USELF
Ukraine Sustainable Energy Lending Facility

Ukraine Sustainable Energy Lending Facility (USELF)
Strategic Environmental Review
Environmental Report
Non-Technical Summary

December 2011

Prepared for:

gef

European Bank
for Reconstruction and Development

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NON-TECHNICAL SUMMARY

Introduction

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 financing, but also provides technical assistance for businesses and local authorities to promote projects that are often challenging to finance and implement. The renewable energy technologies reviewed in this Strategic Environmental Review (SER) include small hydropower, on-shore wind, solar photovoltaic, biomass (using agricultural or wood residues) and biogas (using municipal landfill gas or animal manure).

In co-operation with the national authorities in Ukraine[1], EBRD has commissioned an SER for the USELF programme. The purpose of the SER is to identify the optimal areas of Ukraine for development of renewable energy generation facilities and also to provide data for developers and their consultants (see for example Figures NTS-1 to NTS-9) in order to make environmental reviews of individual projects easier and cheaper. The findings of the SER have been documented within an Environmental Report. This Non-Technical Summary presents a summary of the findings of the Environmental Report and its conclusions in plain language.

USELF is also working with the National Electric Energy Regulatory Commission (NERC) of Ukraine to review legislation and the regulatory framework which currently applies to renewable energy in Ukraine, and make recommendations for improvements to further encourage and facilitate renewable energy development in the country.

SER approach

Ukraine does not presently have legislation or regulations that require the development of a Strategic Environmental Assessment (SEA) for plans and programs, such as can be required under the European Union (EU) SEA Directive (*Assessment of the Effects of Certain Plans and Programmes on the Environment,* Directive 2001/42/EC). However, EBRD's Environmental and Social Policy (2008) requires compliance with EU directives and with national law for projects and programmes. In recognition of this, EBRD commissioned this SER.

The objectives of the SER are in line with the overall aim of USELF; 'to provide development support and debt finance to renewable energy projects which meet required commercial, technical and environmental standards'.

[1] Including, but not limited to, the Ministry of Fuel and Energy, the National Electric Regulatory Commission, the National Agency on Sufficient Energy Resources Management and the Ministry for Ecology and Natural Resources.

Figure NTS-1 Location map

Ukraine Sustainable Energy Lending Facility Strategic Environmental Review

Basemap

Legend

- City
- National Capital
- Oblasts / Regions
- Airport
- Primary road
- Railroads
- Intermittent stream
- Perennial stream
- Water body

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0 50 100
Kilometers
1 cm = 60 km

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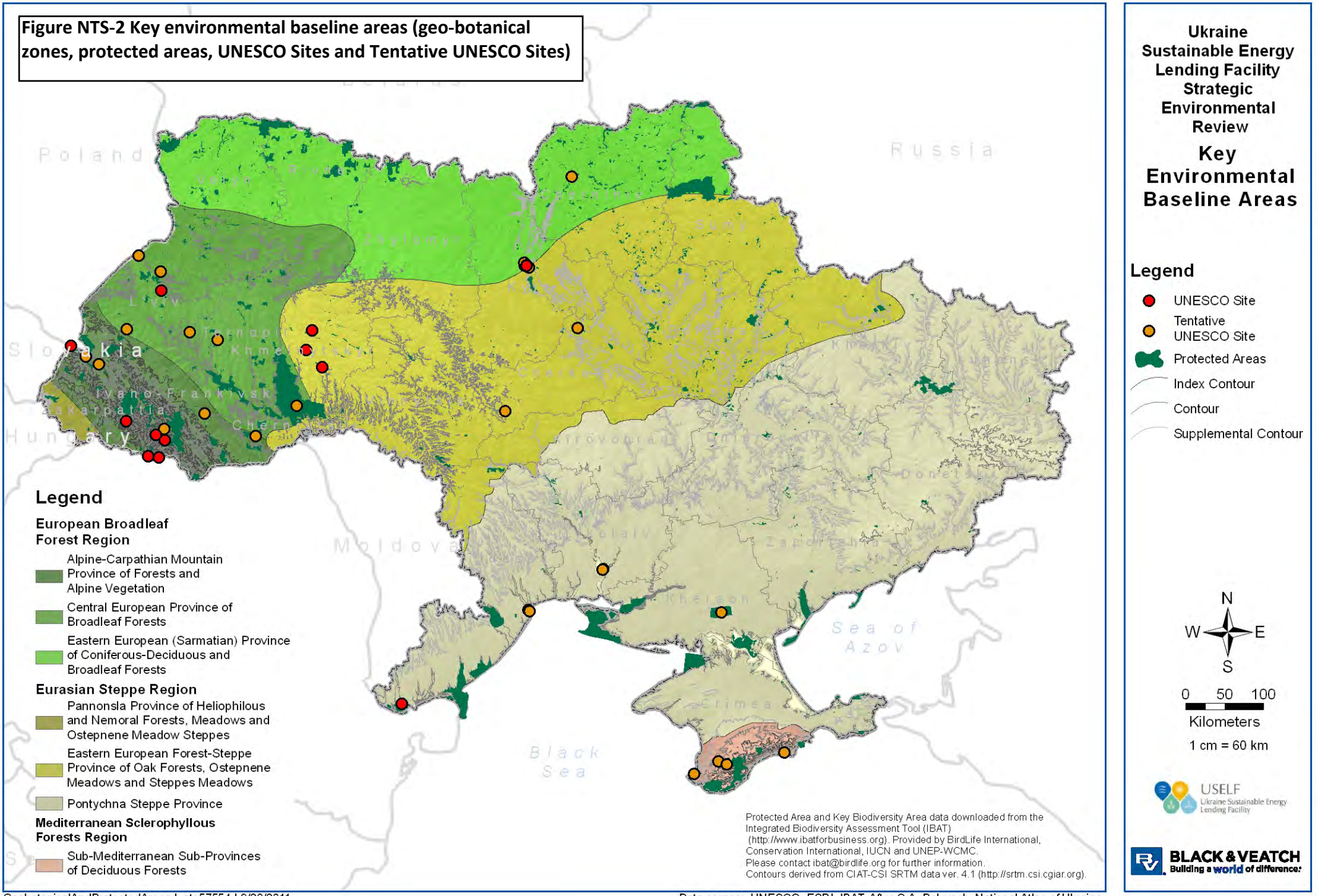
GeneralBasemap J.Steurer 12/22/10

Data source: ESRI

Figure NTS-2 Key environmental baseline areas (geo-botanical zones, protected areas, UNESCO Sites and Tentative UNESCO Sites)



Ukraine Sustainable Energy Lending Facility Strategic Environmental Review

Key Environmental Baseline Areas

Legend

- UNESCO Site
- Tentative UNESCO Site
- Protected Areas
- Index Contour
- Contour
- Supplemental Contour

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Kilometers
1 cm = 60 km

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Data source: UNESCO, ESRI, IBAT, After C.A. Polyvach, National Atlas of Ukraine.

Stakeholder engagement

USELF has also prepared a Stakeholder Engagement Plan (SEP) to guide its communications with key stakeholders, who include those who could be directly affected by a renewable energy project as well as others who are interested. USELF consulted with stakeholders to identify key issues to evaluate in the SER, and now will hold a series of meetings to receive stakeholder comments on the SER process, the Environmental Report, this Non-Technical Summary and the SEP. Details of all the stakeholder meetings to be held around Ukraine in early 2012 are provided in the SEP (also available from www.uself-ser.com).

Any person or organisation may submit comments on EBRD's commitment to renewable energy and/ or the SER documents. Comments can be submitted in person or via post, email, or facsimile using the contact information specified in the SEP and www.uself-ser.com.

Energy production in Ukraine

Almost two-thirds of power generation capacity (defined in terms of megawatts or "MW") in Ukraine is thermal power plants (64%), primarily natural gas. Nuclear power plants account for another 26% and large hydropower for 9%. Renewable energy other than large hydropower contributes less than 1% of the current generation capacity in the country. According to the Energy Strategy of Ukraine to 2030, the demand for electricity (power) consumption in Ukraine is expected to more than double in the 25 years between 2005 and 2030.

The Government of Ukraine is seeking to significantly increase the proportion of total capacity from renewable energy. It is doing this by providing higher revenues for renewable energy power projects (when compared to traditional fossil fuel-based power) and assurance of long-term revenue streams through the Green Tariff mechanism, which will be available to eligible projects until 2030.

As part of the SER process, USELF identified a number of technical and economic issues and benefits for each of the renewable energy technologies. These are summarized in the Environmental Report and described in greater detail in five "Renewable Energy in Ukraine" Technical Reports (available at www.uself-ser.com), one for each of the renewable technologies evaluated in the SER and described here.

Assessment scenarios

In order to identify likely significant effects of projects using the different types of renewable energy technologies, USELF developed and defined USELF 'renewable energy scenarios' to use throughout the SER. These scenarios considered characteristics of the technologies and the methods of construction. They also identified the areas of Ukraine most suitable for renewable energy development given the availability of the resource (for example, windy or sunny areas, or major landfills) and the limits on development that could be caused by geography, existing infrastructure, and power transmission considerations. 'Technical exclusions' have been defined to eliminate certain areas from consideration for specific renewable energy scenarios, so the focus is on only those areas that are most suitable. More details of the scenarios and other methodologies are provided in the Environmental Report and the associated Technical Reports.

Table NTS-1 provides an overview of the renewable energy technologies considered during the SER process. Further information is provided in Section 4 of the Environmental Report.

Table NTS 1 The USELF renewable energy scenarios

Renewable Energy Scenario	Grouped Technologies or 'Projects'
On-shore wind	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 turbines)
Small hydropower (<10 MW)	Small hydropower (<10 MW of capacity)[2] • Small hydropower with Impoundment • Hydropower Retrofit/Rehabilitation at existing dams/impoundments (addition of generation capacity or rehabilitation of existing facilities)
Solar photovoltaic	Utility-scale, ground-mounted projects (rooftop installations not considered) • Small (1-5 MW) • Medium (5-20 MW) • Large (>20 MW)
Biomass[3]:	
using agricultural residues or wood residues	Power-only or Combined Heat and Power (CHP) configurations. • Small Stoker CHP (<5 MW) • Stoker (20-50 MW) • Bubbling fluidised bed (20-50 MW) • Replacement boiler (50 MW)
Biogas:	
using gas generated from animal manure	• Anaerobic digester coupled with Internal Combustion Engine (ICE) (250 kW to 5 MW). • Power only or CHP. *Pending Green Tariff rule change to qualify biogas for tariff.*
using gas generated from municipal landfill sites	Minimum size will be limited by available landfill gas at site. • Microturbines (30 – 250 kW) • Internal combustion engines (ICE) (500 kW– 3 MW) (most common) • Single-cycle gas turbines (>3 MW) *Pending Green Tariff rule change to qualify LFG for tariff.*

[2] Small-hydropower projects are constrained by this Green Tariff capacity criteria.
[3] Co-firing biomass with non-renewable fuels does not qualify for Green Tariff.

Policy context and baseline environment

USELF has undertaken a review of legislation and policies which are relevant to this programme; including, for example:

- International – directives such as the EU SEA Directive and the SEA Protocol to the Espoo Convention;
- National – legislation such as The Law of Ukraine on Environmental Protection, The Law of Ukraine on Ecological Review, The Law of Ukraine on the Electric Energy, The Law of Ukraine on Alternative Fuels, and The Law of Ukraine on Alternative Energy Sources.
- Regional (oblast) level programmes which are relevant to USELF projects exist only in some oblasts.

An analysis of international and Ukrainian legal requirements and policies that are relevant to renewable energy development is provided in the Environmental Report.

As part of the SER process, USELF has described the current state and characteristics of the environment of Ukraine, known as the 'baseline'. This baseline provides the basis for predicting and monitoring environmental effects from projects. Also described are the predicted changes in the baseline environment, known as the future baseline (without the implementation of renewable energy projects funded by USELF) up to 2040. The different elements and characteristics of the baseline and future baseline have been set out under a number of environmental topics.

The environmental topics considered in the SER are:

- Climate and Air Quality;
- Surface water and Groundwater;
- Geology and Soils;
- Landscape and Biodiversity;
- Community and Socio-economics; and,
- Cultural Heritage.

Figure NTS-2 provides an example of the characteristics of the baseline environment of Ukraine that have been established. This example shows geo-botanical zones, protected areas, UNESCO Sites and Tentative UNESCO Sites.

A description of the baseline and future baseline for each environmental topic is provided in the Environmental Report. The SER Topic Paper also contains further detail on environmental baseline, future baseline, data sources and key constraints and opportunities for renewable energy in relation to each environmental topic.

Spatial constraints analysis

Some areas of Ukraine will present particular challenges to the development of certain types of renewable energy projects. The SER includes a "spatial constraints analysis" to identify these areas so it can be determined whether it is suitable for an individual project to be put in any specific location; it will also assist in evaluating their environmental and social impacts. Much of the data used during the SER was put into a project Geographical Information Systems (GIS) to allow spatial analysis. The spatial analysis was used to produce a series of maps that show which areas of Ukraine might not be suitable for renewable energy projects for technical reasons or because of concerns that they could cause negative effects on people or the environment.

Figures NTS-3 to NTS-9 show these "constraints" maps for each of the types of renewable energy that USELF will support. "Technical exclusions" are the areas where the renewable resource (for example, wind or sun) is not suitable for renewable energy projects, and they are presented with uniform grey shading. Further details of the exact technical exclusions are provided in Section 7 of the Environmental Report. "Sensitivity" is intended to show the degree of negative effects from development of a renewable energy project ("high" sensitivity suggests higher potential impacts).

In general, development of a USELF project within areas identified as technically excluded or as being of 'high' sensitivity for that renewable energy scenario should be considered unlikely[4], although not absolutely precluded. Any developer who seeks funding from USELF to develop in a high sensitivity area should be aware that this would only be considered where allowed by Ukrainian law and that more study and a higher degree of impact prevention and mitigation (and therefore more cost) would be required by USELF.

These maps use the best information available but they are not intended to be interpreted as an absolute categorisation. For example, where an area is not technically excluded and is shown as having 'High' sensitivity, this does not imply that the whole of that area will definitely present major limits to development; rather, it is showing that any given location from within this area is considerably more *likely* to present spatial constraints to the particular renewable energy scenario under consideration than a location from within other locations. If a developer wishes to consider construction within such an area, they should be aware of the risk that USELF would not support such development.

Given the large spatial scales on which much of the available baseline data is based, it will be necessary to undertake further detailed analysis of environmental constraints for individual projects funded by the USELF programme. The information shown in these spatial figures will help to focus and prioritize the analysis but should not be considered as definitive.

[4] The notable exception to this is for small hydropower projects (where surface waters are assigned a high sensitivity) as it will clearly be necessary for any small hydropower project to be sited within these high sensitivity areas.

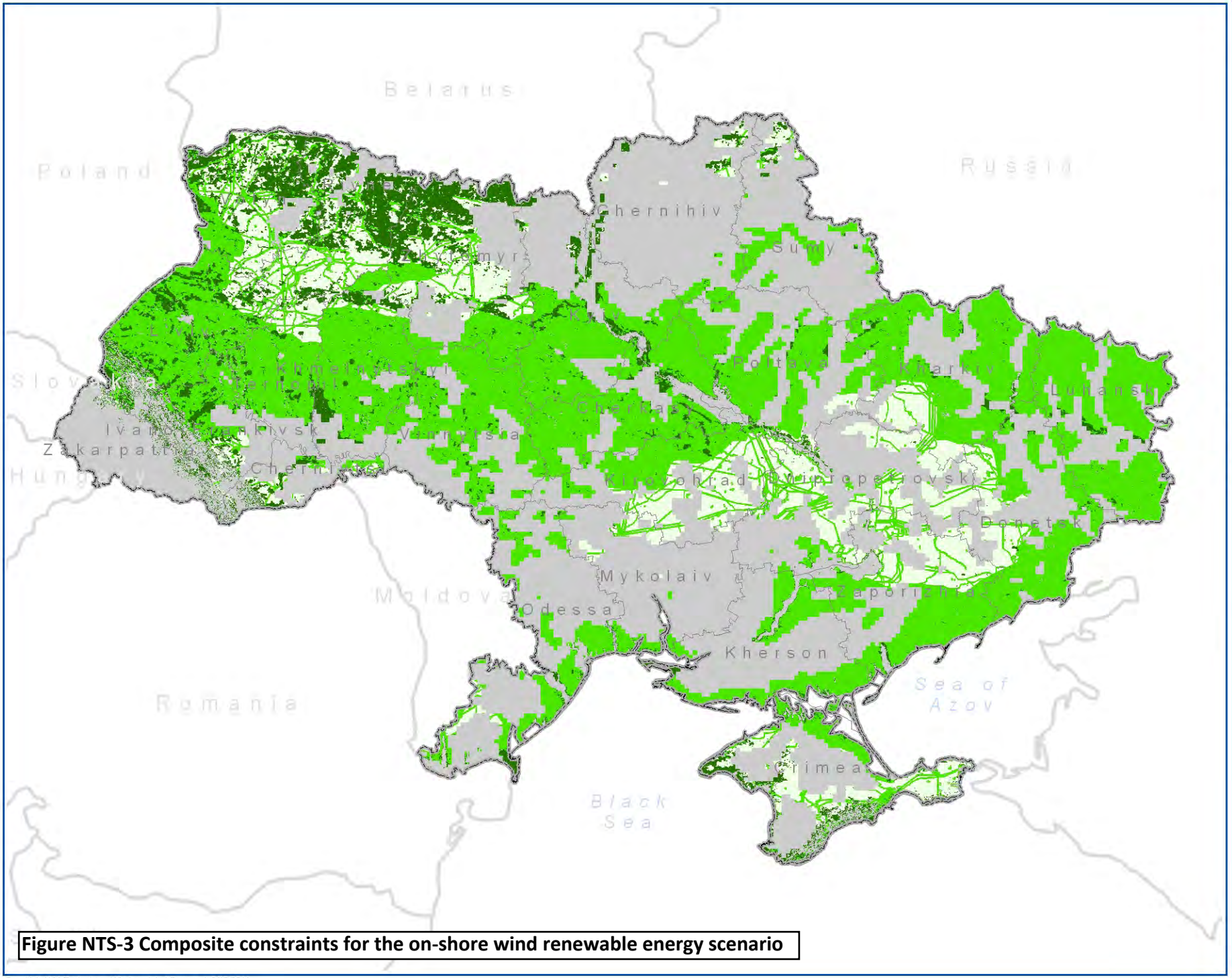

Figure NTS-3 Composite constraints for the on-shore wind renewable energy scenario

SensitivityWithExclusions_Wind.mxd | J.Steurer | 9/13/2011

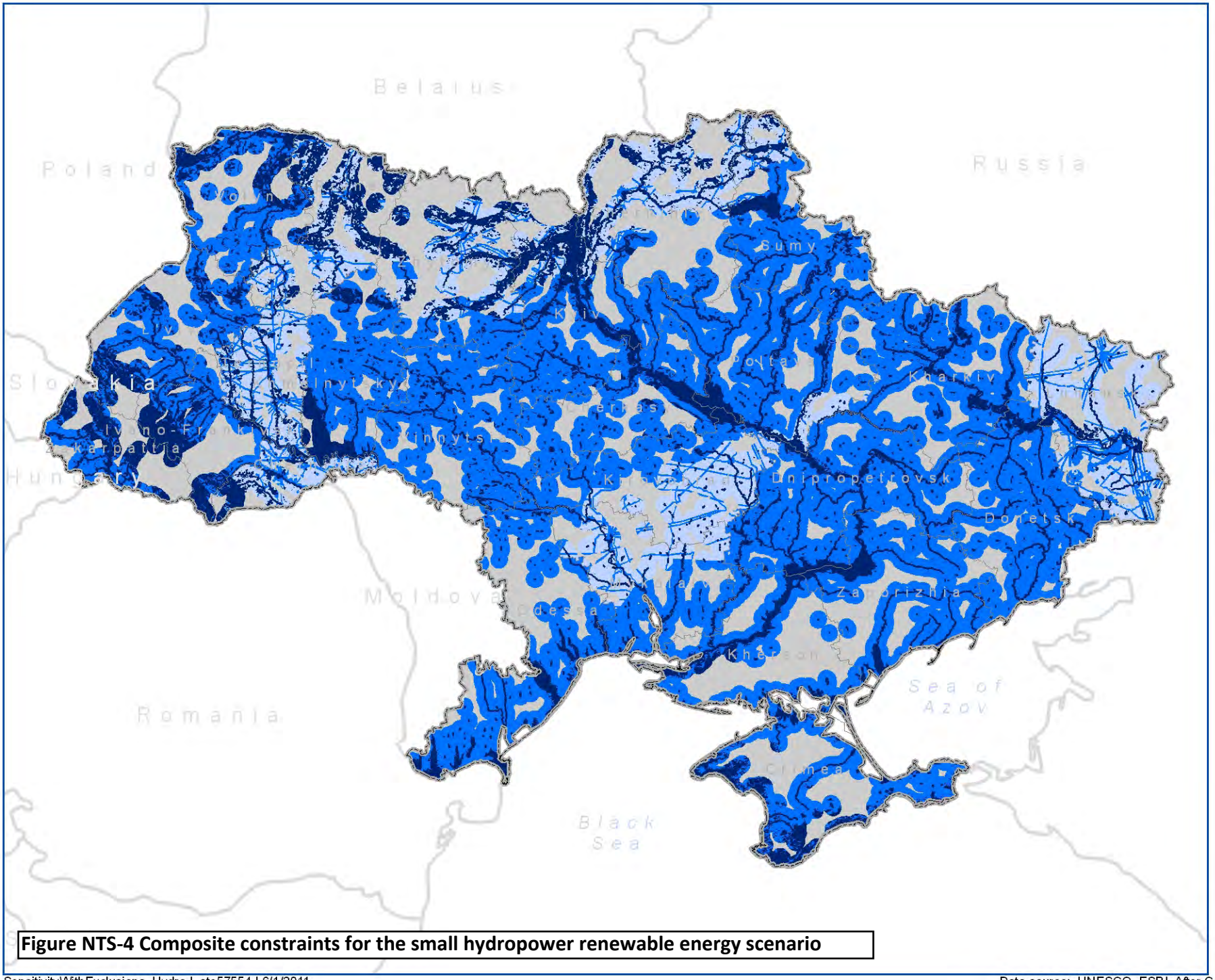

Figure NTS-4 Composite constraints for the small hydropower renewable energy scenario

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Environmental Sensitivity and Technical Exclusion for Small Hydro Development

Legend

- Technical Exclusions

Sensitivity

- Low
- Medium
- High

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0 50 100
Kilometers
1 cm = 60 km

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SensitivityWithExclusions_Hydro | ste57554 | 6/1/2011

Data source: UNESCO, ESRI, After C.A. Polyvach, National Atlas of Ukraine.

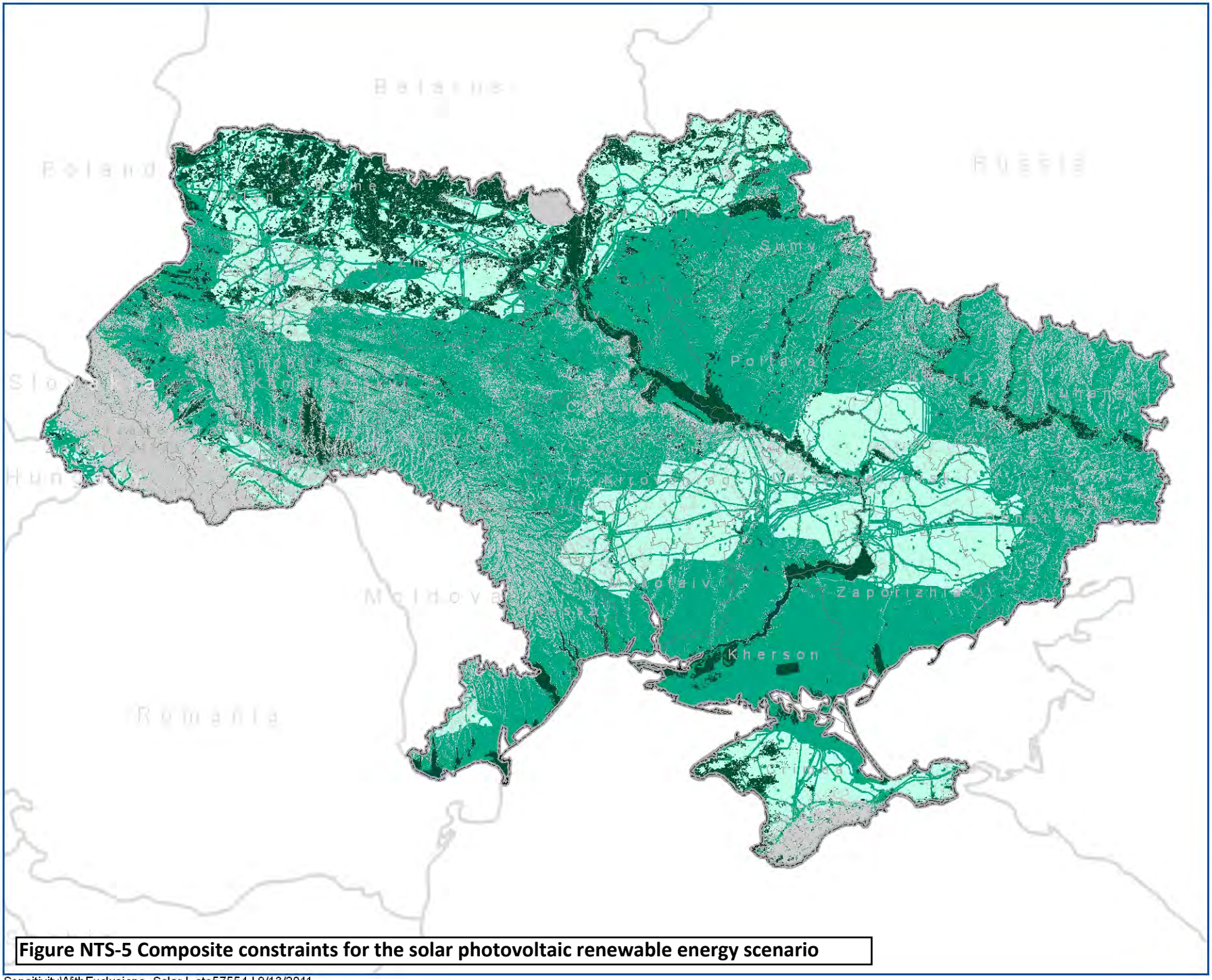

Figure NTS-5 Composite constraints for the solar photovoltaic renewable energy scenario

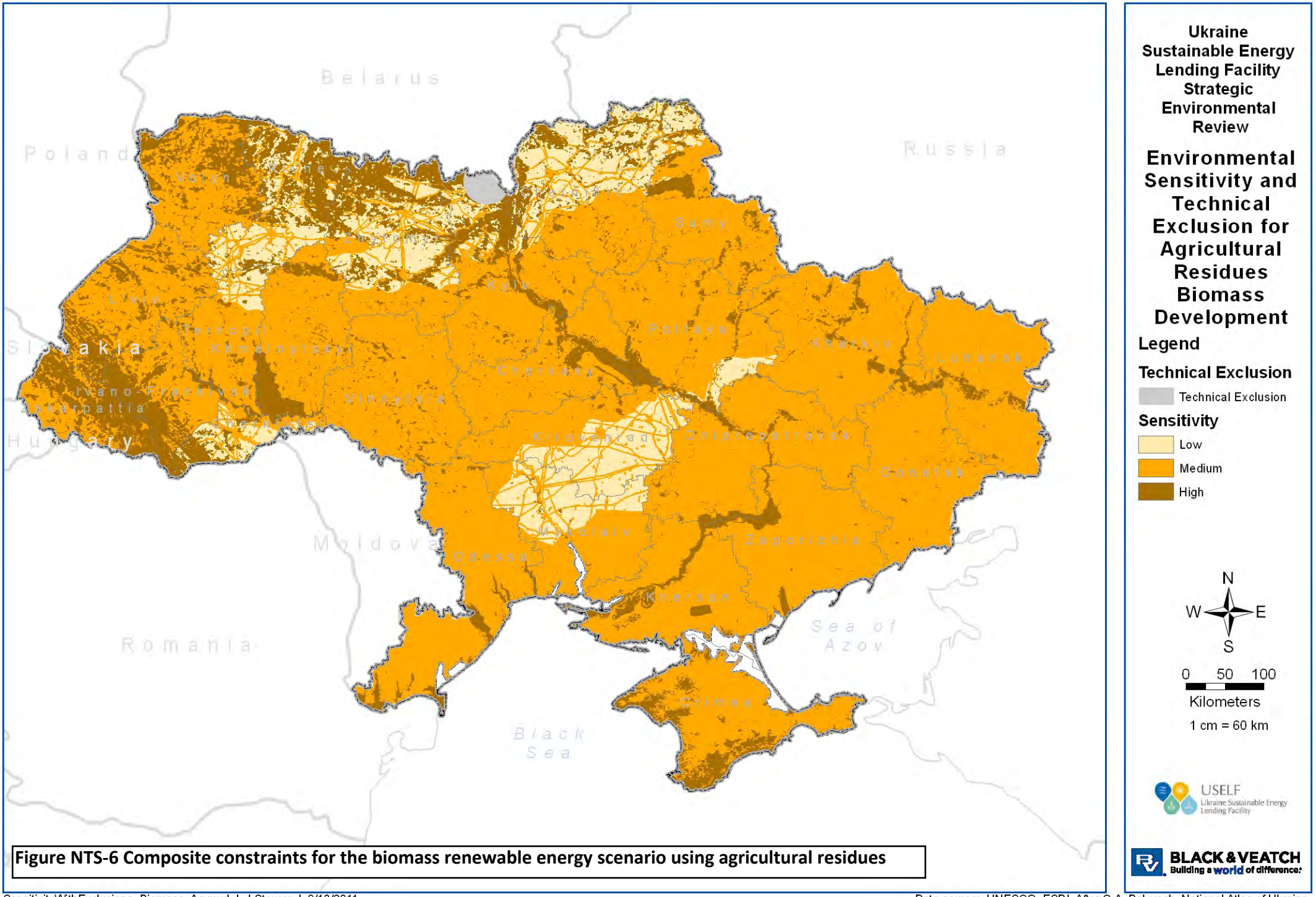

Figure NTS-6 Composite constraints for the biomass renewable energy scenario using agricultural residues

SensitivityWithExclusions_Biomass_Ag.mxd | J.Steurer | 9/13/2011

Data source: UNESCO, ESRI, After C.A. Polyvach, National Atlas of Ukraine.

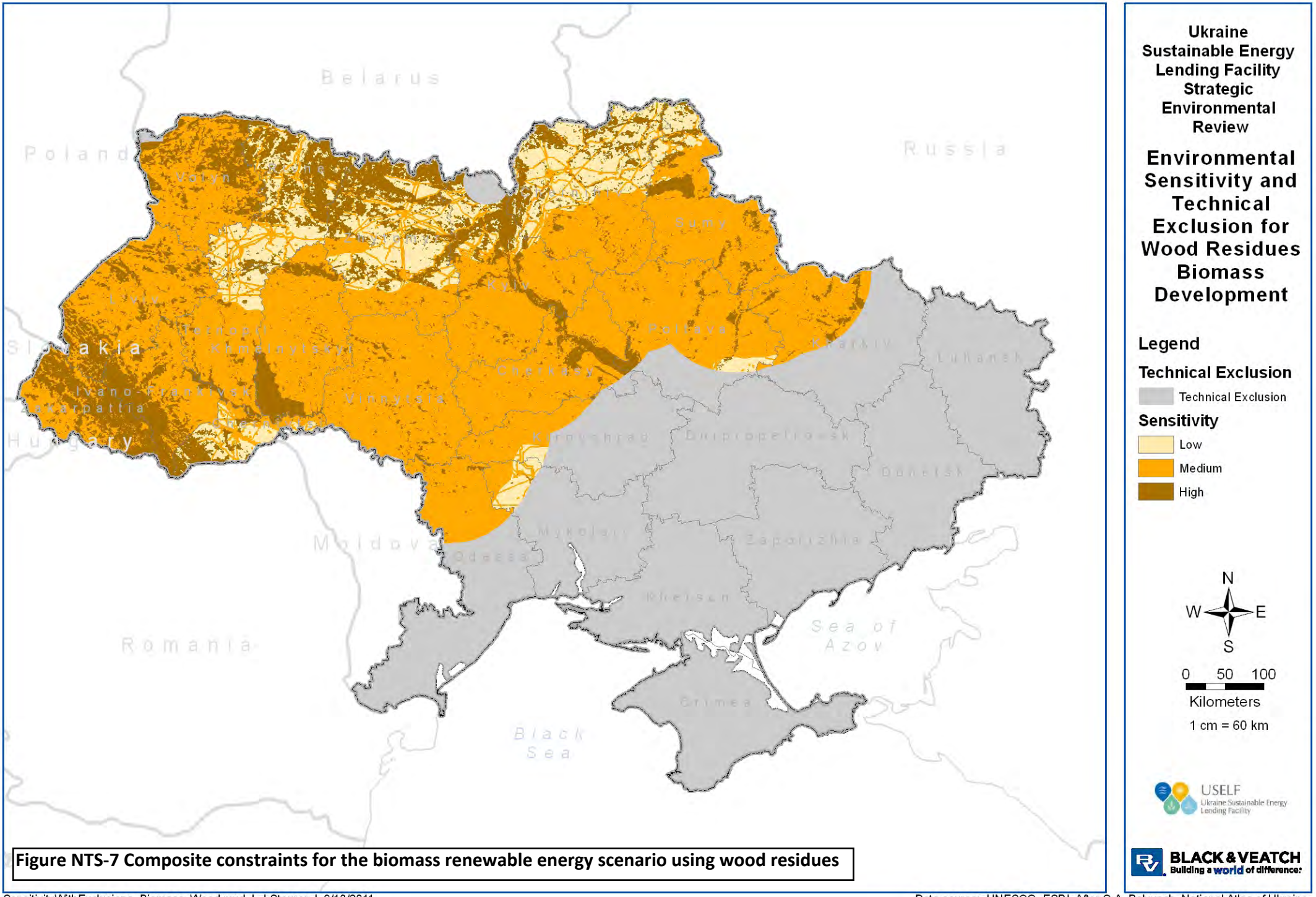

Figure NTS-7 Composite constraints for the biomass renewable energy scenario using wood residues

SensitivityWithExclusions_Biomass_Wood.mxd | J.Steurer | 9/13/2011

Data source: UNESCO, ESRI, After C.A. Polyvach, National Atlas of Ukraine.

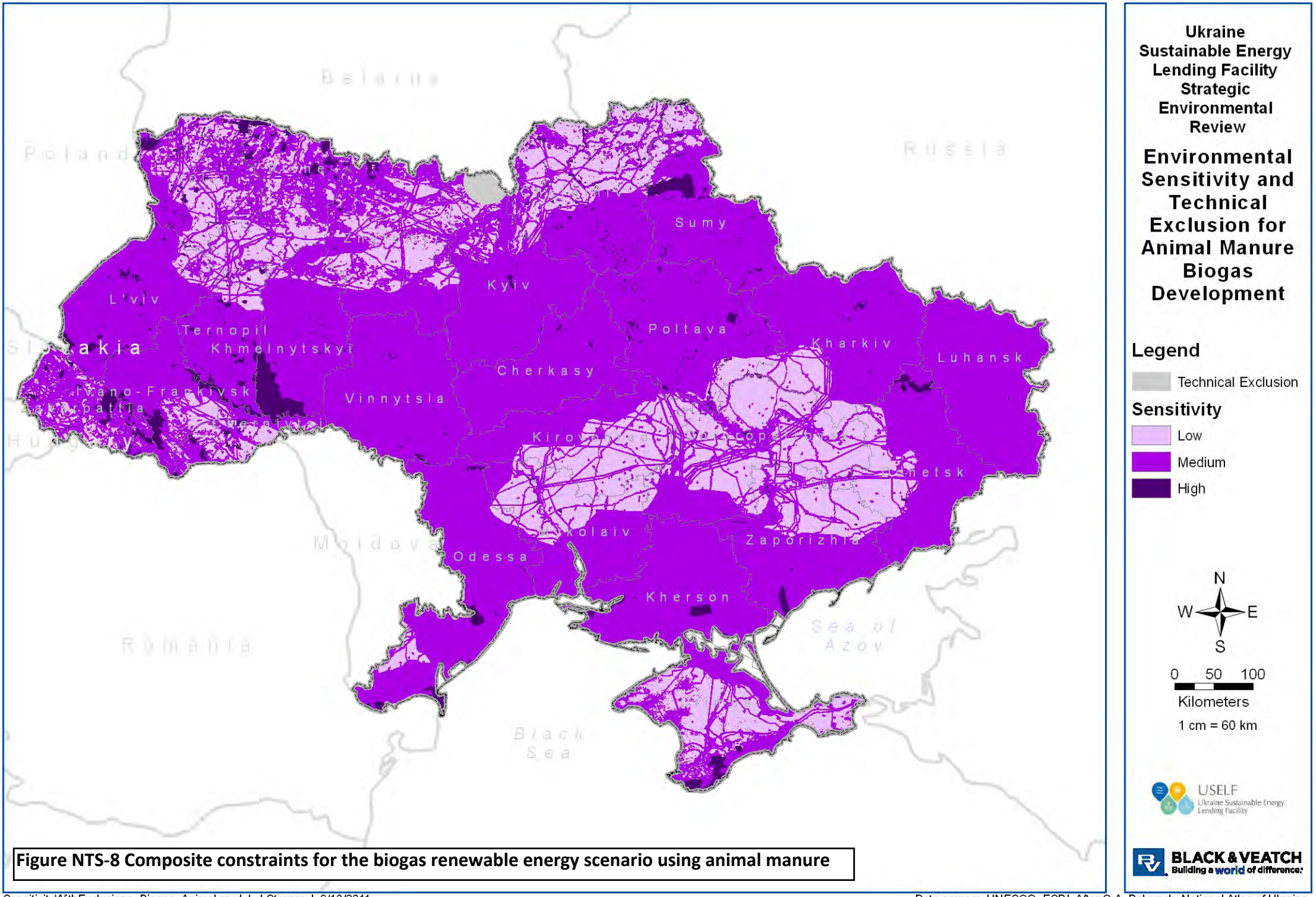

Figure NTS-8 Composite constraints for the biogas renewable energy scenario using animal manure

SensitivityWithExclusions_Biogas_Animal.mxd | J.Steurer | 9/13/2011

Data source: UNESCO, ESRI, After C.A. Polyvach, National Atlas of Ukraine.

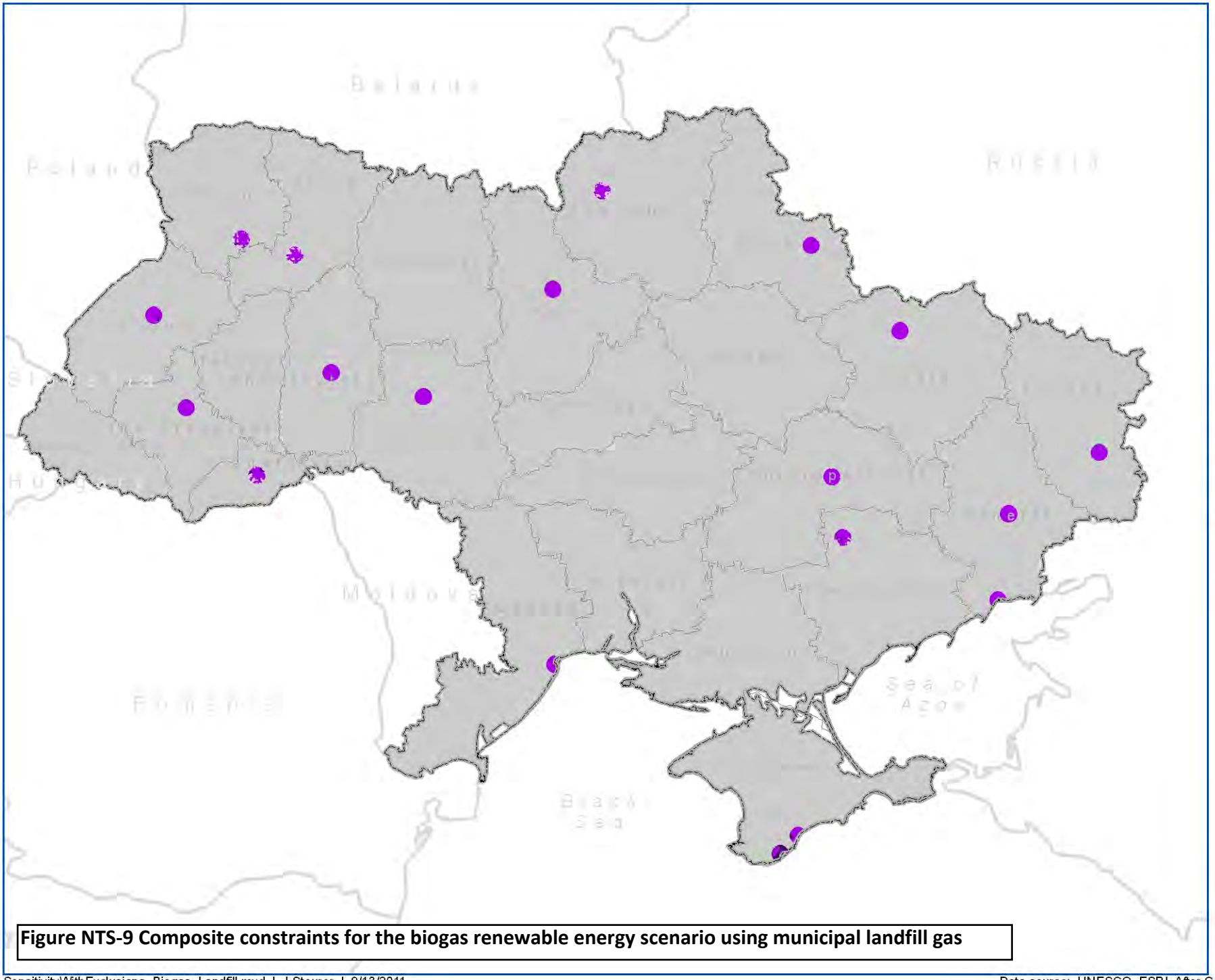

Figure NTS-9 Composite constraints for the biogas renewable energy scenario using municipal landfill gas

SensitivityWithExclusions_Biogas_Landfill.mxd | J.Steurer | 9/13/2011

Data source: UNESCO, ESRI, After C.A. Polyvach, National Atlas of Ukraine.

Likely significant effects on the environment and mitigation measures

The SER used the steps recommended in EU guidance to assess the likely significant effects on the environment that could arise as a result of the USELF renewable energy scenarios.

Generic effects that are common to *all* of the renewable energy scenarios are as follows:

- Cumulatively beneficial (although individually insignificant) effects on climate through reduction in greenhouse gas emissions where the renewable energy projects replace natural gas or coal as fuels for energy generation.
- Local adverse air quality effects during construction works, through dust and combustion engine emissions;
- Risk of pollution of surface water during construction, primarily from erosion;
- Disturbance of soil composition through compaction or pollution during construction;
- Loss of protected and natural remnant habitats and associated species by disturbance or land use for facilities, roads, or power transmission lines;
- Dislocation of communities or households as a result of the facilities, roadways or power transmission lines;
- Hazards to human health during construction, including dust, noise and dangers to workers, and exposure to electromagnetic fields if households are located too close to power transmission lines;
- Economic benefits of increased employment opportunities and improved energy reliability;
- Loss of lands for other economic activities, including lands around power transmission lines;
- Pressure on existing infrastructure through increased traffic of heavy loads for construction, and the need to expand existing power transmission lines;
- Loss and/or damage to cultural heritage from footprint of physical structures, including any associated infrastructure such as transmission systems; and,
- Changes to the context/setting of sites due to physical presence of renewables development and associated infrastructure (such as transmission lines and access roads).

All of the USELF renewable energy scenarios have some potential for negative effects upon people and the environment. Onshore wind and small-hydropower, for example, have the greatest potential for disturbance to birds/bats and aquatic biodiversity respectively. Aquatic biodiversity may be particularly at risk from small hydropower development since the best sites for small-hydropower are often in protected ecological areas such as the Carpathian Mountains.

On-shore wind projects can also be visible from great distances. Solar photovoltaic and wind projects are most technically feasible in areas of relatively high population density (Crimea, Donetsk, Odessa and Kiev (the latter for solar only), and with a higher percentage of vulnerable people (for example, in Crimea and Donetsk). Solar photovoltaic projects in particular can require large amounts of land, which will often be competing with agricultural

land uses. Other than land take, solar photovoltaic projects are likely to have limited negative effects upon environmental receptors, with the exception of perhaps landscape character (in other words changing the character of the landscape due to their highly visible nature). The more significant long-term negative effects of biomass and biogas scenarios largely relate to air quality and odour in the area around the facilities. The majority of the negative effects associated with all the renewable energy scenarios relate to the construction phase of projects.

For all the USELF renewable energy scenarios, there are ways to reduce the potential negative environmental and social effects. Examples of the types of actions that can avoid or reduce impacts ("mitigation measures") that will be required by USELF include:

- *Climate and air quality*:
  - reduce air pollution by keeping vehicles and equipment engines in good working order;
  - control of emissions from biogas or biomass facilities;
  - reduce dust from haul roads and construction sites by through water spraying, dust collectors and enclosures; and,
  - control odours with enclosures and odour control equipment.
- *Surface water and groundwater:*
  - design facilities and implement Best Management Practices through operation plans for runoff and sediment control, pollution prevention and abatement, hazardous materials storage and handling, spill prevention and response, and resource sampling and monitoring.
  - improve flood protection measures and flood compensation within the floodplain.
- *Geology and soils:*
  - control erosion during construction and operation;
  - re-vegetate cleared areas after construction;
  - careful siting, land grading and planting to avoid or minimise landslides;
  - select project sites and arrange facilities to avoid or minimise use of productive agricultural lands;
  - minimise areas used by heavy construction equipment;
  - implement spill prevention, control and countermeasures plans during project construction and operation; and,
  - manage waste collection, treatment and disposal during construction and operation.
- *Landscape and biodiversity:*

  Landscape:
  - where possible, avoid areas within the visual envelope of sensitive receptors; and /or,
  - use natural or artificial screening, careful choice of materials and colour schemes to minimise the effect of construction and operational infrastructure on the landscape.

Biodiversity:

- carry out surveys to establish baseline habitats and species present (for example bird and bat surveys for proposed on-shore wind developments)
- select project sites and arrange facilities to
  - avoid protected areas, and areas which contain protected species;
  - avoid areas that are on migratory flight paths or routes used by wide-ranging species; and,
  - avoid or minimize disturbance or destruction of forests or steppe.
- avoid of construction or operation during critical time-periods (such as nesting/ hibernation) for particular sensitive species
- prevent or minimise the effect of operational effects on biodiversity, through:
  - changes to method of operation in order to mitigate for potential effects; and,
  - provision of sufficient water flows for sensitive habitats and species (minimum biological flows).

- *Community and socio-economics:*
  - avoid disruption to communities, businesses, tourist and recreational areas, farms and homes through careful siting of projects and other infrastructure (such as roads and transmission lines);
  - establish suitable buffers from development;
  - where avoidance is not possible, compensate owners/ land-users;
  - adhere to all international labour occupations health and safety standards;
  - minimise disruption during construction and operation through careful traffic management;
  - identify where access routes should be upgraded as part of the project;
  - minimise risk of disruption to water users through assessment and production of water resources plans; and,
  - make an emergency plan for a potentially disastrous event such as flooding or a landslide.
- *Cultural Heritage:*
  - avoid loss, damage or visual intrusion (through careful survey, siting assessment and establishment of suitable buffers) on:
    - UNESCO World Heritage Sites;
    - Tentative UNESCO World Heritage Sites; and,
    - Registered cultural heritage sites, zones and settlements.
  - where effects on registered sites cannot be avoided, follow a staged approach to cultural heritage studies:
    - consult with EBRD;
    - involve qualified expertise;
    - carry out surveys to identify intangible cultural heritage (such as cultural practices or resources) and avoid the loss or disruption through appropriate siting of developments, alterations to project

designs, and mitigation measures agreed with the potentially affected communities; and,

- minimise visual intrusion (for example by changing the scale, location or layout of the development, the choice of building materials, or the use of visual screening).

Implementation

USELF will evaluate every renewable energy project that is considered for financing to determine if the developer and the project can meets the requirements of Ukraine law and of the EBRD's 2008 *Environmental and Social Policy* and associated Performance Requirements.

In summary, the SER is intended to assist developers in designing projects to meet those requirements and to assist EBRD in making that evaluation in a number of ways:

- identifying the key environmental and social issues for each of the major types of renewable energy to be financed by USELF, and providing baseline data for many of those issues;
- identifying the areas in Ukraine where environmental or social issues may make development favourable or unfavourable;
- identifying ways to avoid or reduce the impacts from each type of renewable energy development; and,
- providing templates for use in developing plans for communicating with stakeholders.

Following adoption of the SER Environmental Report, USELF will develop a further guidance document which will guide developers in providing the information and analyses needed by USELF for it to make financing decisions, and will also guide USELF in its evaluation of each project.

A GIS tool has also been developed, using the information used to develop Figures NTS-3 through NTS-9, to identify the key environmental constraints for specific locations within Ukraine. This will be useful to the USELF team and developers as it allows for constraints (such as protected areas that may be in close proximity to proposed project locations) to be identified.