the United Nations Biodiversity Convention and Pan-European Strategy for Biological and Landscape Diversity. The concept of the 2005-2025 State Biodiversity Conservation Programme has been developed to stipulate that the detailed Programme should be developed and adopted by June 2011.

Waste Management

Waste management is regulated by Law of Ukraine "On Waste Management". The legislation defines four hazard classes for waste: 1st and 2nd class waste is considered hazardous, requires special treatment, and should be separated from the overall waste stream. 3rd and 4th class waste can be processed together with common household waste. If, during the course of its operations, an industrial facility generates hazardous waste, the hazardous waste should be removed and processed or disposed of by a specialized company which possesses a state permit for the handling of hazardous waste. The generation and disposal of waste by industrial facilities is regulated by permits and limits issued by authorized state bodies. The procedure for the preparation, approval and revision of permits for waste generation and disposal is established by the Cabinet of Ministers of Ukraine.

(d) National Social and Public Laws Applicable to the Project

Occupational Health and Safety

The Law of Ukraine "On Hazardous Facilities" defines legal, economic, social and organizational basis for activities related to hazardous facilities. The law is aimed at protecting the environment, as well as human health and human life, from the adverse effects of accidents at those facilities by means of appropriate accident prevention and response (containment and elimination).

The core piece of legislation in the field of occupational health and safety (OHS) is the Law of Ukraine "On Labour Protection", which applies to all legal entities and individuals that use labour. The Code of Labour Legislation of Ukraine addresses OHS issues in Section XI "Labour Protection" and in a number of other sections, including "Work Contract", "Work Time", "Rest Time", "Women's Labour", and "Youth Labour". The Ukrainian OHS legislation also includes the Law of Ukraine "On Compulsory State Insurance against Occupational Accidents and Diseases Resulting in the Loss of Capacity for Work". Certain procedures related to occupational health and safety are also regulated by the Law of Ukraine "On Collective Agreements". The Ukrainian OHS legislation is generally based on the principles and approaches of the International Labour Organization (ILO), to which Ukraine is a member country.

Community Health and Safety

The Law of Ukraine "On Ensuring Sanitary and Epidemiological Well-Being of Population" and respective secondary legislation addresses the issue of protecting community health during the process of construction and operation of industrial facilities. This Law defines procedures for the construction of a centralized water supply and wastewater disposal systems, as well as wastewater treatment facilities, and address issues related to the lighting regime and solar radiation, the wind regime, and other facilities. The protection of public interests and cultural and historical heritage, in the process of investment/economic activities, is ensured by the Law of Ukraine "On Planning and Development of Areas".

Land use

Land in Ukraine is considered as a key national asset that is subject to special care and protection. The existing land use classification recognizes nine land use categories, which include agricultural land; housing and urban development land; forest fund land; water fund land; sectoral land (industry, transport, communications, energy, and defence).

The re-categorisation of state-owned or community-owned land to any other uses falls under the mandate of a relevant state executive authority or local self-governance authority.

The change of the designated land use for an allotment privately owned by physical or legal entities can only be initiated by an owner. The land re-categorisation procedure is approved by Cabinet of Ministers of Ukraine. To initiate this change, an owner should file an application with a relevant local council (village, town, city council) if the allotment of concern lies within the boundaries of a settlement, or, if otherwise, with a state district administration. Furthermore, the Cabinet of Ministers is also empowered to make decisions concerning the change in the designated land use subject to the consent of the Parliament of Ukraine. This arrangement is used in respect land allotments of outstanding value located outside the settlement boundaries. If an allotment is located within the boundaries of a settlement, its designated use can be altered by a relevant local council after receiving the subject to the consent of the Parliament of Ukraine.

Public Consultation and Disclosure

The public's right to access environmental information is regulated by a number of fundamental legal acts, including the Laws of Ukraine "On Information", "On Citizens' Appeals", "On State Secrets", and the Aarhus Convention. The national EIA (OVOS) procedure provides for public disclosure of the following documents:

- Declaration of Intent, which must be published in the mass media and contain, in particular, information on the planned activity and on the locations where OVOS materials are available to the public;
- Declaration of Environmental Effects, which must be prepared after the completion of the environmental impact assessment (EIA) study and contain a summary of the key OVOS results.

National requirements on public consultations and disclosure are further detailed in the Stakeholder Engagement Plan (SEP).

Involuntary Resettlement

Currently Ukraine does not have a clearly defined procedure for involuntary resettlement associated with the implementation of economic projects. Requirements with regard to resettlement processes and addressing related property issues are scattered across various laws and regulations, with many issues remaining unaddressed. The key issues related to resettlement process are those of acquisition (purchasing) of land for the construction of new facilities and buildings, for various purposes including in particular, providing housing for citizens. These issues will be explored further in the next stage of the SER.

Cultural Heritage (including architectural and archaeological heritage)

The Law of Ukraine "On the Protection of Cultural Heritage" regulates legal, institutional, social and economic relations associated with the protection of cultural heritage assets. Such assets may include terrestrial habitat sites, water bodies, other natural or natural/man-made or man-made sites. All protected sites are recorded in the Inventory of Sites of National or Local Significance. Any construction activity within the mandatory protection zone established around these sites is subject to a special permit.

Definition of archaeological heritage, authorities of management bodies in the sphere of archaeological heritage protection (Cabinet of Ministers), scope of archaeological research, and rights and duties of the explorer of archaeological heritage are defined by the Law of Ukraine "On Protection of Archaeological Heritage". Pursuant to the Law, archaeological finds shall be the property of the state.

(e) Other relevant national strategies and plans

The regulatory environment in Ukraine is characterised by a large amount of various strategic documents, mainly plans, programs, policies, and concepts. They may have administrative, territorial, (inter) sectoral focus, or be of a combined nature. For example, all oblasts in Ukraine are required by law to develop their own development strategies.

Timeframe of strategic documents varies between 5 to 20 years. Not all of them contain implementation and monitoring mechanisms, and some of them are not supported by a financial evaluation. As a result, implementation varies from case to case.

Apart from the Energy Strategy of Ukraine that has been considered above, National Programs on ecological network development, water use and development, land protection, development of protected areas, and others, are potentially or directly relevant to SER process. A full list of programmes that are applicable to the SER is shown in Appendix C.

(f) International environmental and social requirements applied to the Project

International Finance Institutions requirements

In addition to the Ukraine Laws, Strategies and Policies on renewable energy and environment, the SER will conform to requirements and principles contained in policies adopted by the EU and EBRD/IFC performance standards. The following international guidelines, regulations and policies will be followed and applied to the USELF SER development:

- EBRD Environmental and Social Policy, 2008, including Performance Requirements PR1 through PR10;
- EBRD Public Information Policy (PIP), 2008;
- EBRD Strategy for Ukraine (2007);

- EU Directive 2001/42/EC – The Strategic Environmental Assessment (SEA);
- Guidance on EU SEA Directive 2001/42/EC implementation: an assessment of the effects of certain plans and programs on the environment (2003);
- EU Directive 2009/147/EC – Bird Directive on the conservation of wild birds the conservation of wild birds (amended version of Directive 79/409/EEC);
- EU Directive 92/42/EEC – Habitats Directive on the protection of sensitive and vulnerable natural habitats;
- EU Directive 2000/60/EC – Water Framework Directive;
- EU Directive 96/62/EC – Air Quality Framework Directive;
- Natura 2000 Network, which is a centrepiece of the EU nature and biodiversity policy combining key components of EU Bird and Habitats Directives. (Since Ukraine is not a member of the EU, there are no Natura areas; however, for the purposes of this SER, we consider that National Parks, protected habitat areas, or other areas protected for conservation value to be the equivalent of Natura areas; and
- Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC (2007).

International conventions and agreements

Ukraine is a party to more than 40 international conventions and agreements in the field of nature protection. Among the most relevant to this project are:

- Espoo Convention on EIA in a transboundary context, 1991;
- Protocol on Strategic Environmental Assessment (SEA) to the Espoo convention (effective July 11, 2010);
- The Convention on the Conservation of Migratory Species of Wild Animals (known as CMS or Bonn Convention); and
- UNECE Aarhus Convention on access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters.

Other relevant environmental agreements and conventions to which Ukraine is party are listed in Appendix D of this Scoping Report.

6. KEY ENVIRONMENTAL CONDITIONS AND ISSUES

6.1 General Environmental and Social Baseline

(a) Introduction

The SER will identify the current state and characteristics of the environment, known as the 'baseline'. This baseline will provide the basis for predicting and monitoring environmental effects. The SER will also need to describe the evolution of the baseline environment without the implementation of renewable energy projects.

This Scoping Report provides an initial overview of the baseline, which will be the foundation for development in the SER. Having summarised the current state of the environment, and future trends, this report then identifies issues and opportunities for renewable energy projects. Data collection needed in the next stage of the SER are identified. Together, these set the scope for the next stage of SER.

The baseline environment is described according to a series of topics, these being aspects of the environment that could be affected by renewable energy projects. The nature of the effects will be explored during the SER, once the baseline and types of renewable projects are better understood.

The topic areas comprise:

- Climate and air quality
- Surface water and groundwater
- Geology and soils
- Landscape and biodiversity
- Community and socio-economics
- Cultural Heritage.

(b) Information sources used

Various statistical, official, and internet sources were consulted when preparing the baseline sections below. Information was gathered through a combination of publically-available websites, documents, and publications. The majority of the data came from national reports on the state of the environment of Ukraine, available on-line. Websites consulted include:

- The website of the Ministry of Environmental Protection containing information regarding the protected areas and species, biodiversity, and landscapes of Ukraine (http://menr.gov.ua/).
- Data on geology and hazardous exogenic geological processes, were derived from the national reports of the Ministry of Emergency Situations (http://mns.gov.ua/).
- Internet sources such as, Water Profile (http://www.eoearth.org/article/Water_profile_of_Ukraine) and Energy Profile http://www.eoearth.org/article/Energy_profile_of_Ukraine). WikiWater and Wikipedia also informed the description of current baseline conditions and trends. Socio-economic and cultural data were obtained from the website of the Ministry of Statistics of Ukraine (http://ukrstat.gov.ua/), the website of International Councils of Monuments and Sites (http://www.international.icomos.org /risk/2001/ukra2001.htm), and the website of Compendium of Cultural Policies and Trends in Europe (http://www.culturalpolicies.net/web/ukraine.php).

- The World Wildlife Fund (WWF) website was used to develop ecoregion descriptions (http://www.worldwildlife.org /science/ecoregions/WWFBinaryitem4810.pdf)
- The National Agency for Environmental Investments website for information on greenhouse gas emissions (http://neia.gov.ua/nature/control/uk/index).
- The UND-Dnipro Basin. Transboundary Diagnostic Analysis of the Dnipro River Basin (http://www.dnipro-gef.net/first_stage/projects-reports/transboundary-diagnistic-analysis-1/transboundary-diagnistic-analysis-of-the-dnipro-river-basin?set_lengauage=en)

The following documents and publications were cited in preparing this section of the Scoping Report:

- "National Report on the State of Environment in Ukraine" (Ministry of Environmental Protection. 2006, 2008, 2009);
- "Environment of Ukraine: Statistics" (Ministry of Statistics of Ukraine: 2009);
- "Ukraine in Figures: Statistics" (Ministry of Statistics of Ukraine: 2010);
- "Dynamics of climatic characteristics in Ukraine, initial prognosis of the climate changes and their possible impact on the branches of economy". (Scientific Research Institute of Hydrometeorology; Ministry of Emergencies of Ukraine; Research Center of Aero and Cosmic Earth Research of the Institute of the Geological Sciences of the Academy of Science of Ukraine, Council for the Studies of Production Forces of Ukraine, Academy of Science of Ukraine: 2009);
- "The Fifth National Notification on Climate Change - Preparation to implement Articles 4 and 12 of the Framework UN Convention on Climate Change, and Article 7 of the Kyoto protocol". (Ministry of Environmental Protection of Ukraine, Ministry of Emergencies of Ukraine; National Academy of Science of Ukraine, Scientific Research Institute of Hydrometeorology: 2009);
- "National Report of the State of Technogenic and Environmental Safety in Ukraine" (Ministry of Emergencies of Ukraine: 2009);
- "On the Approval of the Energy Strategy of Ukraine for the Period until 2030". Ukraine's Energy Strategy for the Period until 2030 (Resolution of the CM of Ukraine of 15.03.2006 No. 145-r);

Several Geographic Information System (GIS) data sources have also been utilised to compile the mapping information within this report. The relevant sources are:

- State Statistics Committee of Ukraine, 2010 (http://www.ukrstat.gov.ua/); Potential of solar electricity generation in the European Union member states and candidate countries. Solar Energy, 81, 1295–1305. (http://re.jrc.ec.europa.eu/pvgis/download/download.htm);
- Institute of Engineering Thermophysics, NASU, 2010. Assessment of biomass potential in Ukraine, Biomass Energy Europe Project, FP7;
- EBRD and UDI, 2010. Ukraine Country Profile. (http://ws2-23.myloadspring.com/sites/renew/countries/Ukraine/profile.aspx);
- 3TIER Environmental Forecast Group, Inc., 2010;
- Hole-filled seamless SRTM data V4, International Centre for Tropical Agriculture (CIAT) (http://srtm.csi.cgiar.org);
- The World Database on Protected Areas (WDPA). UNEP-WCMC. 2009, Cambridge, UK. (www.wdpa.org)
- UNESCO 2010. World Heritage List (http://whc.unesco.org/en/list); and

- National Atlas of Ukraine, ed. by L.G. Rudenko. Available from National Academy of Sciences of Ukraine Institute of Geography, 01034 Kyiv.

6.2 Climate and Air Quality

(a) Baseline Conditions

The majority of Ukraine's climate is temperate continental; however, it is subtropical in the south of the Crimean peninsula. Variable weather is typical for Ukraine due to cyclones and anticyclones, which occur an average 45 and 36 times annually, accordingly. The mean annual air temperature ranges from +6 °C in the northern part of the country to +13 °C in the south. There are significant seasonal and regional variations in temperature. Atmospheric precipitation is unevenly distributed during the year. The mean annual precipitation decreases from the west and northwest (550-650 mm per year) to the south and southeast (300-350 mm per year). The maximum precipitation occurs in the Ukrainian Carpathian (more than 1,500 mm per year) and in the Crimean Mountains (about 1,000 mm per year). On a country-wide scale, wind conditions vary over the year. The average near surface wind speed in Ukraine is 4 m/s. The average amount of sunlight hours increases from 1,700 in the northwest of the Ukraine to 2,400 hours/year in the southeast and south.

Due to prevailing westerly winds, the vast majority of the air-borne pollutants are transported to the Ukraine from central and eastern Europe, while air pollutant loads from Ukraine are mainly transferred further east to Russia. The energy sector in Ukraine is a major contributor to local air pollution. Fuel and Energy Complex (FEC) enterprises are considered second by capacity (after the metallurgy industry) as a source of pollutant emissions to the atmosphere. More than 80% of all emissions of thermal power plants are from 8 large thermal power plants, mostly located in the Donetsk-Pridniprovsk region. The energy sector contributes about 70% of total domestic emissions of greenhouse gasses (GHGs) in Ukraine and is the main source of carbon dioxide (CO_2) and methane (CH_4) emissions in the Ukraine. The combustion of fossil fuels, particularly coal, is the most significant contributor to CO_2 emissions. Globally, Ukraine ranks 20th in the emissions of CO_2 from fuel combustion and 8th in energy-related CH_4 emissions. Greenhouse gas emissions in Ukraine decreased through the 1990s, mostly due to the sharp economic decline. Since 2001, greenhouse gas emissions have grown. In 2004, Ukraine's total greenhouse gas emissions were 45% of their 1990 level. Both the CO_2 emissions from fuel combustion and fugitive CH_4 emissions from coal have fallen significantly since 1990. However, fugitive CH_4 emissions from oil and gas have dropped by only 25% for the same period of time.

(b) Future Trends in Baseline

Current projections of the effects of climate change (IPCC, 2007) indicate that Ukraine will experience an increased frequency and magnitude of winter floods, decreased water availability, increased variability in crop yields and potentially decreased crop yield with increased soil erosion, increased health effects from heat waves, and severe fires in drained peatland. Drought risk is expected to increase to the extent that 100-year droughts today will return every 50 years or less by the 2070s.

It is not clear whether Ukraine will benefit from climate-change driven improvements in conditions for agriculture; since benefits could be offset by increased variability and extreme events. There are also issue of agricultural efficiency to consider. Ukraine will most likely face a mix of losses and gains (World Bank, 2009).

The analysis of the atmospheric ozone layer illustrates a positive trend - average annual deviation of total content of ozone values has declined. According to the ten-year

forecast, changes in ozone layer conditions will be variable. Solar activity is variable as well. The nearest maximum of solar activity will occur in 2012, and a minimum in 2019.

Trends in air quality in the Ukraine are contradictory. Without additional policy measures and technological innovations, the country's greenhouse gas emissions will continue to increase with economic recovery. Since a significant increase in coal consumption for electricity and heat production is envisioned for Ukraine, increased greenhouse gas emissions would be expected. Changes in Ukraine's energy efficiency will also lead to potential emissions decrease. Financial hardships could force enterprises to switch from more expensive gas to coal and oil as a source of energy, which could increase GHG emission. If financing is not secured for implementing air emission mitigation measures, and the level of energy and heat generation does not drop, air pollution in industrialized part of Ukraine will continue to increase.

(c) Climate and Air Quality Constraints and Opportunities for Renewable Energy

The key constraints and opportunities for renewable energy in relation to climate and air quality are summarised in Table 6.1.

Table 6.1: Constraints and Opportunities in relation to Climate and Air Quality

Constraints	Opportunities
• For wind power: possible changes in wind characteristics (speed, constancy, etc) • All renewable energy types: climate change will increase frequency and scale of hazards and disasters • The economic decline will cause manufacturing reduction and an improvement of air quality; that may decrease the interest of the local authorities in renewable energy projects development • Climate-change driven alterations to wind and rainfall patterns could alter the business case for wind, solar and small hydropower schemes.	• All renewable energy types: Reduction in GHG and other air pollutants compared to energy generated by non-renewable means • Wind conditions in Ukrainian Carpathian and Crimean Mountains (wind) • Good indexes of insolation in the southern part of Ukraine (Solar PV) • Changing structure of agricultural cropping (biomass) • Increasing air pollution may stimulate development of green technologies • See climate change under 'constraints'.

(d) Data to be included in the SER

The following climatic parameters will be further considered and described in the main SER document.

- Climate
  - Climatic Zones
  - Precipitation
  - Temperature
  - Sunlight (characterized as Direct Normal Insolation)
  - Wind (velocity and select wind roses)
  - Further information on climate change trends

- Air Quality
  - Particulate and other Criterion Pollutants by major regions

6.3 Surface Water and Groundwater

(a) Baseline Conditions

Hydrography

Water resources are not equally distributed throughout Ukraine. Sufficient resources are found in the north and northwestern part of the country, while the eastern and southern regions, with the highest concentration of industry and agriculture, experience fresh water deficit. Kyivska and Zakarpatska oblasts have maximal availability of fresh water; while fresh water supply in insufficient in the Autonomous Republic of Crimea and Donetsk, Kharkiv, Lugansk, Odesa and Mykolaiv oblasts.

Ukrainian rivers are divided into three sea basins – Black Sea, Sea of Azov and the Baltic Sea. The majority of the territory of Ukraine (98%) is within the catchment basin of the Sea of Azov and the Black Sea. There are 63,119 rivers in Ukraine, including 9 large (with a watershed area of more than 50,000 km^2), 81 medium (from 2,000 to 50,000 km^2), 63,029 small (less than 2,000 km^2) watersheds. Total length of the country's river network is estimated as 206,400 km, 90% of which is comprised of small rivers.

The main Ukrainian rivers are characterised in the Table 6.2

Table 6.2: Major rivers in Ukraine

River name	Basin area, km2	Total length, km	% of all Ukraine's river watersheds within basin
Dnieper (Dnipro)	504,000	2,201	28
Dniester	72,100	1,352	24
Pivdennyj Buh	63,700	806	9
Danube (3.8%*)	801,463	2,850	26

*Only 3.8% of the total Danube basin area is within Ukraine

Table 6.3 demonstrates the variability in index of river network density by major river basins in Ukraine. The highest index of river network density is found in the Carpathian region. In the Dnister river basin, the index of river network density decreases from the basin headwaters toward the lower reaches. In the Pivdennyj Buh and Dnipro river basins, the indices of river network density changes from 0.73-040 km/km^2 in the headwaters to 0.2-0.16 km/km^2 downstream and from 0.35-0.59 to 0.12-0.18 km/km^2, respectively.

Table 6.3: Major river networks in Ukraine

Basin	Basin area km^2	River network density, km/km^2	Geographic location
Prut River	27,500	0.94	Carpathian Mountains
Dniester River	68,627	1.0-1.7 – headwaters 0.2-0.18 – lower basin	Ukrainian Carpathians
Pivdennyj Buh River	63,700	0.73 – headwaters 0.2-0.16 – lower basin	South-western Ukraine
Dnieper (Dnipro) River	504,000	0.35-0.59 – headwaters 0.12-0.18 – lower basin	Russia, Belarus, Ukraine

Flood control facilities include more than 1,100 water storage basins, 28,000 reservoirs, 7 grate channels and 10 main aqueducts in the watersheds of Dnipro, Dnister, Danube, Siverskyj Donec, Pivdennyj Buh, and Zahidnyj Buh rivers. Risk of flooding is still considered to be high, particularly in Dnister, Prut and Syret basins. The main reasons for the high flood risk are limited capabilities of the flood control facilities, lack of investment, and inadequate level of modernization. Uncontrolled construction in water withdrawal zones is an additional factor that causes flooding and other negative impacts on water bodies.

		
View showing the lower Dnipro River in Kherson.	The Buh River near the town of Doroshivka.	View looking south from Mykolaiv along the Buh River.

Groundwater and Water Resources

Total groundwater resources in Ukraine are estimated to be 20 km^3 per year. Fresh groundwater aquifers are found at the depth of 300-400 m in the northern regions of the country, and at 100-150 m in the southern regions. Groundwater in aquifers lying below these levels is usually salty. Total volume of the annual river discharge in the Ukraine is among the highest in Europe (about 210 km^3); but only 25% of this amount originates at the territory of Ukraine (local discharge); while the rest is formed beyond Ukrainian borders (transit discharge). Actual water availability per capita in Ukraine is among the lowest in Europe. This applies both to the surface and ground water resources. Quality of drinking water in Ukraine often fails to meet national standards, which poses a threat to the public health. Decline in drinking water quality, along with groundwater pollution, and deterioration of the conditions of main rivers, is reported in the regions where coal and metal mining and raw materials processing are traditionally concentrated (the east and southeast regions of the country).

Surface Water Quality

In 1999, all river basins in Ukraine, apart from the rivers in Crimea, were classified as moderately or significantly polluted. It should be noted; however, that the water quality standards applied are in some cases stricter than those applied in EU countries. According to various sources, the most serious causes of pollution are municipal economy, ferrous and non-ferrous metallurgy, heavy engineering, and agriculture. Mining activities also represent a serious threat, causing discharge of heavy metals and other harmful substances. The Dnieper River, the primary source of drinking water to 60% of the Ukrainian population, is often cited as a 'classic example of non-sustainable usage'; the concentration of several pollutants, such as ferrous ions and ammonium in the water of Dnieper reservoirs in industrial regions, is reported to exceed repeatedly national standards. Industrial activities are the sources of large volumes of insufficiently treated (12-20% of total discharge volume) or, in some cases, untreated wastewater (up to 7%). Water losses in the distribution infrastructure are greater than 30%.

(b) Future Trends in Baseline

Analysis of long-term surface water quality monitoring data (including seawater quality) indicate that the overall level of water pollution does not significantly change regardless of

the economic situation and level of industrial output. Overloaded sewerage systems and treatment facilities that are dilapidating in the absence of maintenance and reconstruction are the main reason for continuing water quality deterioration.

The volume of discharged water has declined as a result of the industrial recession during 1995-2005. During the last 5 years, the per capita water use in Ukraine has decreased, but industrial water consumption is constantly increasing. This trend is expected to continue unless steps to modernize industries are implemented. Power generation (including electricity), domestic and municipal consumption, agriculture, and metallurgy industries are the main water users in Ukraine. With the expected recovery of heavy industry, it is reasonable to expect significant growth of water discharges along with water consumption for industrial purposes. However, the quality of drinking water continues to deteriorate as indicated by sanitation, chemical, and bacteriological characteristics, with no indications or major initiatives to reverse this trend.

(c) Surface Water and Groundwater Constraints and Opportunities for Renewable Energy

The key constraints and opportunities for renewable energy in relation to surface water and groundwater are summarised in Table 6.4.

Table 6.4: Constraints and Opportunities in relation to surface water and groundwater

Constraints	Opportunities for small hydropower
• Small hydropower: interaction with risk of flooding in areas of high renewable energy potential • Small hydropower: insufficient state of water-related infrastructure (including reservoirs, channels, aqueducts) • Small hydropower: uncontrolled land use in water intake zones	• Small hydropower development might be seen and promoted as an alternative to large power station (re)construction, the latter are one of the causes of water shortage in some parts of the country • The wide net of small rivers with high potential for small hydropower development • The possibilities to use existing hydropower facilities (with necessary upgrading)

(d) Data to be included in the SER

The following surface water and groundwater information will be further considered and described in more detail in the main SER document.

- Surface Waters
  - List of key water bodies and watercourses and map of hydrography network
  - Map of main watersheds and hydrologic regimes
  - Flood areas/flood control
  - Channel processes
  - Coastal processes
  - Surface water withdrawals
  - Surface water quality parameters by regions (monitoring data)

- Groundwater

- Hydrogeological map and major aquifers
- Groundwater withdrawals/wells
- Groundwater availability by regions
- Groundwater quality

6.4 Geology and Soils

(a) Baseline Conditions

Geology, Hydrogeology and Hazardous Geomorphologic Processes

Ukrainian territory is situated in the southeastern part of Eastern European platform, and the mountain structures of Carpathia and Crimea that surround the platform. Mountain structures are part of the Alpine folding geosyncline region. Rocks of Precambrian, Palaeozoic, Mesozoic, and Cenozoic age form three structural levels. A variety of underground resources are mined in Ukraine and, according to the inventory of natural resources, there are more than 8,500 deposits of 97 types of minerals in Ukraine.

Among the exogenous geological processes in the Ukraine, landslides are the most important. The landslides mainly occur on the coasts of the Black and Azov Seas, as well as in the Carpathian region. Fluctuations in groundwater level often cause groundwater flooding in some areas of the Ukraine. High groundwater poses significant geotechnical risks to engineering structures and could impair local and regional economic development. Groundwater flooding typically occurs in industrial (Dnepropetrovsk and Krivyj-Rih) and agricultural (Odesska and Mikolayvska oblasts) areas of the country.

Exposed geological strata along a river through the Carpathian foothills

Carpathian Mountains; part of the Alpine folding geosyncline region

Ground-sloughing (landslip), Carpathians.

Gently rolling low hilly terrain of a likely karst origin

Soils and Soil Quality

Chernozems (Mollisols) are the most valuable soil type in Ukraine. Chernozems in the Ukraine account for approximately 8.9% of the world resources of Chernozems. Other soil types that are present in Ukraine include grey forest soils, brown mountain soils, and podzols. Soil erosion is a significant problem in the country. Eroded soils cover 85% of total steppe and forest-steppe territories. About 100,000 hectares of fertile land is lost every year because of wind and water erosion.

Soil pollution is an issue in Ukraine. Virtually all regions of the Ukraine have a significant level of soil pollution by pesticides. Significant proportions of air pollutants are also absorbed by soils within 5 km of pollution sources; which commonly include ferrous and non-ferrous metallurgy, light industry, and thermoelectric power stations. Open cast mining, processing and smelting enterprises are also major sources of soil pollutants in Ukraine.

As a consequence of the Chernobyl nuclear power plant accident in 1986, 8.4 million hectares of agricultural land were contaminated, principally by Ceasioum-137. This led to the abandonment of 180,000 hectares of arable land and 157,000 hectares of forest; and the designation of a 'Zone of Alienation' around the town of Prypiat, within which most activities are heavily restricted. A slow process of decontamination of the surface soil layers is underway, but the latest available published data for soil contamination (1998) indicates that areas of the north and central Ukraine still show signs of radioactive contamination (Ministry for Environmental Protection and Nuclear Safety of Ukraine).

Seismic conditions

The territory of Ukraine is situated in a seismic zone. The highest risk zones are situated in Crimea, the western Black Sea coast, and the Carpathian Mountains where earthquake intensity may reach between 6 and 9 on the Richter scale. Additionally, intensive mining operations can cause technogeneous earthquakes that are not as intense as natural events but, if in industrially developed areas, could lead to harmful and destructive results.

(b) Future Trends in Baseline

Intensive mineral extraction activities in Ukraine – principally concentrated in Donetskiy, Krivirizhsko-Nikopolskyj (southeastern Ukraine), and Pricarpatskyj (southwestern Ukraine) industrial regions – caused essential changes in geology of the regions and led to environment degradation, such as changes in groundwater hydrology of the territory, deformation of geological bands, soils pollution, and alkalinisation. This long-term trend is likely to continue, since no significant efforts have been undertaken to remedy the situation.

There is a large-scale program on prevention and mitigation of landslides and groundwater flooding of the most vulnerable areas in Ukraine. The program is executed and managed by the Ministry of Emergency Situations; however, it has not been very successful because these issues are not priorities for the Ministry. Soil erosion prevention has been a priority target for the sectoral Ministries (Ministry of Environment, Ministry of Agrarian Policy); however, the rate of soil erosion is not declining, and there are no changes proposed to drive any positive changes. Lack of knowledge and skills, along with an absence of governmental incentives, make the farmers unable to deal with the erosion issue.

The Ministry of Emergencies of Ukraine continues to supervise activities within the Zone of Alienation around Chernobyl.

(c) Geology and Soils Constraints and Opportunities for Renewable Energy

The key constraints and opportunities for renewable energy in relation to geology and soils are summarised in Table 6.5.

Table 6.5: constraints and opportunities in relation to geology and soils

Constraints	Opportunities
• High value of Chernozem soils might limit siting options for all renewable energy projects • High level of soil pollution, including heavy metals could limit development of all renewable energy projects • Seismic activity and landslides could limit siting options for all renewable energy projects	• Possibility of siting for all renewable energy projects on land formerly used for minerals extraction or that is contaminated • High soil productivity often relates to significant nearby biomass potential • Significant mineral resources could support a steady demand in electricity production for all renewable energy projects.

(d) Data to be included in the SER

The following parameters will be considered for geology and soils within the main SER document.

- Geology
  - Bedrock Geology
- Seismic Hazard Areas
- Landslide Hazard Areas (topography-derived >50% slopes)
- Soil classification

6.5 Landscape and Biodiversity

(a) Summary of Existing Baseline

Topography and vegetation type

In general, the topography of Ukraine is characterized by flat lowlands and gently rolling uplands, with about 5% of the country covered by mountainous and sub-mountainous regions, as shown in Figure 6.1: Geobotanical Zones and Topography. The western edge of Ukraine lies within the Carpathian mountain range, which stretches from the eastern boundary of the Czech Republic to the northern part of Romania. The highest mountain peak in the Ukrainian Carpathians is "Hoverla" with an elevation of 2,061 m above mean sea level (amsl). Forested areas that are predominantly characterized by fir and beech tree species cover about half of the area occupied by mountain slopes, as shown in Figure 6.1. Another distinctive topographic feature of Ukraine, the Crimean mountain range, is located on the southeastern coast of the Crimean peninsula. This mountain range is elongated along the peninsula's seashore for about 250-300 km in the northeastern direction from the southwestern tip of the peninsula. The highest point of the Crimean mountain range is the "Roman-Kosh" peak, at an elevation of 1,545 m amsl.

Approximately 60% of the hilly and mountainous terrain is covered by forest, consisting mainly of oak, beech, hornbeam and pine.

		
View of eroded peak, forested slopes, and mountain steppe habitats of the central Crimean Mountains.	Rolling uplands of the Crimean steppe. This is a field planted with winter wheat.	Estuarine salt-marsh habitats of the Sevash region (located between Crimea and the southern coast of Ukraine mainland)

The remainder of the country can be divided into three main geographic zones that can be described as roughly parallel 'east-west spread belts'. The most northern part of the country is predominantly covered by coniferous, mixed and deciduous forests. Forest regions cover approximately 20% of the total area of the country. The elevation of the land varies mostly between 100 and 200 m, but reaches some 400 m in some places in the west. The forest-steppe zone in the centre of Ukraine is predominantly agricultural and covers about 35% of the country. The topography ranges between 50 and 500 m amsl with the higher regions being mainly to the west. The remaining 40% of the country (the southern and eastern portions of the country) lies within the predominantly arable steppe belt. The elevation varies between 0 and 300 m amsl with the higher regions being in the north and east of the zone. Most of the land in the forest-steppe and steppe zones (44% of the whole country) is covered by Chernozems (Mollisols) soils, a particularly fertile type of soil. Original (undisturbed) steppe ecosystem now is a decreasing rarity, with total areas less than 1% of the overall country territory.

The biodiversity of the Ukraine includes more than 72,000 species of flora, microbiota, and fauna. Approximately one-third of these species, mostly insects and fungi, have yet to be described.

The biodiversity in most of the Ukraine is associated with the East European Plain, which occupies 94% of the land area of the country, including the Polissja, forest-steppe and steppe landscapes. The diverse geomorphology, climate, and topography of Ukraine account for much of the richness of flora and fauna. Ukraine is home to a high number of endemic and sub-endemic species, principally found in the Crimean Mountains, but also in the estuaries and marshes along the Black Sea and in the Carpathian Mountains. There are more than 55 species of fauna protected under the Bern Convention on the territories of reserves, protected areas, and landscape parks all over the Ukraine. Ukraine has 22 sites listed as wetlands of international importance under the Ramsar Convention on Wetlands. The Danube River Basin, which runs along the Ukrainian-Romanian border before emptying into the Black Sea, has been recognized as a Global 200 Ecoregion, based on selection criteria such as species richness, levels of endemism, taxonomic uniqueness, unusual evolutionary phenomena, and global rarity of major habitat types.

Natural Protected Areas

Protected areas in Ukraine are maintained under the natural reserve fund of Ukraine. The fund includes 7,346 protected areas that cover 2,990,000 hectares (4.95% of total territory of the country). The structure of natural reserve fund includes 11 categories of territories and objects protected at national, regional, and local levels. Geographical distribution of reserve areas varies from region to region (as shown in Figure 6.2: Natural Protected Areas).

Land Use

The land use pattern in Ukraine is characterized by overuse of land resources for agricultural purposes. Agricultural land covers more than 70% of the total territory of Ukraine including pasture (9.5%), hayland (4.4%), and perennial plants (1.5%). The remainder is arable land.

There are 3.4 billion hectares of reclaimed areas in Ukraine that were formerly wetlands. Only 957,100 hectares of wetlands remain based on reported estimates.

As indicated above, activities within the Zone of Alienation around the Chernobyl nuclear site are restricted and under the jurisdiction of the Ministry of Emergencies of Ukraine.

(b) Future Trends in Baseline

Although the government is planning a substantial expansion of the nature reserve fund of Ukraine (compared to current 2,990 ha) by 2015, landscapes and biodiversity in Ukraine are under constant threat of uncontrolled land use for economic purposes (extraction of fossil fuels, residential development, and recreational facilities). Biodiversity in large parts of Ukraine was systematically adversely impacted during the Soviet era, largely to make way for agriculture. Steppe and wetland ecosystems (meadows and marshes) suffered the most. Land conversion activities and dams have seriously impacted biodiversity of rivers, the Black Sea, and the Sea of Azov. A few large reserves are well managed, while many small reserves have no management at all. Poorly regulated hunting activities and uncontrolled collecting of wild plants pose serious threats to declining populations of native species. Conservation programs at the local level are energized and dynamic, but suffer from inadequate management of natural resources. The non-governmental organisation (NGO) community is often too weak to be an effective partner with government and industry to address biodiversity and natural resources issues.

There are; however, certain positive tendencies in land use. There are trends towards increasing of areas under conservation status (in average 400 hectares per year), expansion of forest areas, as well as towards reduction of non-vegetated areas and radioactively polluted lands.

(c) Landscape and Biodiversity Constraints and Opportunities for Renewable Energy

The key constraints and opportunities for renewable energy in relation to landscape and biodiversity are summarised in Table 6.6.

Table 6.6: constraints and opportunities in relation to landscape and biodiversity

Constraints	Opportunities
• Expansion of protected areas could reduce the amount of land available for all renewable energy projects • High density of existing protected areas are located in the most promising for renewable energy project areas (Carpathian region (hydropower), Crimea (wind, solar)) • Low productivity and land degradation	• Compensation measures such as creation of protected territories or natural parks may be acceptable to the authorities and communities and may facilitate solving the conflicts over the land use for all renewable energy projects • Degraded lands could be used for wind or solar renewable energy

Constraints	Opportunities
in certain areas of the country could prevent development of bio-mass and bio-gas projects • Small hydro: minimum flow requirements to protect biodiversity • Bird migration corridors, important breeding grounds for large birds, or areas favourable for bats (wind, mainly).	projects.

(a) Data to be included in the SER

The following parameters will be considered for landscape and biodiversity within the main SER document.

- Protected Lands
  - Biosphere Reserves
  - National Parks
- Protected Aquatic Ecosystems
- Protected Species
  - Point data or areas as well as bird, bat and fish migration routes
- Unregulated Habitats and Associated Flora and Fauna
- Physio-Ecological Regions
  - Terrestrial
  - Wetlands
  - Aquatic
  - Bat Populations
  - Bird Migration Pathways
  - Anadromous Fish Routes

6.6 Community and Socio-economics

(a) Summary of Existing Baseline

The population of Ukraine is 45.8 million (data on December 1, 2010). The end of the 20th century and beginning of the 21st are characterized by a process of depopulation. Population size reduced by 7.5% in the period 1991-2001 and by 5.1% in the 2001-2010 period. The aging population of Ukraine causes social and economic problems and misbalances the population structure. This is especially an issue amongst rural populations within central Ukraine and Donbas. The demographic pressure on the working-age population is higher for rural populations: there are 792 retired people for every 1000 persons of working-age, compared to 592 retirees for 1000 for urban working-age people. It is caused by a higher proportion of children and retirees in the villages.

Ukraine is a multicultural country. Three quarters of the population are Ukrainian. There are particularly high numbers of Russians, with the remainder of the population principally consisting of Bulgarians, Slovakians, Poles and Czechs. However, there are strong regional variations in population make-up across Ukraine (for example, 12% of Crimea population is Crimean Tatars, 12.1% of Zakarpatska oblast population – Hungarian, 12.5% Chernivetska oblasts population – Romanian). The migration process in Ukraine is still very intensive. The average level of labour (forced) migration is 2-2.7 million persons; most of them are persons with vocational technical training or higher

education and 20-49 years old. The main migration directions are toward Russia (40-50%), Poland (15-20%), Czech Republic (10-12%) and Italy (10%).

Population density on January 1, 2010 was 76.1 persons per sq km. Density varies significantly from region to region. Major urban populations are around Kyiv, Kharkiv, Odessa and the Southern Crimea. Other more densely populated areas include the central eastern part of Ukraine around Dnipropetrovsk, Zaporizhzhya, Donetsk and Luhansk (all major cities in their own right) and western Carpathia.

		
An unused Tatar settlement south of Simferopol, Crimea.	View of small farm community with Carpathian Mountains in background.	Skiing development in the Carpathian region prior to the ski season.

Transport, financial activity, and mining operations are the economic activities with high level of remuneration of labour (salaries 1.5-3 times higher than average level). Existing generation activities, particularly in relation to renewable energy are discussed in Section 3.2. Average level of salary in 2010 was higher than the living wage. Lowest salaries are paid in Thernopilska, Volynska, Chernigivska and Khersonska oblasts.

Levels of unemployment are the highest in the central and northern regions of Ukraine (excluding Kyiv). The situation in the southern, western and eastern regions is slightly better and relatively stable. It is accepted that the central northern part of Ukraine cannot achieve the economical stabilization and growth without targeted governmental help. T

The overall rate of illness is increasing (respiratory organs diseases, injuries and intoxications are wide-spread causes of sickness). There are approximately 1.4% of adults with AIDS in Ukraine; 48 AIDS-related deaths occur every day. Unfortunately, Ukraine has no effective AIDS mitigation programme, current activities are orientated towards overcoming consequences rather than on prevention and treatment. Tuberculosis occurrence in Ukraine is also high, one of the highest in Europe, and growing, despite significant governmental effort to combat the disease.

(b) Future Trends in Baseline

Aging population has caused disproportions in population structure that will not be overcome in the near future. For a long period, these tendencies were aggravated by migration of the most economically active population and a high sickness rate. There are now some weak but positive trends observed on this issue. The latest socio-economic forecast predicts a birth wave in all regions of Ukraine. The economic growth in 2003-2006 years stimulated job creation, demand for higher education, industrial development and progress of society; however, this process was not accompanied by technical and technological modernization and innovation. Therefore, the current situation is worsening by exhaustion of growth potential while expectations and social obligations are not met. The human health level situation critical – the number of AIDS and tuberculosis patients is increasing permanently. The situation is unlikely to change unless mitigation measures and programmes are of high government priority.

Many have noted that climate-change driven trends of warmer climate and abundant precipitation in the Ukraine will open up a new agricultural ‘frontier’. However, any

potential benefit is reported to pale in comparison to the costs of the region's relative inefficiency and low productivity (World Bank, 2009).

7.5.3 Community and Socio-economics Constraints and Opportunities of Renewable Energy

The key constraints and opportunities for renewable energy in relation to community and socio-economics are summarised in Table 6.7.

Table 6.7: constraints and opportunities in relation to community and socio-economics

Constraints	Opportunities
• Presence and condition of electricity grid and connections • Absence of qualified staff • High migration level that has caused staff turnover • Possibility of ethnic conflicts around land use	• Increased employment opportunities • High level of employees' education • Low employment costs • Necessity and high priority for the development of new advanced technology for potential economic growth basis

7.5.4 Data to be included in the SER

The following parameters will be considered for community and socio-economics within the main SER document.

- Demographics
  - Population
  - Income
  - Employment
  - Ethnicity
- Health
  - Longevity
  - Death Rate
  - Availability of Potable Water
  - Waste Management Capabilities /Practices
  - Soil Radon
  - Contaminated Sites
  - Chemical (including radiation)
- Infrastructure
  - Transportation
    - Roads/Highways
    - Rail
    - Airports and Approaches
    - Ports
    - Gas Pipelines
  - Military Facilities
    - Bases
    - Testing Areas
  - Energy
    - Existing and Planned Generation Facilities
    - Non-Renewable

  - Renewable
  - Existing and Planned Transmission Lines
  - Utility Service/Operation Areas
- Natural Resource Usage
  - Mining/Extraction Areas
  - Fisheries
  - Land Use
  - Other Value Lands
- Tourism
  - Beaches
  - Hunting
  - Fishing
  - Skiing
  - Eco-Tourism

6.7 Cultural Heritage

(a) Summary of Existing Baseline

Officially there are five UNESCO World Heritage Sites in Ukraine, as shown in Figure 6.3; these are:

- Lviv - the historic centre;
- The Struve geodetic arc (Khmelnytska and Odeska oblasts);
- Saint-Sophia Cathedral and related monastic buildings, and
- Kyiv-Pechersk Lavra.
- Primeval Beech Forests of the Carpathian

The last site from UNESCO list is the Primeval Beech Forests of the Carpathian, an outstanding example of an undisturbed, complex temperate forest, that constitutes a transnational serial property of ten separate components (6 in Ukraine and 4 in Slovakia). Ukraine also has thirteen submissions on the UNESCO tentative list. A state-organised and run project, ”Seven Wonders of Ukraine” has identified seven historical and cultural monuments of the country, that are perceived as high value by the society as a whole.

An entrance to Carpathian National Park near Vorokhta.

Kamyanets-Podilsky UNESCO tentative list site

At present in the Ukraine there are official records for more than 140,000 objects of cultural heritage and 132,000 historical and archaeological monuments and items of monumental art, of which approximately 500 are of national importance. There are 15,600 urban and architectural monuments, of which more than 3,000 are monuments of national importance. In addition, Ukraine has 56 Individual Heritage Units and complexes with an exceptional historical value (state historical-cultural reservations), of which 12

have been granted the status of national reservations. In addition to this, 402 towns and municipalities of the urban type have been included on the List of Historically Inhabited Places of the Ukraine.

(b) Future Trends in Baseline

Cultural heritage of Ukraine is a part of world cultural heritage and its protection is one of the proclaimed priorities of Ukrainian governmental policy. However, this part of state responsibility typically is of lower priority during the periods of socio-economic instability. Society is anxious to preserve national socio-cultural values and their materials embodiments and support their further development even under crisis conditions. One of the urgent social issues is to develop an integrated system of authorities responsible for protecting cultural heritage. Presently, the uncoordinated and isolated activities of the state agency cause functional duplication, ineffective resource usage, and absence of responsibility. That recent administrative reforms of December 9, 2010 bring an opportunity for needed improvements.

Since the declaration of Ukrainian independence in 1991, there was a drastic decrease in public support for culture due to political instability, the economic crisis, and contradictions between democratic goals and market conditions. The lack of a clear medium and long-term cultural development strategy resulted in the creation of ad hoc policies at the central and local levels. In most cases, these policies are aimed at preserving the existing situation. By the end of 2008, the government adopted the draft *Concept of the State targeted programme for innovative development of Ukrainian culture in 2009-2013*. The Programme is intended to improve the budget allocation process, increase the share and effectiveness of cultural expenditure, modernize mechanisms for attracting non-budget funds, regulate legislation, and modernize the governance system. In 2008, National Board for Cultural Affairs (NBCA) together with the Presidential Secretariat, elaborated an operation plan (*The Roadmap to the Programme for Enrichment and Development of Culture and Spiritual Heritage of the Ukrainian Society*) defining three key strategic priorities. They are:

- integrity of the national linguistic and cultural space;
- updating national cultural heritage, and
- protection of national cultural industries.

(c) Cultural Heritage Constraints and Opportunities of Renewable Energy

The key constraints and opportunities for renewable energy in relation to cultural heritage are summarised in Table 6.8.

Table 6.8: constraints and opportunities in relation to cultural heritage

Constraints	Opportunities
• Possible conflicts with local communities and authorities over the land use • Probability of extension of cultural heritage sites' territories or creating new ones, thus limiting potential renewable energy project siting	• Opportunity to support cultural heritage development as one of mitigation measures within renewable energy projects • Siting of renewable energy projects on natural heritage sites for demonstration purposes.

(d) 7.6.4 Data to be included in the SER

The following parameters will be considered for cultural heritage within the main SER document.

- UNESCO World Heritage Sites
- Archaeological Sites and Monuments of Interest / under protection
- Battlefields/War Monuments/Burial Grounds
- Main archaeology Hotspot/Zones.

7. SER OBJECTIVES

'Objectives' are a recognised tool for describing, analysing, and comparing the environmental effects of options (e.g. ODPM *et al*., 2005). Objectives usually reflect the desired direction of change. It therefore follows that the objectives may not necessarily be met in full by a given scenario, but the degree to which they do will provide a way of identifying preferences when comparing scenarios.

In this case, the SER objectives will need to satisfy the overall aim of USELF; 'to provide development support and debt finance to renewable energy projects which meet required commercial, technical and environmental standards'.

SER objectives have therefore been developed for each SER environmental topic – see Table 7.1. These objectives have been formulated through the review of best practice guidelines and review of relevant baseline data for the USELF SER. Scoping consultation has also helped to inform the development of the SER objectives, and it is anticipated that these will be refined through further consultation and review of baseline characteristics.

Table 7.1: Proposed draft SER objectives

SER Topic	Does the proposed development of the renewable resource...
Air and Climatic Factors	• Avoid adverse effects upon Ukrainian greenhouse gas emission targets? • Minimise the risk of potential impact from noise or air quality?
Soil and Geology	• Avoid adverse effects upon soils? • Avoid adverse effects to land and infrastructure from erosion and from landslides in high slope areas? • Avoid the risk of potential mobilisation of anthropogenic contaminants during construction? • Minimise the use of high value soils (Mollisols)? • Maximise the use of developed, Brownfield, and other impacted sites? • Avoid areas with high seismic risk?
Water	• Avoid adverse effects upon the water and groundwater resource? • Avoid adverse effects upon fisheries, water quality, recreation, and commerce associated with rivers and lakes?
Landscapes and biodiversity (including Flora & Fauna)	• Minimise the risk of potential impacts on the visual value of the Ukrainian landscape? • Avoid adverse effects upon internationally designated nature conservation sites? • Avoid adverse effects upon nationally designated nature conservation sites? • Avoid adverse effects upon important habitats and species?
Population and Human Health (including socio-economic factors)	• Avoid the economic or physical displacement of people? • Avoid adverse effects upon the health and well being of Ukrainian communities? • Have the potential to contribute towards direct employment? • Minimise the risk of potential adverse impact on other

SER Topic	Does the proposed development of the renewable resource...
	sectors (conventional tourism, hunting, eco-tourism, etc.). • Avoid adverse effects upon existing land uses such as agriculture and forestry?
Cultural Heritage (including architectural and archaeological heritage)	• Avoid adverse effects upon Ukrainian and World Cultural Heritage sites?
Material Assets (including existing energy infrastructure)	• Avoid adverse effects upon important material assets and infrastructure? • Avoid adverse effects upon other renewable energy initiatives in Ukraine?

8. NEXT STAGES OF THE SER

8.1 Introduction

As identified in Section 2.1, the SER will be guided by the EU SEA Directive and guidance on its application, which identifies a series of stages in the process. SER Stage A is identified as the Scoping Stage. This section summarises the proposed approach to the next stages of the SER process, i.e. Stages B to D.

8.2 SER Stage B – Assessing Environmental Effects

Stage B of the SER involves 'developing and refining alternatives and assessing effects'. As noted in Section 3, strategic renewable energy scenarios have been developed and will be refined as part of the next stage of the SER. The other main aspect of Stage B is to identify the 'likely significant effects' on the environment of the USELF renewable energy scenarios and their implementation. The SER will therefore assess the potential significant effects of each renewable energy resource scenario upon each of the various environmental topics.

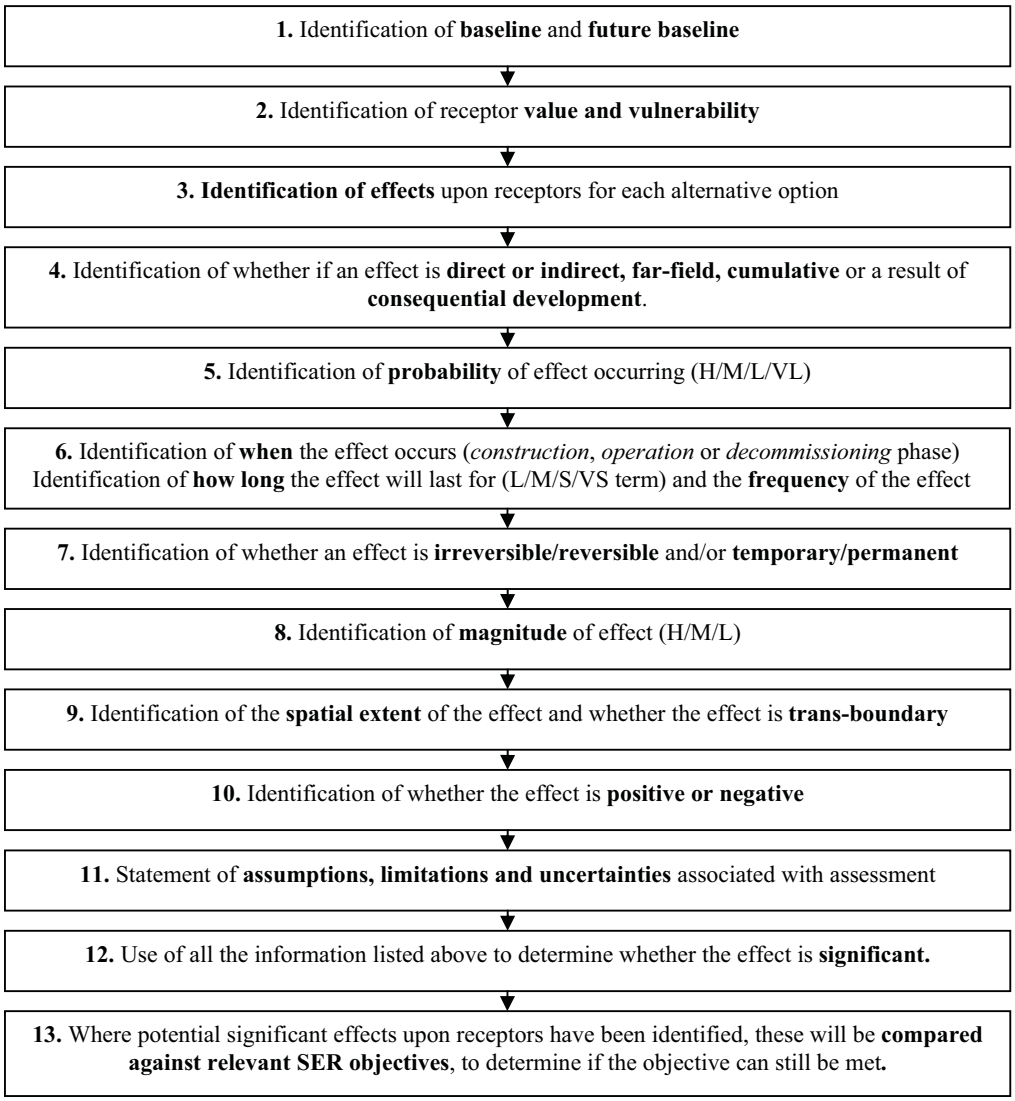
The criteria for determining the likely significant effects upon the environment principally relate to the nature of the effects from the renewable energy scenarios (including probability, duration, frequency and reversibility, cumulative and transboundary effects, as well as magnitude and spatial extent) and the value and vulnerability of affected receptors. Receptors are the key environmental features within each SER environmental topic, for example receptors for the water topic could include: surface waters, groundwater, water resources, and flood risk.

An assessment of significance will be made by reviewing the potential effects on each receptor against the above criteria. These assessments will be based upon both quantitative and qualitative information, as well as expert judgement. The assessment will consider location-specific and oblast scale effects of each renewable energy resource scenario for these environmental topics where possible or applicable.

Mitigation measures to prevent, reduce, and offset significant effects will be developed through the assessment process. The mitigation measures will be used to refine the proposed renewable energy scenarios, in agreement with EBRD.

Each of the renewable energy resource scenarios will then be assessed for compliance against the SER objectives (provided in Section 7), and then assessed against the SER objectives in combination with each other as well as other major proposed developments to determine the potential for cumulative effects upon the environment. Where necessary, further mitigation will be developed to reduce any cumulative effects of the renewable energy scenarios.

The flow chart below summarises the steps that will be undertaken to complete the significance assessment process for the SER.



8.3 SER Stage C – Preparing the Environmental Report

The main deliverable of the SER process is the Environmental Report. This will describe the SER process and results. The proposed structure of the Environmental Report is as follows:

1) Non-Technical Summary
2) Introduction - Summarising background and context, the USELF, the purpose of the SER;
3) SER Approach - Scope and structure of the SER process, emphasising the four SER stages (A, B, C, D), plus any constraints on the assessment;
4) SER Consultation - Summarising the results of the Stakeholder Engagement Plan;
5) Alternative Options - Summary of how renewable energy scenarios were selected and descriptions of these;
6) Other Relevant Plans, Programmes, and Environmental Protection and Enhancement Objectives;
7) Baseline Environment - Covering other plans and programmes, current and future baseline environment, existing environmental problems and assumptions, limitations and uncertainty;
8) SER Objectives – providing a list of the finalised SER objectives;

9) Likely Significant Effects on the Environment and Measures to Prevent, Reduce and Offset These - Summary of assessment methodology, likely significant effects on the environment, assumptions, limitations and uncertainty, measures to prevent, reduce and offset significant effects;
10) Performance of scenarios in relation to the SER Objectives - Will compare any significant effects upon environmental topics to the corresponding environmental objective(s) for that topic to ascertain if SER objectives are met; and
11) Implementation - A summary of proposed monitoring measures and further work to inform scheme level EIAs.

8.4 SER Stage D – Consulting on the Environmental Report

As noted in section 4, a Stakeholder Engagement Plan (SEP) is being developed that will map out the strategies for engaging the various stakeholder groups and the public, by identifying key SER stakeholders, establishing communication methods, disclosing SER project information and, collecting comments and feedback. The SER will set out how the Environmental Report will be consulted upon, and is likely to involve a series of written and face to face communication methods.

8.5 SER Stage E – Monitoring the Effects and Data Gaps

Guidance to the SEA Directive advocates the implementation of a further stage in the SEA process, Stage E. This involves monitoring the effects of the plan or programme, and identifying any data gaps. As part of this SER, it is proposed to identify within the Environmental Report the key recommendations for environmental assessment and mitigation at project stage, and recommendations for further audit or follow-up. However, a detailed monitoring programme may not be developed for this SER, since it appears premature for this level of assessment.

8.6 SER Scoping Report consultation

This scoping report has been prepared to facilitate input from people and organisations on the scope of the SER. Comments received prior to the close of the consultation will be considered in the finalisation of the scope.

In making comments on this document, respondents are encouraged to consider the following questions:

- Chapter 2 and 8: Is the scope of the SER and the methodology proposed for assessing renewable energy scenarios appropriate for this strategic-level environmental assessment?
- Chapter 3: Is the range of renewable energy scenarios and criteria for their selection acceptable?
- Chapter 4: Is the scope of the stakeholder engagement plan appropriate for this strategic-level environmental assessment? Are there any additional stakeholders we should speak to?
- Chapter 5: Are there any other plans, programmes or environmental protection objectives that are relevant for this strategic-level environmental assessment?
- Chapter 6: Is there any additional information that could help supplement the baseline data? Additional information relating to the baseline, existing problems and trends over time would be very useful.
- Chapter 6: Is there any other important environmental baseline issues or receptors that that are relevant for this strategic-level environmental assessment?
- Chapter 6: Is the range of environmental constraints and opportunities covered appropriate?

- Chapter 3 and 6: Are there any technology-specific concerns that you may have, for example the effects of hydropower facilities on streams and rivers, or wind turbines on birds and bats?
- Chapter 7: Are there any changes that should be made to the proposed SER objectives? Are there any other SER objectives that should be included?
- Chapter 8: Are there any major plans or projects that should be included in the assessment of cumulative effects?

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APPENDICES

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APPENDIX A: INTRODUCTORY FLYER FOR USELF SER

Project Development Support

- A related but separate effort of Ukraine Sustainable Energy Lending Facility
- Renewable energy project development support is available through a Project Support Team based in Kiev.
- The Project Support Team screen projects for support by USELF, and works with developers of selected projects on proposals for USELF financing.
- The Bank will be able to provide developers the support they need to prepare projects in Ukraine, while at the same time ensuring the information required for the Bank's due diligence is prepared in a thorough and consistent way for each project.

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European Bank
for Reconstruction and Development

BLACK & VEATCH
Building a world of difference

USELF
Ukraine Sustainable Energy Lending Facility

GEF

Strategic Environmental Review of Renewable Energy for Ukraine

To help Ukraine realize its renewable energy potential, the European Bank for Reconstruction and Development (EBRD) has launched the Ukraine Sustainable Energy Lending Facility (USELF).

USELF aims to provide development support and debt finance to renewable energy projects which meet required commercial, technical and environmental standards.

Strategic Environmental Review

USELF is conducting a Strategic Environmental Review (SER) to "set the stage" for later environmental reviews of renewable energy projects in Ukraine. The SER will be performed in collaboration with key stakeholders in renewable energy development in Ukraine.

USELF
Ukraine Sustainable Energy Lending Facility

European Bank
for Reconstruction and Development

Strategic Environmental Review

In co-operation with the national authorities in Ukraine, the newly formed Ukraine Sustainable Lending Facility has commissioned a Strategic Environmental Review (SER) focusing on renewable energy technologies in selected areas of Ukraine.

The purpose of the SER is to "set the stage" for later environmental reviews of specific renewable energy projects. The SER will comply with EBRD Environmental and Social Policy and the Public Information Policy. The SER will be guided by the European Union Strategic Environmental Assessment Directive.

The SER will be undertaken in collaboration with key stakeholders in the area of renewable energy development in Ukraine, representatives from ministries, regulators, developers, local power utilities, and other stakeholders.

Purpose of the Strategic Environmental Review

The USELF Strategic Environmental Review (SER) represents a key initial step toward effectively and efficiently developing renewable energy projects in Ukraine. The SER evaluates the general impacts of developing renewable energy projects on environmental resources, communities, and the economy and identifies strategies to avoid, minimize, and mitigate those impacts while moving projects forward.

Later steps, after the SER is completed, will utilize the environmental and project information and the methodology in the SER as the basis for developing and permitting future projects. By laying out the path for this step-wise process, the USELF can foster selected renewable energy projects and transmission improvements that will ultimately deliver more and "greener" power to the Ukraine electric grid.

Limitations and Benefits of the SER

The SER will consider possible renewable energy projects, in the locations that they might be proposed. Later when actual projects are proposed, a project-level environmental review will be needed.

However, the necessary project-level environmental reviews can use the permitting path laid out and approved in the SER. For example, small-hydro project developers will know the type of fisheries and water quality information needed for permit applications; wind project developers will know the type of bird and noise information needed for permit applications. They will also know the type of mitigation measures that will likely be required for permits to be approved.

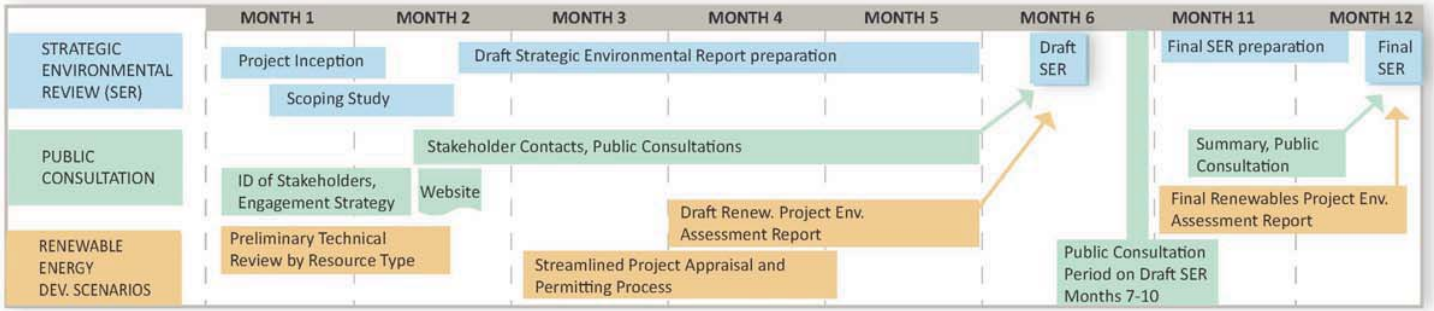
Transmission Grid

Delivering renewable energy to electric power customers is essential. The SER will also assess the possible grid connections at medium and high voltages, identify the possible ways of connecting the new generating facilities to the grid, the technical constraints and the likely costs.

Process for the Strategic Environmental Review

The work needed to prepare the SER is shown below in an ambitious one-year schedule.

- The SER will use primarily existing environmental information as the environmental setting in Ukraine that could be impacted by renewable energy development. The possible impacts to the environment from each type of renewable energy technology will be evaluated and mitigation measures will be proposed.
- Throughout this process, the SER team will conduct public consultation to seek the best existing information possible and input on environmental impacts and mitigation measures.
- As a "stand-in" for the renewable energy projects that are likely in the future, the SER will develop scenarios of solar, wind, biomass, small hydro, and geothermal projects in the locations where these types of resources are known to exist in Ukraine.



APPENDIX B: STAKEHOLDERS CONSULTED AT SCOPING STAGE

Mtg No.	Institution/ organization	Type	Date (2010)
1.	Scientific Engineering Centre "Biomass" Ltd. (SECB)	Consultancy	Nov 22
2.	National Technical University of Ukraine 'Kyiv Polytechnic Institute', Institute of energy saving and energy management	Ministry of Science and Education of Ukraine, university	Nov 23
3.	USELF	EBRD Program	Nov 24
4.	Council of the Study of the Productive Forces of Ukraine (SOPS)	National Academy of Sciences of Ukraine (NANU), research center	Nov 24
5.	Taras Shevchenko National University of Kyiv	Ministry of Science and Education of Ukraine, university	Nov 24
6.	National institute for strategic studies	Other central bodies of the executive power	Nov 25
7.	Verkhovna Rada (Parliament) of Ukraine, Committee on the issues of fuel and energy complex, nuclear policy and nuclear safety	Organ of legislative power	Nov 25
8.	Zelenyi Svit / Friends of the Earth Ukraine	National NGO	Nov 26
9.	UkrHydroEnergo	Professional association	Nov 26
10.	Foundation for the Development of Environmental and Energy Markets	Non-commercial organization, dedicated to the promotion of market-based environmental and energy programs in Ukraine	Nov 29
11.	Mama-86	National NGO	Nov 30
12.	All-Ukrainian Ecological League	National NGO	Nov 30
13.	Fitchner/Imepower	Firms associated with management of the USELF lending facility	Nov 30
14.	Ukrainian society for the protection of birds (USPB) / BirdsLife Partner in Ukraine	NGO	Dec 1
15.	Public enterprise “Inter-Branch Scientific and Technological Center for Wind Power Engineering” & Institute of renewable energy	National Academy of Science of Ukraine	Dec 1
16.	National Ecological Center of Ukraine (NECU, partner of Bankwatch international)	Country branch of international NGO	Dec 2
17.	National Academy of Sciences, institute of ornithology	Research center	Dec 2
18.	Presentation at EBRD on Commercial Use Biomass for CHP Applications (in Bulgaria, Romania, Ukraine, Belarus, and Turkey).	Separate EBRD-funded project	Dec 2
19.	Ministry of Agricultural Policy of Ukraine – Department of Engineering & Technical Support	Executive power	Dec 2
20.	Tavricheskiy National University named after Vernadskiy Scientific information center ‘Technologies for sustainable development’	consultancy	Dec 5
21.	Crimean Republican Association EKOLOGIYA i MIR	Regional NGO	Dec 5
22.	Tavricheskiy National University named after Vernadskiy Department of geo-ecology	University	Dec 5

Mtg No.	Institution/ organization	Type	Date (2010)
23.	Society of Geoecologists	Youth NGO	Dec 5
24.	Association of the farmers of Crimea	Professional association	Dec 6
25.	Chamber of Commerce and Industry of Crimea	Professional association	Dec 6
26.	Ministry of Economy of Crimea, Department of investment policy and foreign economic activities,	Executive power	Dec 6
27.	Ministry of Fuel and Energy of Crimea	Executive power	Dec 6
28.	Ministry of Economy of Crimea; Agency for Regional Development	Executive power of Autonomous Republic of Crimea	Dec 6
29.	Creative union of scientific and engineering societies of Crimea	Professional association	Dec 6
30.	Republican Committee on environmental protection	Regional environmental authority	Dec 6
31.	Representative office of the President of Ukraine in the Autonomous Republic of Crimea	Central executive power	Dec 6
32.	"Environment-People-Law" (EPL) (formerly Ecopravo-Lviv)	NGO	Dec 6
33.	Regional Sustainable Development Agency, Ivan Franko National University in Lviv	Regional NGO, Ministry of Science and Education of Ukraine, university	Dec 6
34.	Lviv City Council	Regional elected power	Dec 6
35.	Lviv Oblast State Administration	Regional executive power	Dec 6
36.	Lviv Oblast Department of Environmental Protection	Regional environmental authorities	Dec 6
37.	Ukrainian National Forest Engineering University Institute of Environmental Economics	University	Dec 7
38.	Lviv State Agrarian University	University	Dec 7
39.	Small-Hydro power plant near Vinnitsia	Private company	Dec 7
40.	Small-hydro power plant near the village of Sutysky	Private company	Dec 7
41.	Lviv Polytechnic National University	University	Dec 7
42.	Ministry of Environmental Protection of Ukraine	Executive power, state agency	Dec 8
43.	Passive House Institute EcoInform Publishing House	NGO, business	Dec 8
44.	Small-hydro power plant near the town of Bilyn	JSC Energy of Carpathians	Dec 8
45.	Regional Capacity Building Initiative II (RCBI II)	EU project	Dec 8
46.	Environmental Investigation Bureau	NGO	Dec 8
47.	Institute of Advanced Technologies		Dec 8
48.	Fichtner	Consultancy/USELF	Dec 8
49.	National Electricity Regulatory commission of Ukraine (NERC)	Other bodies of executive power	Dec 9
50.	National Power Company 'Ukrenergo" EBRD	Other bodies of executive power	Dec 10
51.	Ministry of Fuel and Energy of Ukraine	Executive power	Dec 10

APPENDIX C: PROGRAMMES AND OTHER STRATEGIC DOCUMENTS RELEVANT TO THE USELF SER PROJECT

Alternative Energy

1. **Comprehensive Programme for the Construction of Wind Power Plants**
   Approved by the Resolution of the Cabinet of Ministers of Ukraine of 3 February 1997 No. 137 *On the Comprehensive Programme for the Construction of Wind Power Plants.*
   The Programme aims to promote the large-scale development and use of alternative energy sources – including wind power – for electricity generation. The text of the Programme is not available as an open source.

   The Resolution of the Cabinet of Ministers of Ukraine of 29 September 2010 No. 908 *On Actions Taken in 2010 to Implement the Comprehensive Programme for the Construction of Wind Power Plants*
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=908-2010-%EF
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=137-97-%EF

2. **Comprehensive State Programme for Energy Saving in Ukraine (up to 2010)**
   The CSPES Development Working Group was set up pursuant to the Instruction of the President of Ukraine of 15 April 1995 No. 74/95-rp; the Decision on Priority Steps on the CSPES Development was approved by the Resolution of the Cabinet of Ministers of Ukraine of 20 April 1995 No. 243; and the Resolution of the Cabinet of Ministers of Ukraine of 15 November 1995 No. 911 assigned the responsibility for developing the Comprehensive State Programme for Energy Saving in Ukraine to the State Energy Saving Committee of Ukraine.

   The CSPES Clause 4.16. specifically relates to the use of alternative and renewable energy sources for achieving energy savings. It anticipates the development of the national legislation on alternative energy sources; establishment of relevant bodies to manage the development and introduction of energy saving technologies and equipment at the national, sectoral and regional level; identification of resources and stocks, preparation of inventories, development and adjustment of efficient schemes, technologies and equipment; establishing a new sector comprising specialised companies for the manufacture, certification, assembly and maintenance of equipment, provision of research and design, and specialist training services.
   http://www.mintrans.gov.ua/uk/energo_programm/11557.html

3. **National Energy Programme up to 2010**
   Approved by the Resolution of the Verkhovna Rada of Ukraine of 15.05.96 No. 19/96-VR.
   The National Energy Programme up to 2010 aims to increase the national electricity and thermal energy generation capacity through the use of alternative and renewable energy/fuel sources. According to the Programme, the total annual electricity output from alternative/renewable energy sources (wind and geothermal power, household waste, biomass, excess process heat generated by industries, excess blast-furnace gas etc.) should exceed 10 billion kWh by 2010.
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=191%2F96-%E2%F0

http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=731-97-%EF

4. **The Concept of the 2010-2015 State Earmarked Energy Efficiency Programme**
   The Resolution of the Cabinet of Ministers of Ukraine of 01.03. 2010 No. 243 *On the Approval of the 2010-2015 State Earmarked Energy Efficiency Programme* and the Resolution of the Cabinet of Ministers of Ukraine of 14.07.2010 No. 587 "On Amending the 2010-2015 State Earmarked Energy Efficiency Programme.
   The main objective of the Programme is achieving an optimised structure of the country's energy balance by reducing the proportion of imported fossil fuels, including natural gas, and substituting them by other energy resources, especially alternative and secondary resources.
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=243-2010-%EF
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1446-2008-%F0

5. **Sectoral Energy Efficiency and Resource Saving Programmes**
   The Resolution of the Cabinet of Ministers of Ukraine of 17.12.08 No. 1567-r *On the Sectoral Energy Efficiency and Resource Saving Programmes* stipulates the development of sectoral energy efficiency programmes, to cover the period from 2010 to 2014.
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1567-2008-%F0

6. **The State Support Programme for Promoting the Development of Alternative and Renewable Energy Sources and Low-Capacity Hydropower and Thermal Power Plants**
   The State Support Programme for Promoting the Development of Alternative and Renewable Energy Sources and Low-Capacity Hydropower and Thermal Power Plants is an integral component of the National Energy Programme of Ukraine, approved by the Resolution of the Cabinet of Ministers of Ukraine of 31 December 1997 No. 1505.
   http://zakon.nau.ua/doc/?code=1505-97-%EF

Environmental Protection and Natural Resource Management

1. **The NASU's Comprehensive Interdisciplinary Research Programme in the Area of Sustainable Development, Natural Resource Management and Environmental Protection**
   Approved by the Resolution of the Board of the National Academy of Sciences of Ukraine of 03.02.2010 No. 31.
   The Programme's main activity areas include ensuring the transition towards the sustainable development agenda and mainstreaming the sustainable development principles in all aspects of the country's life; ensuring the provision of quality and safe drinking water supply in Ukraine; improving the energy resource efficiency; further development and effective implementation of a scientifically justified approach to waste management, including hazardous waste; integrated environmental monitoring in line with the EU standards; implementation of the UN Framework Convention on Climate Change; conservation of biological and landscape diversity and continuous development of nature reserve capacity in Ukraine.
   http://zakon.nau.ua/doc/?uid=1041.40089.0

2. **Law of Ukraine on the 2000-2015 State Programme for the Development of National Ecological Network in Ukraine of 21 September 2000 No. 1989-III.**
   The implementation of this Programme is expected to ensure the conservation and development of landscape diversity and help maintain the ecological balance in Ukraine; facilitate the development of favourable living conditions in the ecologically balanced

environment whose characteristics are as much as possible similar to those of natural landscapes; prevent the irrecoverable (partial) loss of country's gene pool, human resources, coenotic and ecological diversity; ensure balanced and non-consumptive use of natural resources within Ukraine; enhance recreational capacity; improve the resource value of adjacent agricultural land in the locations of the national eco-network elements; enhance the legal and regulatory framework for environmental management by bringing it in line with the international legislation; facilitate the development of the European ecological network; ensure the restoration of biogeochemical cycle in the environment, minimize the risk of land degradation and loss of soil fertility; restoration of disused agricultural land to its natural state; improve coordination and consistency of environmental action taken by central and local executive authorities, local self-governance bodies and environmental NGOs.

http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1989-14
Vidomosti Verkhovnoi Rady Ukrainy (VVR), 2000, No. 47, p.405

3. **Law of Ukraine on the State Water Sector Development Programme of 2002.01.17 No. 2988-III**
   The objective of this Programme is ensuring the implementation of the state policy that aims to prevent further growth of anthropogenic pressures on the environment; provide a healthy and safe environmental for human life and economic activities whilst ensuring that water resources are protected against contamination and depletion; promote sustainable management of natural resources; ensure the ecosystem stability in the river basins; and prevent harmful effects of water.

   The implementation of the Programme will ensure that water resources are managed in a sustainable and balanced manner, the harmful effects of waters and their consequences are minimized, living conditions for the public are improved, and national water demand for water is met in a sustainable manner.
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2988-14

4. **Law of Ukraine on the 2006-2020 State Drinking Water Programme**
   The 2006-2020 State Drinking Water in Ukraine Programme aims to support the implementation of the state policy toward the provision of quality drinking water to the public in line with the Law of Ukraine on the Drinking Water and Supplies. The objective of the Programme is ensuring improved public access to drinking water of compliant quality in line with the scientifically justified water consumption rates; modernization and development of water supply and sewerage networks, ensuring their improved efficiency and reliability; all above mentioned measures ultimately aim to ensure better public health and living conditions, and sustainable management practices in respect of drinking water supplies.
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=2455-15

5. **Law of Ukraine on the State Programme for the Development of National Fisheries for the Period until 2010**
   The Programme aims to ensure the restoration and protection of fish stocks and other aquatic resources
   http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1516-15

6. **Law of Ukraine on the State Toxic Waste Management Programme**

The main objective of the Programme is to prevent the accumulation of toxic waste and minimize their hazardous effects to the environment and human health. The Programme's main expected environmental and social benefits are as follows: reduced impact of toxic waste on the environment and human health; decontamination of territories; gradual reduction in toxic waste generation; toxic waste recycling to produce commercial products; reduced area of land occupied by toxic waste landfills and dumps; more active adjustment and application of high technology developments available in the defence industry; creation of new jobs at the toxic waste management facilities.
http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=1947-14

7. **Law of Ukraine on the Nature Reserve Capacity Development Programme**
The "Nature Reserves" Programme aims to ensure improved conditions for the conservation of valuable nature reserves and protected areas, and further development – in a scientifically justified manner – of nature reserve capacity in Ukraine based on the recognition and acknowledgement of its social, economic and ecological value for the sustainable development of Ukraine as a country and a nation.
http://zakon.rada.gov.ua/cgi-bin/laws/main.cgi?nreg=177%2F94-%E2%F0
Vidomosti Verkhovnoi Rady Ukrainy (VVR), 1994, No. 48, p.430

8. **National Programme for Environmental Rehabilitation and Drinking Water Quality Improvement in the Dnipro Basin, approved by the Resolution of the Verkhovna Rada of Ukraine of 27 February 1997 No. 123/97-VR**
The main objective of the Programme is ensuring the restoration and sustainability of the Dnipro's ecosystem, good quality water supplies, safe and healthy environment for human life and economic activities, and protection of water resources against pollution and depletion.
http://uazakon.com/big/text1042/pg1.htm

9. **Draft Law on the State Land Resource Management and Conservation Programme**
The document returned to a legislator for finalisation (02.11.2004).
http://gska2.rada.gov.ua/pls/zweb_n/webproc4_2?id=&pf3516=5755&skl=5

10. **The Chernihiv Oblast Environmental Protection, Natural Resource Management and Environmental Safety Programme**
The Programme is implemented by the Chernihiv Oblast State Environmental Protection Department and aims to ensure better living conditions and environmental restoration in the Oblast.
http://eco23.gov.ua/ru/news/459

APPENDIX D: MAIN INTERNATIONAL LEGAL ACTS RELATED TO ENVIRONMENTAL PROTECTION AND TO WHICH UKRAINE IS A PARTY

Information as of December, 2009

Source: http://epl.org.ua/en/legislation/international/

International document	Date of adoption	Date of entry into force	Date of ratification/ accession by Ukraine
Antarctic Treaty	01.12.1959	23.06.1961	17.09.1992
Convention concerning the Protection of Workers against Ionising Radiations	22.06.1960	17.06.1962	05.08.1967
International Convention for the Protection of New Varieties of Plants	02.12.1961	10.08.1968	02.06.1995
Vienna Convention on Civil Liability for Nuclear Damage	21.05.1963	12.11.1997	12.07.1996
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties	29.11.1969	06.05.1975	17.12.1993
Convention on Wetlands of International Importance especially as Waterfowl Habitat	02.02.1971	21.12.1975	29.10.1996
Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage	18.12.1971	16.10.1978	25.05.1980
Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction	10.04.1972	26.03.1975	26.03.1975
Stockholm Declaration on the Human Environment	16.06.1972		
Convention for the Protection of World Cultural and Natural Heritage	16.11.1972	17.12.1975	04.10.1988
Convention concerning the Prevention of Marine Pollution by Dumping of Waste and Other Materials	29.12.1972	30.08.1975	17.12.1993
Convention on International Trade in Endangered Species of Wild Fauna and Flora	03.03.1973	01.07.1975	30.12.1999
Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques	10.12.1976	05.10.1978	16.05.1978
Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries	24.10.1978	01.01.1979	06.07.1999
Convention on the Conservation of Migratory Species of Wild Animals	23.06.1979	01.11.1983	19.03.1999
Convention on the Conservation of European Wildlife and Natural Habitats	19.09.1979	01.06.1982	29.10.1996
Convention on Long-range Transboundary Air Pollution	13.11.1979	16.03.1983	05.06.1980
Convention on the Physical Protection of Nuclear Material	03.03.1980	08.02.1987	06.07.1993

International document	Date of adoption	Date of entry into force	Date of ratification/ accession by Ukraine
Convention on the Conservation of Antarctic Marine Living Resources	20.05.1980	07.02.1982	04.02.1994
World Charter for Nature	01.01.1982		
UN Convention on the Law of the Sea	10.12.1982	16.11.1994	03.06.1999
Vienna Convention for the Protection of the Ozone Layer	22.03.1985	22.09.1989	20.05.1986
Protocol on the Reduction of Sulfur Emissions or Their Transboundary Fluxes by at Least 30 Percent to the Convention on Long-range Transboundary Air Pollution	08.07.1985	02.09.1987	12.08.1986
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	26.09.1986	26.02.1987	26.01.1987
Convention on Early Notification of a Nuclear Accident	26.09.1986	27.10.1986	30.12.1986
Montreal Protocol on Substances that deplete the Ozone Layer	16.09.1987	01.01.1989	20.09.1998
Convention for the suppression of Unlawful Acts against the Safety of Maritime Navigation	10.03.1988	01.03.1992	17.12.1993
Protocol for the Suppression of Unlawful Acts against the Safety of Fixed Platforms Located on the Continental Shelf	10.03.1988	07.01.2002	17.12.1993
Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes to the Convention on Long-range Transboundary Air Pollution	01.11.1988	14.02.1991	24.07.1989
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	22.03.1989	05.05.1992	01.07.1999
Convention on Environmental Impact Assessment in a Transboundary Context	25.02.1991	10.09.1997	19.03.1999
Agreement on the Conservation of Bats in Europe	04.12.1991	06.01.1994	14.05.1999
Convention on the Protection and Use of Transboundary Watercourses and International Lakes	17.03.1992	06.10.1996	01.07.1999
Convention on the Protection of the Black Sea Against Pollution	21.04.1992	15.01.1994	04.02.1994
United Nations Framework Convention on Climate Change	09.05.1992	21.03.1994	29.10.1996
Rio Declaration on Environment and Development	03.06.1992		
Convention on Biological Diversity	05.06.1992	29.12.1993	29.11.1994
Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction	13.01.1993	29.04.1997	16.10.1998
Protocol on the Further Reduction of Sulfur Emissions to 1979 Convention on Long-range Transboundary Air Pollution	14.06.1994	05.08.1998	17.12.1996
Convention on Nuclear Safety	20.09.1994	07.07.1998	17.12.1997

International document	Date of adoption	Date of entry into force	Date of ratification/ accession by Ukraine
Agreement for Conservation of African-Euroasian Migratory Waterbirds	16.06.1995	01.11.1999	04.07.2002
Agreement for the Implementation of the Provisions of the Convention relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	04.12.1995	11.12.2001	28.11.2002
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	05.09.1997	18.06.2001	20.04.2000
Kyoto Protocol to United Nations Framework Convention on Climate Change	11.12.1997	16.02.2005	04.02.2004
Protocol on Persistent Organic Pollutants to 1979 Convention on Long-range Transboundary Air Pollution	24.06.1998	23.10.2003	
Heavy Metals Protocol to the 1979 Convention on Long-range Transboundary Air Pollution	24.06.1998	29.12.2003	
Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters	25.06.1998	30.10.2001	06.07.1999
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	10.09.1998	24.02.2004	26.09.2002
Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes	17.06.1999		
Protocol on Liability and Compensation for Damage Resulting from Transboundary Movements of Hazardous Wastes and their Disposal	10.12.1999		
Cartagena Protocol on Biosafety to the Convention on the Biodiversity	29.01.2000	11.09.2003	12.09.2002
Stockholm Convention on Persistent Organic Pollutants	22.05.2001	17.05.2004	

FIGURES

Figure 1.1: Location Map

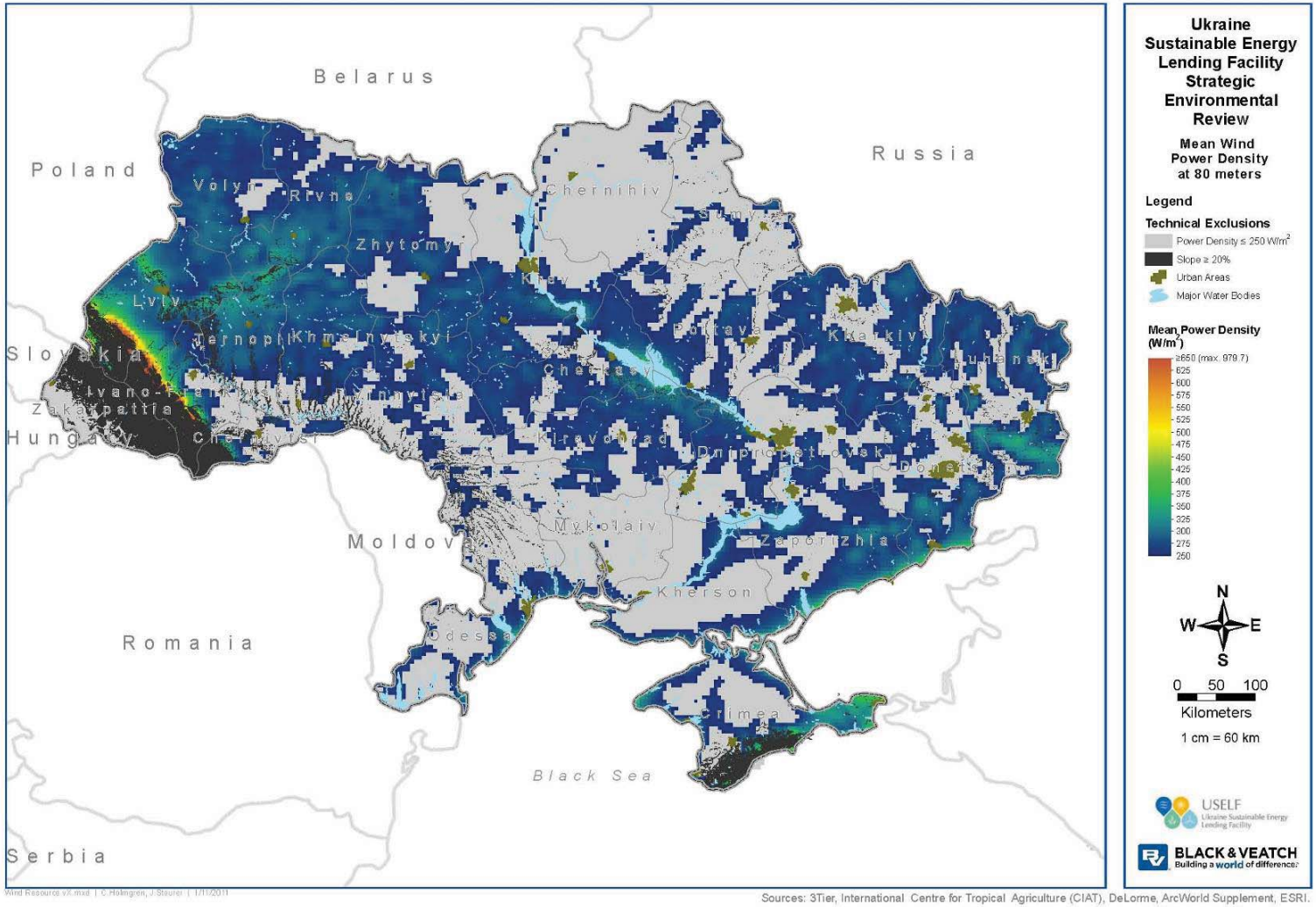


Figure 3.1: Areas with good potential for wind power

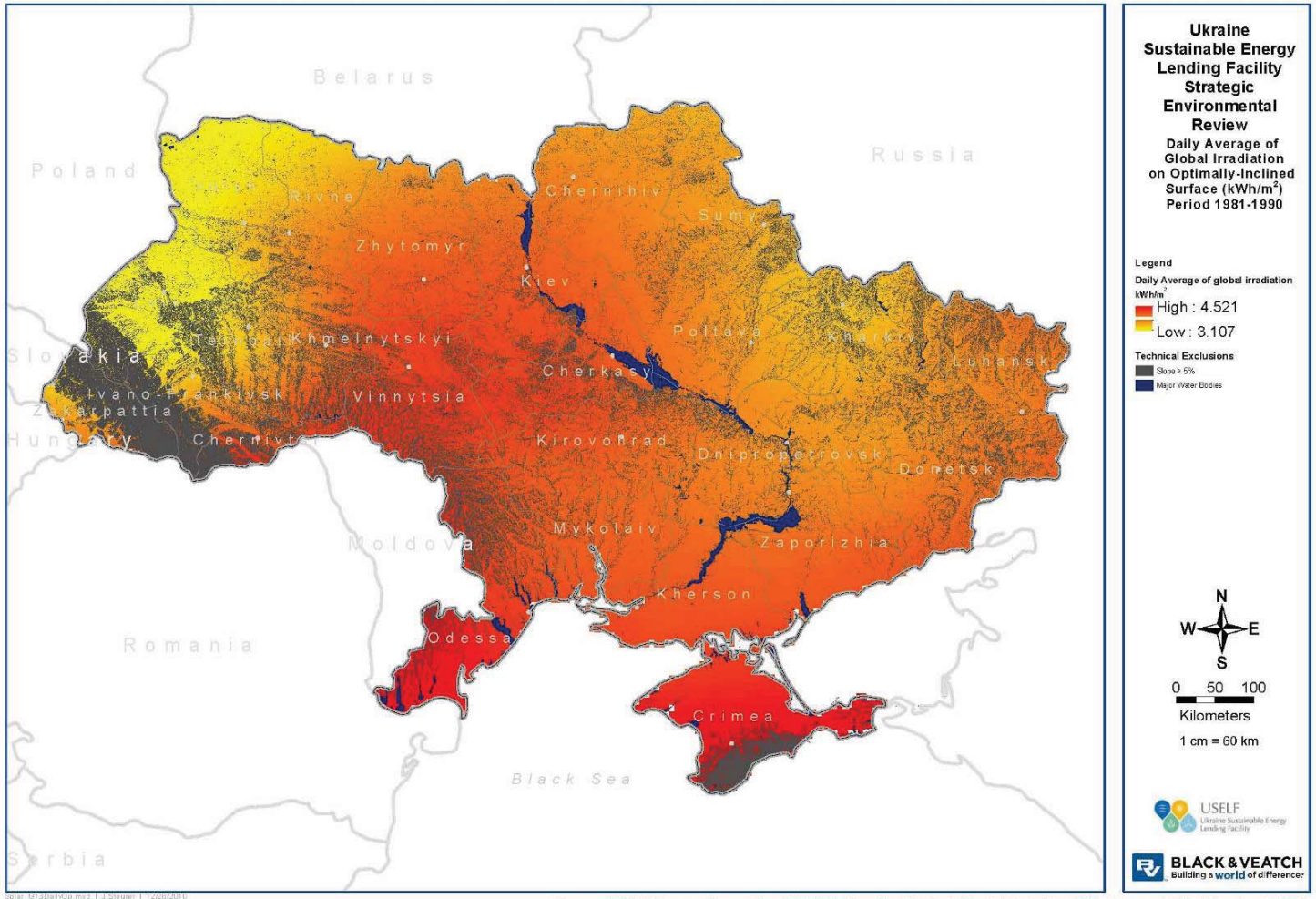


Figure 3.2: Areas with good potential for solar power

Figure 3.3: Areas with good potential for small hydro power

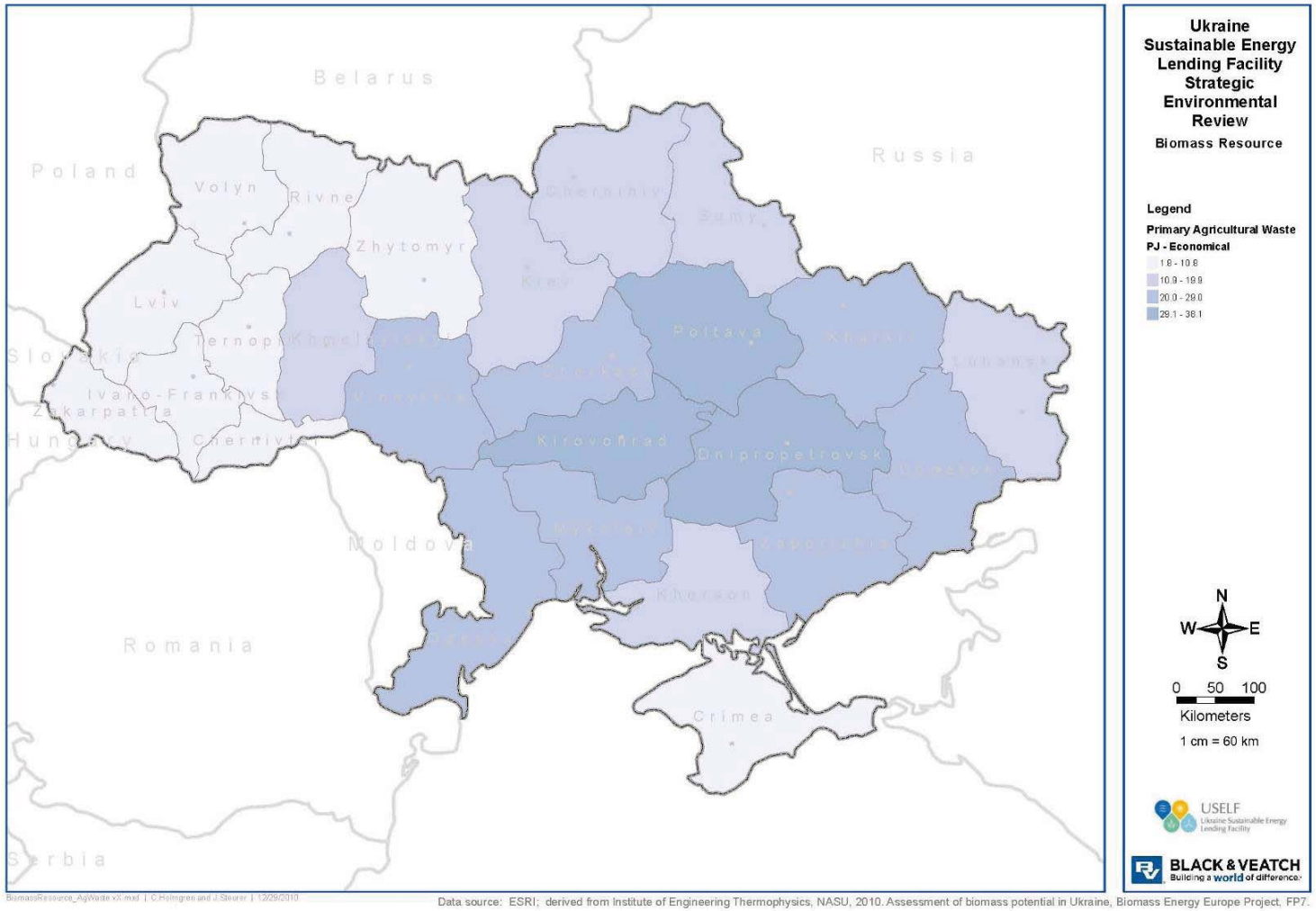


Figure 3.4: Areas of agricultural waste for biomass resource

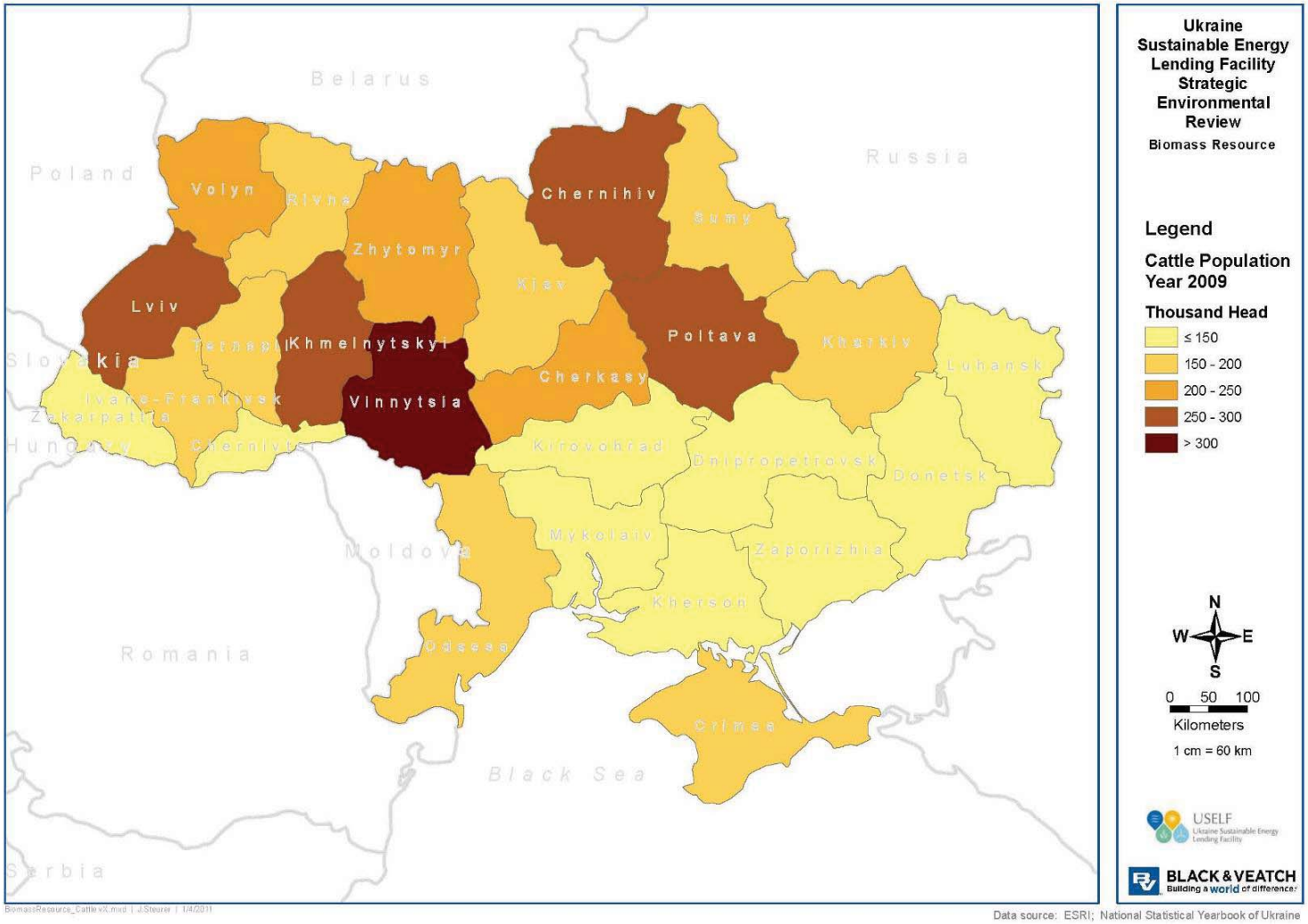


Figure 3.5: Areas of cattle production for biomass resource

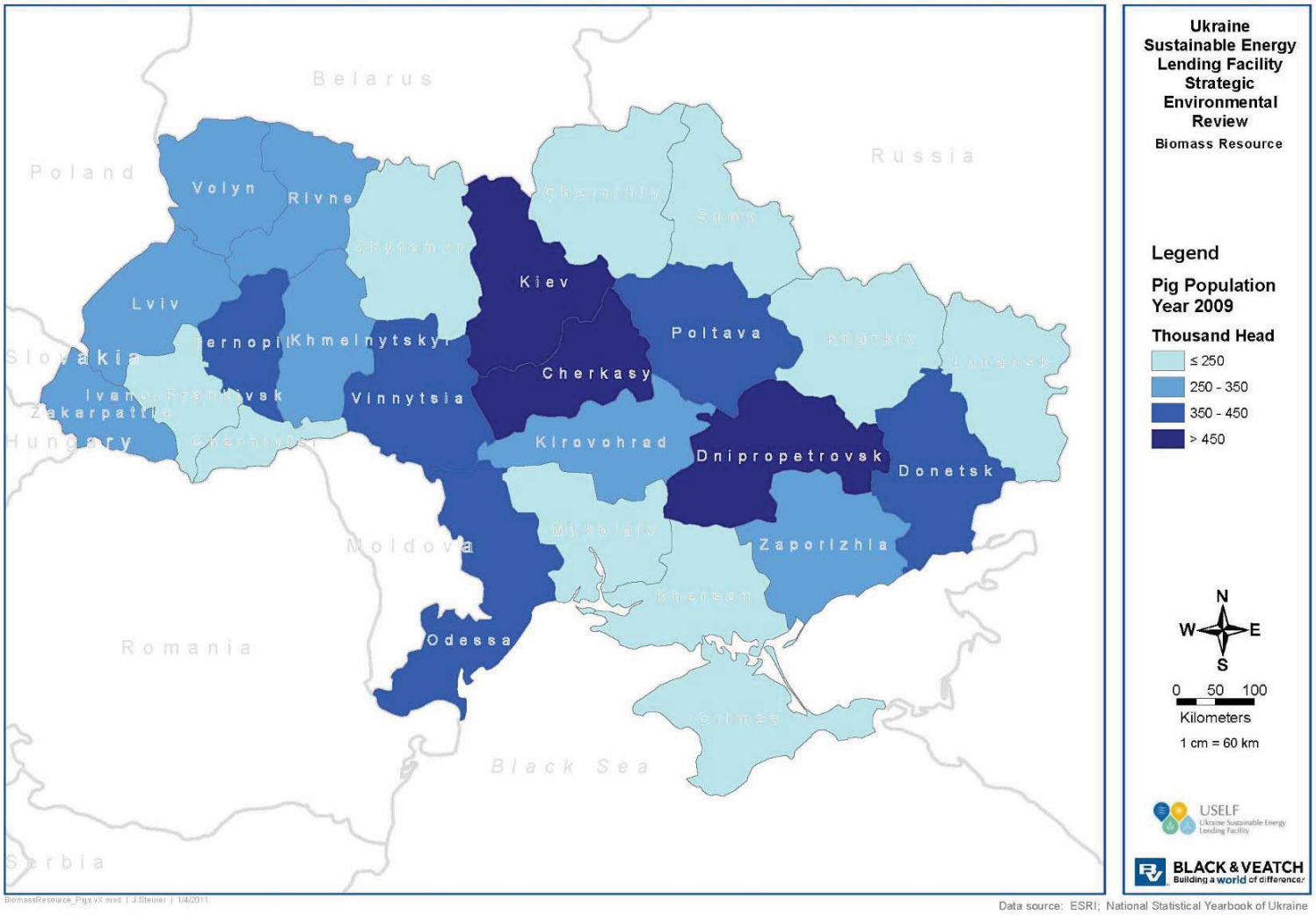


Figure 3.6: Areas of pig population for biomass resource

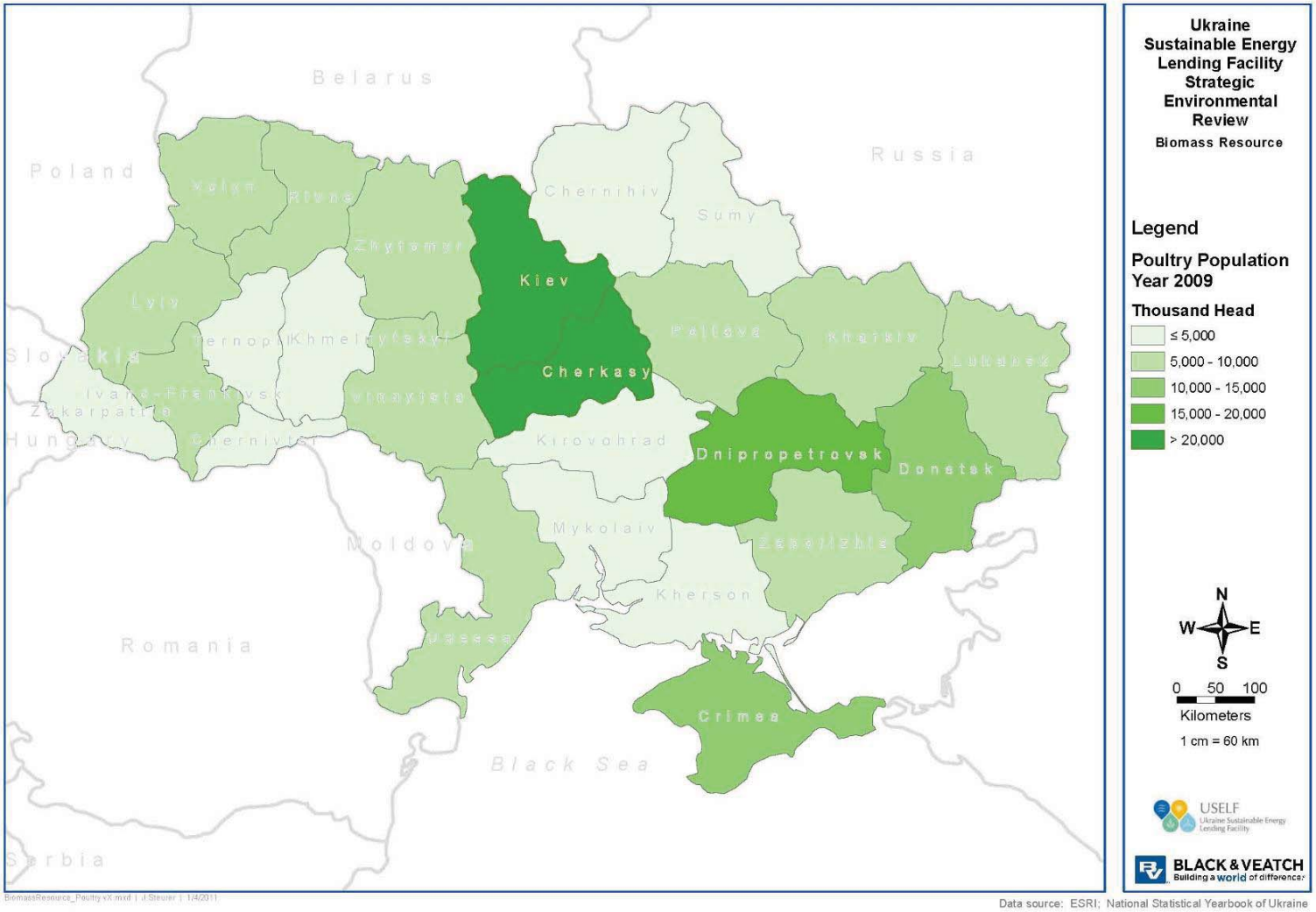


Figure 3.7: Areas of poultry population for biomass resource

Figure 3.8: Areas of wood residue for biomass resource

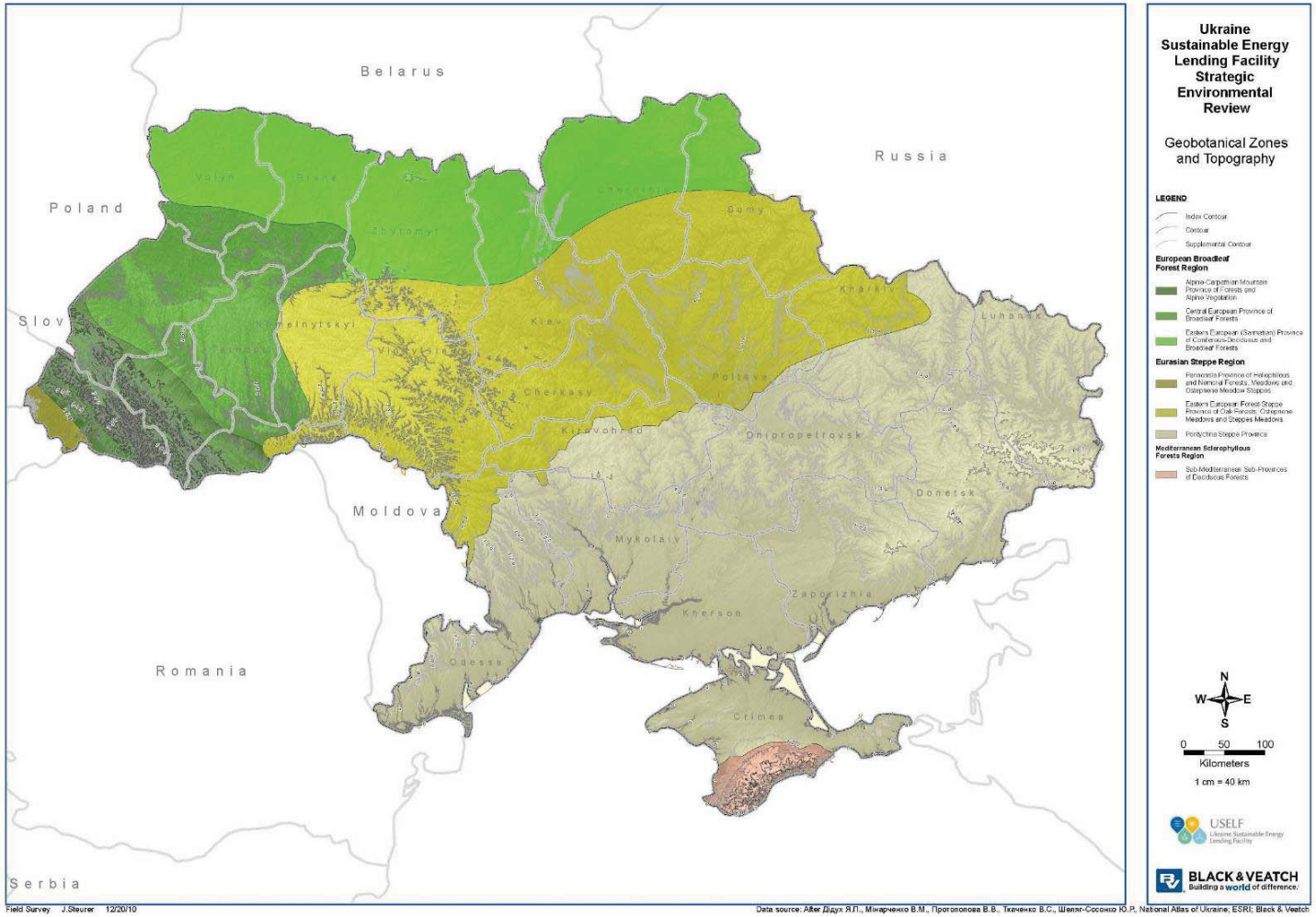


Figure 6.1: Geobotanical Zones and Topography

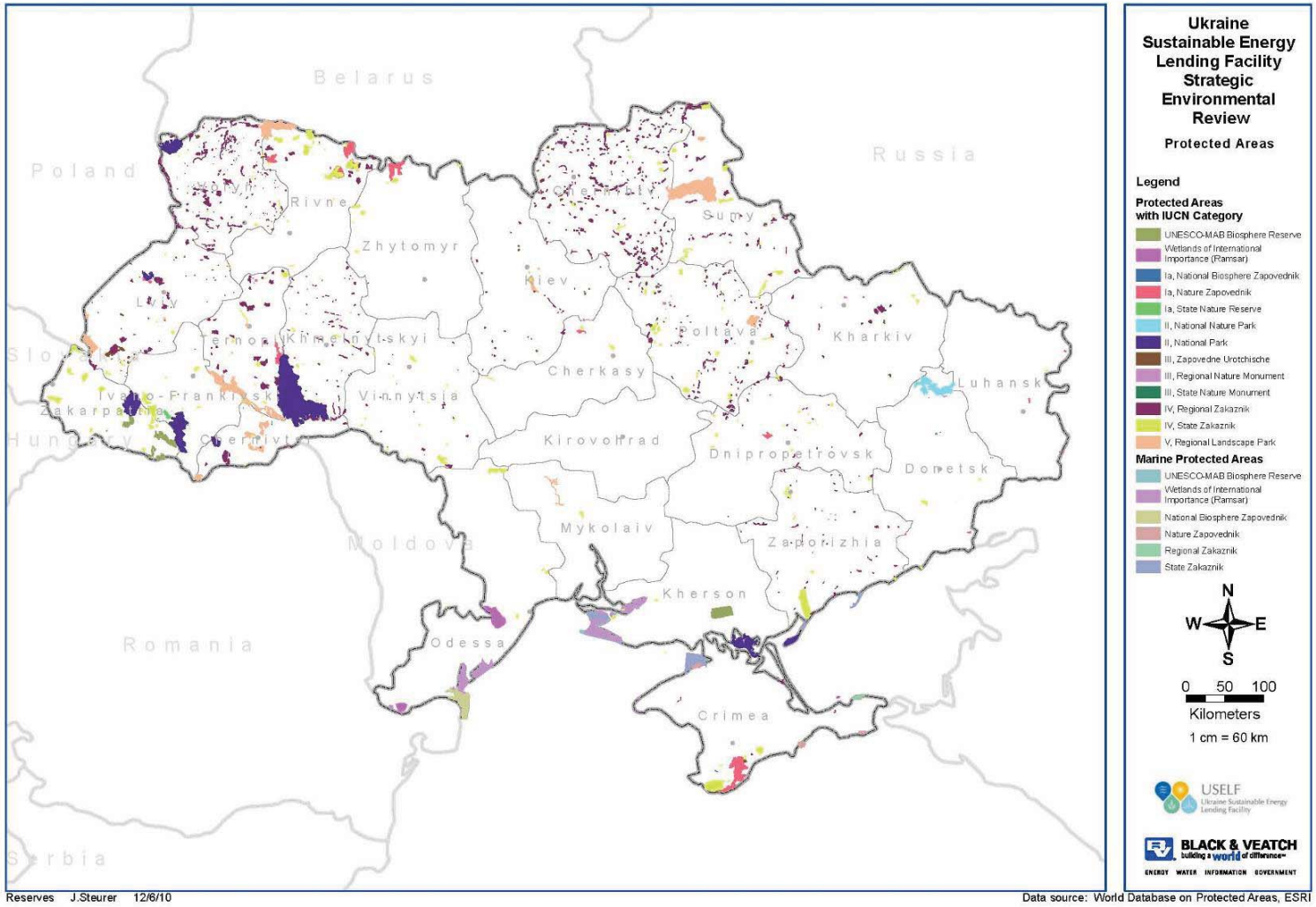


Figure 6.2: Natural Protected Areas

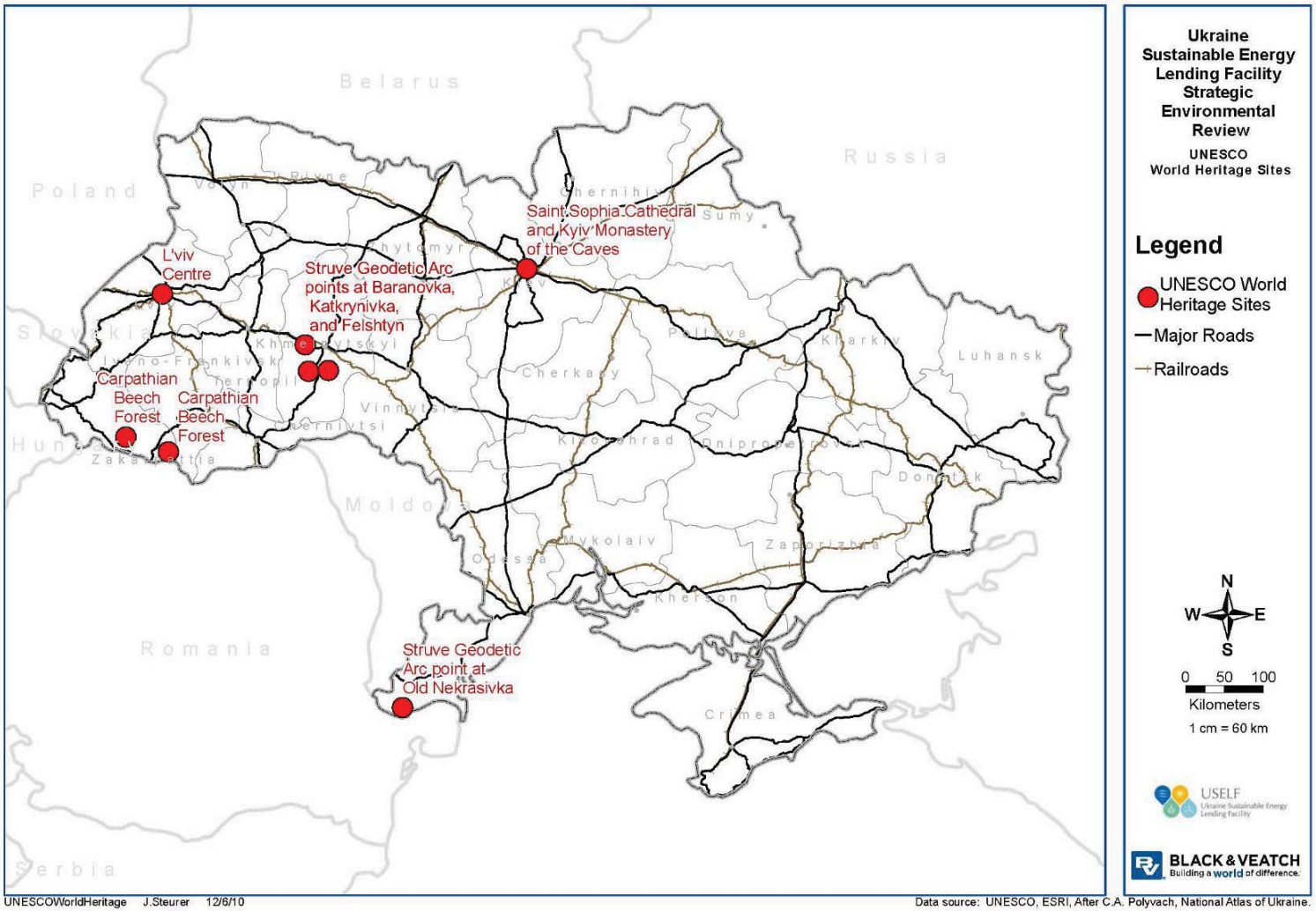


Figure 6.3: UNESCO World Heritage Sites