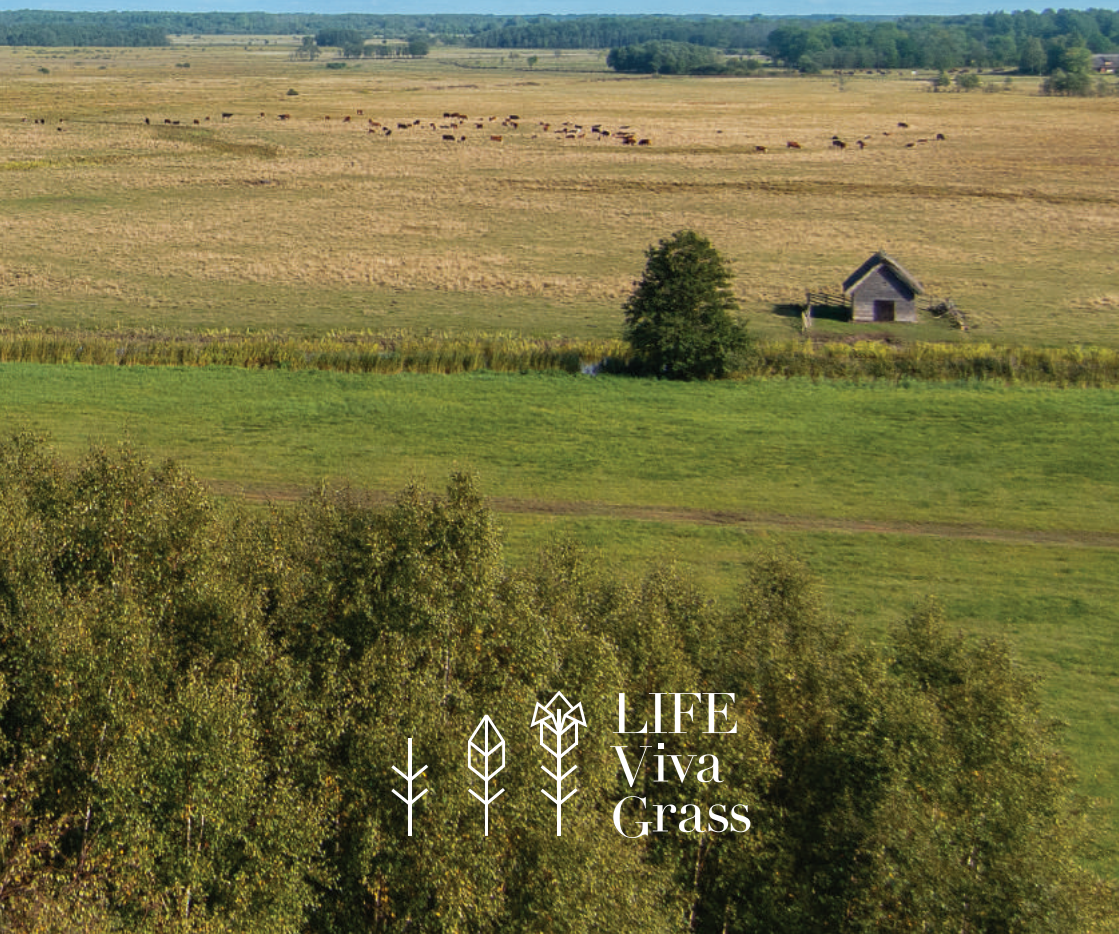
INTEGRATED PLANNING APPROACH AND "VIVA GRASS INTEGRATED PLANNING TOOL"



LIFE Viva Grass

INTEGRATED PLANNING APPROACH AND VIVA GRASS INTEGRATED PLANNING TOOL

Integrated planning approach and Viva Grass Integrated Planning Tool

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CONTENTS

Introduction

With this brochure we give a brief introduction to the **integrated planning approach** taking into account ecological as well as socio-economic aspects and, to the benefits of considering **ecosystem services** (contribution of nature to human welfare) in different policy sectors, land use management and development planning.

We also want to introduce and invite you to use the **Viva Grass Integrated Planning Tool (the Tool)** – a decision support tool developed in the "LIFE Viva Grass" project to support application of the integrated planning approach in landscape and spatial planning and sustainable grassland management. Furthermore, the Tool also serves an informative and educational purpose, showing the potential of grasslands' ecosystem services and enabling comparison of different grassland types and evaluation of management practices.

The link to the **Viva Grass Integrated Planning Tool** and detailed self-learning platform guiding the use of the Tool as well as information on other outputs of the "LIFE Viva Grass" project can be found at *www.vivagrass.eu.* Amongst others, you will find there also easy language brochures explaining ecosystem services and socio-economic benefits provided by grasslands.

Integrated planning approach

Integrated planning is a planning approach where various different factors are taken into account, including social, economic and ecological aspects, interests and needs. Our social and economic opportunities largely depend on goods and services provided by natural ecosystems, therefore it is crucial to consider ecosystems in development planning. The concept of ecosystem services provides a good framework for it.

Ecosystem services or the contribution of nature to human well-being are all those benefits that ecosystems (e.g. grasslands, forests, mires etc.) provide to humans, including provisional (goods and products such as hay, berries, honey), regulating (benefits from natural processes, e.g. water and climate regulation, pollination) and cultural services (non-material benefits such as beautiful landscape, possibilities for recreation etc.).

The concept of ecosystem services is increasingly used in spatial, landscape and environmental planning. Although this process is challenging due to the rigid structure of national spatial and landscape planning frameworks, many benefits arise from the integration of ecosystem services in planning processes. The concept of ecosystem services can be helpful when involving public stakeholders into planning processes and explaining them the benefits of certain planning approaches. Moreover, ecosystem services help visualize the full spectrum of impacts and benefits of different (and often contrasting) planning scenarios.

Ecosystem service concept in policy and land use management

Nowadays ecosystem services are acknowledged as an important concept for policy and decision making, because of its holistic view on interactions between nature and humans and potential to address conflicts and synergies between environmental and socio-economic goals. First, policy-makers have realized that ecosystem services or nature based solutions (e.g. using wetlands for water purification or flood prevention) might be more cost efficient than technical infrastructures. Moreover, the concept of ecosystem services enables the comparison of competing land uses and helps to facilitate planning and development decisions across sectors, scope, and administrative boundaries. For example, when a planner in a municipality has to make a decision about the location

of a new living area, the information about ecosystem services enables the planner to decide, which grasslands are important to preserve due to other benefits for the region, e.g. the flood prevention or potential for tourism.

The interest of policy-makers in the concept of ecosystem services arose when the global target to prevent the loss of biodiversity by 2010 was not met. Thus, approaches involving ecosystem services were first applied for strengthening nature conservation policy under the Convention on Biological Diversity and EU Biodiversity Strategy. However, mapping and assessment of ecosystem services, required by the EU Biodiversity Strategy 2020, is not only important for the advancement of biodiversity objectives, but it is also strongly related to the implementation of other related policies, involving water ways, marine environments, climate policy, agriculture, forestry as well as regional development (Fig. 1). Ecosystem service mapping and assessment results can support sustainable management of natural resources, and can be applied to develop nature-based solutions, contribute to spatial planning as well as environmental education.

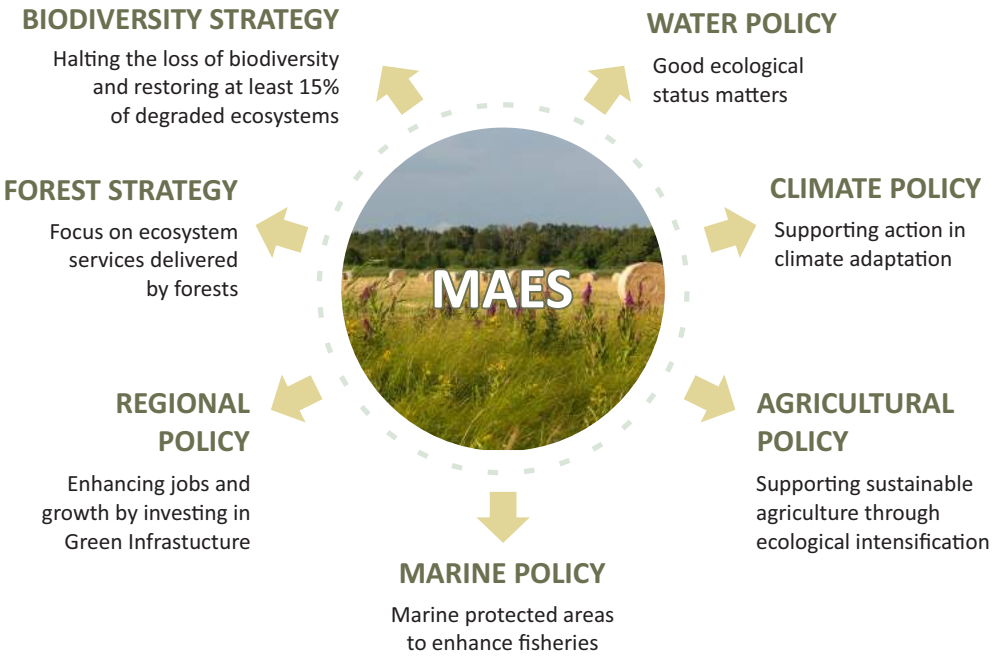


Figure 1. *Different policy sectors where mapping of ecosystem services (MAES) can be used*[1]

[1] *Maes, J., Teller, A., Erhard, M., 2014. Mapping and Assessment of Ecosystems and their Services. Indicators for ecosystem assessments under action 5 of the EU biodiversity strategy to 2020*

The main contribution of the ecosystem service mapping and assessment to the spatial planning can be summarised as follows[2]:

- identification of the so-called ecosystem service 'hotspot' areas with high potential of ecosystem services, which might require planning solutions for their safeguarding or restoration – it helps to identify the most valuable ecosystems (from environmental as well as from socio-economic point of view) and to ensure their preservation;
- assessing the impacts of the planning solutions on ecosystems and their services (i.e. application within the Strategic Environmental Assessment procedure) – it enables to have a comprehensive overview on all different impacts;
- visualisation of the trade-offs of the ecosystem services supply resulting from different lands use alternatives – e.g. turning a permanent grassland into a cultivated grassland increases the production of grass biomass but decreases the ecosystem services related to biodiversity and natural processes, e.g. medical herbs, pollination, climate regulation;
- identification of mismatches between areas of ecosystem service supply and demand (when combining the ecosystem service maps with assessment of people's values and actual use of the services) – e.g. identification of locations of grass biomass resources and the need for energy or animal feed is a basis for finding solutions to bring together supply and demand;
- enhancing stakeholders' and decision-makers' engagement in the planning process by communicating the overall benefits and shortcomings of the planning proposals – the assessment of ecosystem services highlights not only the impacts on nature but also on human well-being, which helps to explain the consequences of planning decisions to people;
- enhancing citizens' participation in the planning and decision making by gathering people's local knowledge and perceptions and enhancing knowledge exchange in terms of ecosystems and their services – our experience shows that involving local people can provide important information for planning as well as contributes to the acceptance, "ownership" and further implementation of the plan as people feel that the values important for them have been considered.

The **Integrated Planning Tool** developed in the "LIFE Viva Grass" project provides opportunities to consider grasslands' ecosystem services in land use planning and decision making.

[2] *Albert, C., Geneletti, D., Kopperoinen, L., 2017. Application of ecosystem services in spatial planning.*

Viva Grass Integrated Planning Tool

The **Viva Grass Integrated Planning Tool** is a support tool for decision making and planning sustainable use and management of grasslands. It enables integration of grassland ecosystem services into planning and decision making by linking biophysical grassland data (e.g. land quality, relief, land use/habitat types) with expert estimates of the ecosystem services as well as socio-economic context. The tool is integrated into an online GIS working environment and allows users:

- to assess the supply and trade-offs of grassland ecosystem services in user-defined areas, as well as
- to develop ecosystem-based grassland management and planning scenarios.

The **Viva Grass tool** is tested in nine case study areas across the three Baltic States (two farms, four municipalities, two protected areas and one county), each of them having a different spatial and thematic scale, as well as different data availability (see *https://vivagrass.eu/demo-cases*). Thus, the **Viva Grass Tool** demonstrates the applicability of ecosystem services related information at different planning scales and contexts.

The **Viva Grass Tool** offers three applications or modules: "Viva Grass Viewer", "Viva Grass BioEnergy" and "Viva Grass Planner", each designed for different user groups and context of decision making.

The Tool combines information on land use (semi-natural, permanent and cultivated grasslands, arable land), data on natural conditions (land quality & slope) and expert assessments of ecosystem services in different grassland types to create distribution maps of ecosystem services. Furthermore, the **Viva Grass Integrated Planning Tool** offers the spatial visualisation of ecosystem services' bundles and trade-offs as well as hotspot and coldspot areas, which helps to make decisions on the most beneficial use of grasslands, from nature's as well as people's point of view. The modules of the **Viva Grass Integrated Planning Tool** as well as other data and information products developed for the "LIFE Viva Grass" project are presented on Figure 2.

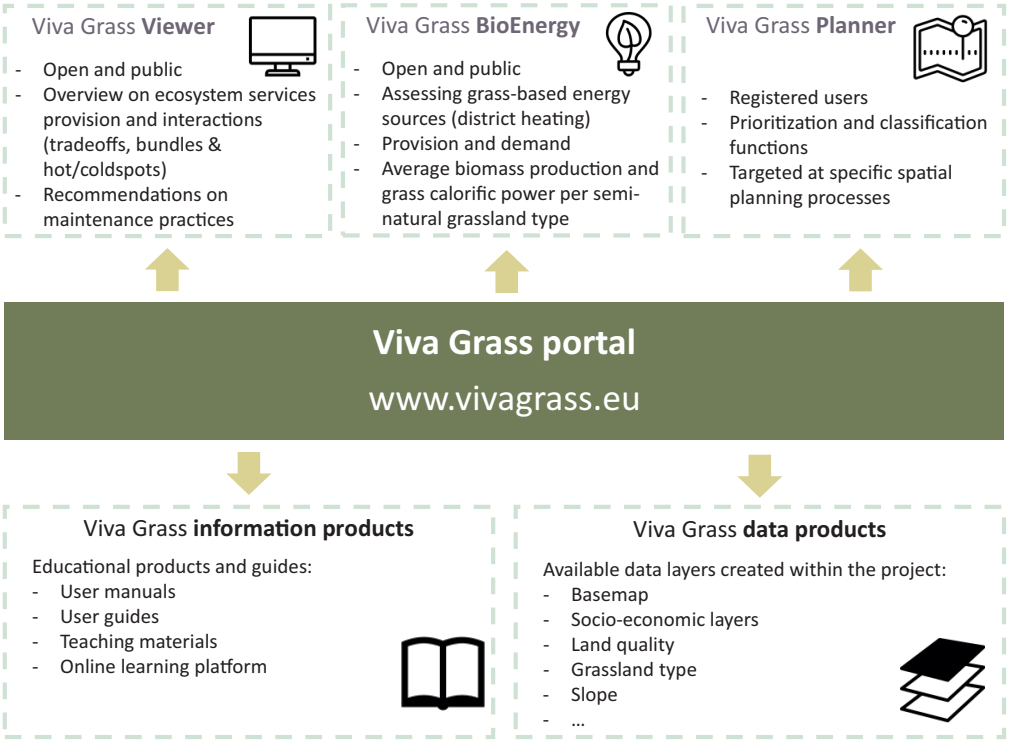


Figure 2. *The modules of the Viva Grass Integrated Planning Tool and other data & information products developed by the "LIFE Viva Grass" project.*

Viva Grass Viewer

Viva Grass Viewer is a basic module of the **Viva Grass Tool** targeted at general public and farmers, which is accessible for everybody without registration. It provides an overview of ecosystem services provided by a selected area as well as the grouping of similar ecosystem services in bundles and interactions between different grassland ecosystem services.

By clicking on a land block of interest, the user can view ecosystem services provided by the selected grassland. The user can change the land use type (e.g. from cultivated grassland to semi-natural) to see how it changes the supply potential of ecosystem services. Where available, recommendations on maintenance practices are given (Fig. 3).

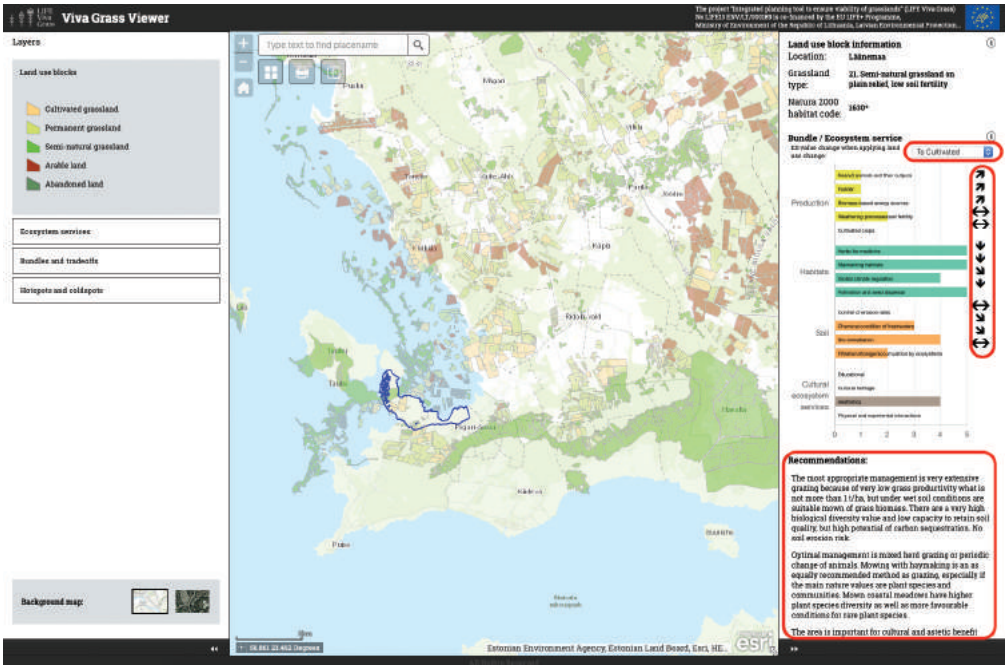


Figure 3. *Viva Grass Viewer. The user can change land use from the drop-down menu on the right side (e.g. from semi-natural grassland to cultivated as in the picture). The arrows show how it changes the provision of different ecosystem services. In the lower right corner the management recommendations for this particular grassland type are provided.*

The data layer of ecosystem services allows the user to explore mapping and assessment results of selected ecosystem services by choosing one in the drop-down menu (Fig. 4).

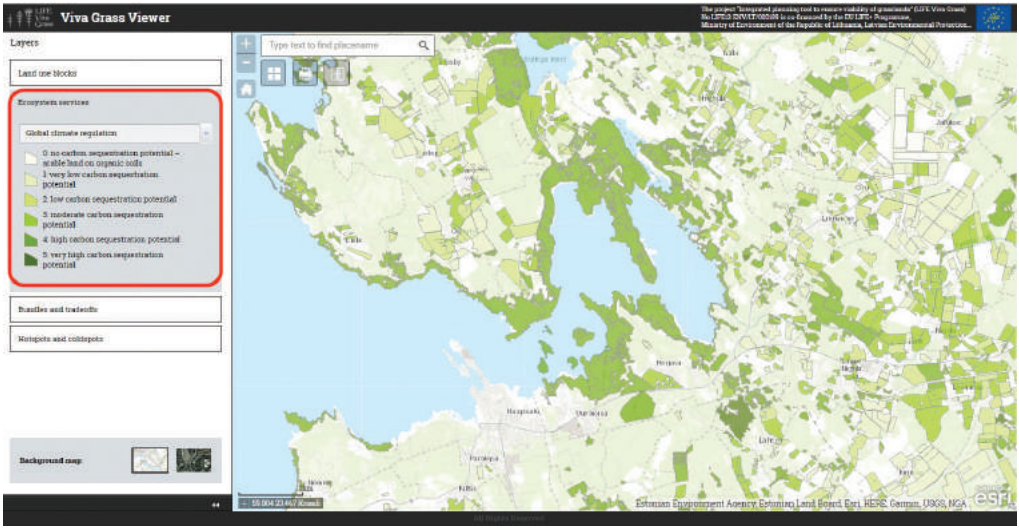


Figure 4. *Viva Grass Viewer. By selecting certain ecosystem service from the drop-down menu on the left side, the user can see the provision (distribution and value) of this ecosystem service in different land blocks. The dark green colour shows higher provision of the selected ecosystem service.*

Bundles and trade-offs of ecosystem services represent spatial grouping and interactions of ecosystem services. The user is able to explore those groupings and interactions by choosing one of them in the drop-down menu (Fig. 5).

Bundles of ecosystem services are defined as a set of associated ecosystem services that are linked to a given ecosystem and usually appear together repeatedly in time and/or space. The increase of one service in the bundle usually means also increase of other services belonging to the bundle. **LIFE Viva Grass** analysis revealed 3 bundles of ecosystem services for grasslands:

1. **"Habitats" bundle** including 4 ecosystem services: *Herbs for medicine, pollination and seed dispersal, maintaining habitats and global climate regulation.* For example, in species rich grasslands, we are also likely to find a wide range of herbs with a medicinal value. The grassland management practices that aim to increase biodiversity, such as the reduction or complete elimination of ploughing and fertilization, also increase pollination or ecosystem services supporting climate regulation. Grasslands belonging to the "Habitats" bundle support preservation of biodiversity and related ecosystem services.

2. **"Production" bundle** including 4 ecosystem services related to the productivity of ecosystems: *Reared animals and their outputs, fodder, biomass for energy and cultivated crops.* All these ecosystem services are based on biomass production. Therefore, the increase in one of the services in this bundle usually means an increase also in others. However, biomass for energy not only depends on the productivity but also on the calorific potential of grassland species. Grasslands belonging to the "Production" bundle ensure provisional ecosystem services such as hay for animal fodder or grass biomass for energy.

3. **"Soils" bundle** including 5 ecosystem services related to the role of soil in ecosystem processes: *Control of erosion rates, chemical condition of fresh waters, bio-remediation, filtration/storage/accumulation by ecosystems and weathering processes-soil fertility.* Grasslands belonging to the "Soils" bundle ensure ecosystem services related to the soil such as protection of soil or cleaning of water.

Trade-offs occur when some ecosystem services are provided at the expense of others. This means that an increase in the production of a service would decrease the production and benefits of another service. A clear example in the context of grasslands is the trade-off between biomass production and biodiversity & habitats: Increasing

grassland's productivity usually requires a certain degree of intensification through fertilization, ploughing and reseeding with a mix of selected species. These intensification practices in turn simplify grasslands' structure and decrease the number of grassland species, leading to a loss of habitats for birds and arthropods.

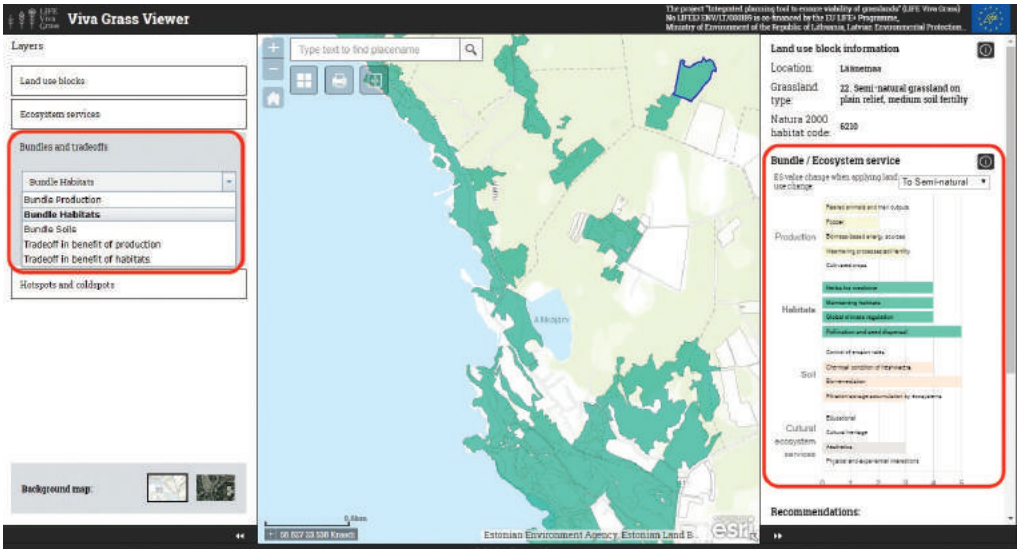


Figure 5. *Bundles and trade-off view in Viva Grass Viewer. Drop-down menu (left) enables to select different bundles ("Production", "Habitats", "Soils") or trade-offs (in benefit of habitats or production). The green areas presented currently on the map belong to the "Habitats" bundle (grasslands important for the preservation of biodiversity). By clicking on a concrete land plot, the detailed information about ecosystem services in that area will be displayed (on the right side).*

Coldspots/hotspots of ecosystem services is a data layer that represents the number of ecosystem services with either low or high values. Coldspot areas are areas where a great number of services are provided at low or very low values(see Fig. 6); hotspot areas in contrast offer a great number of services at high or very high values (see Fig. 7). The user is able to explore different representations of coldspots/hotspots of ecosystem services by choosing one from the drop-down menu. Hotspots are vulnerable to intensification of agriculture due to the good agro-ecological conditions and coldspots are farmland where use is not suitable for given agro-ecological conditions.

Figure 6. *An example of a "coldspot" area (the selected blue area) where most of ecosystem services are provided at low or very low values, which can be also seen from the diagram of ecosystem services' bundles on the right side.*

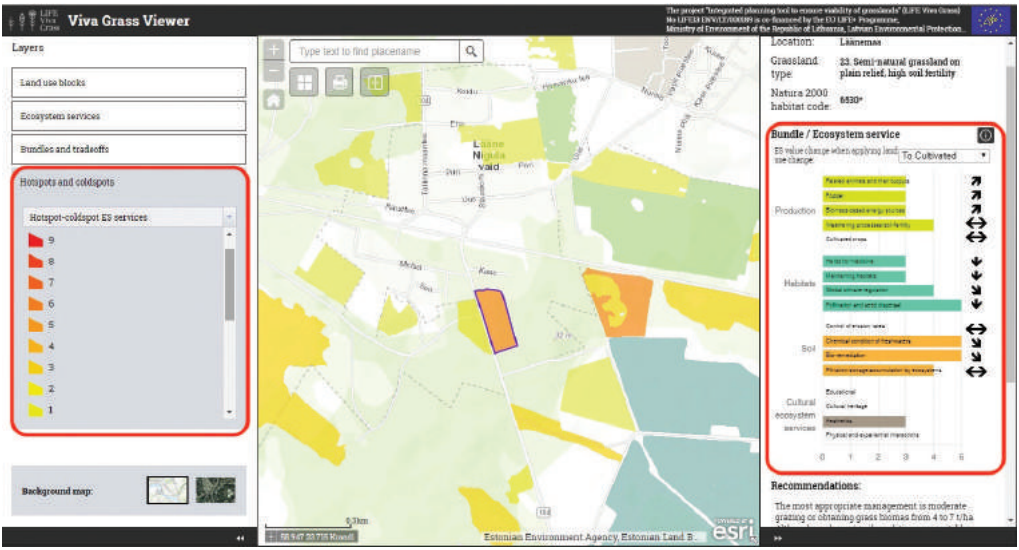


Figure 7. *An example of a "hotspot" area (the selected orange area) where most of ecosystem services are provided at high or very high values, which can be also seen from the diagram of ecosystem services' bundles on the right side.*

Viva Grass BioEnergy

The Viva Grass BioEnergy module (Figure 8) is a tool for assessing grass-based energy resources (area, production, calorific potential for district heating) and informing relevant planners/ stakeholders about areas with the highest potential for grass for energy. By including socio-economic information (number of inhabitants in block houses, location of district heating plants) it also enables the assessment of possible demand for energy (district heating).

Grasslands have a potential for energy production as solid biomass heating fuels. Whether grasslands are specifically cultivated for this purpose, or the grass mown from permanent and semi-natural meadows is used, grass can be burnt in co-fired plants for heat generation. In many cases, the use of grass bales for heating is a feasible alternative to regular biomass-based resources such as woodchips. Unused biomass resources resulting from semi-natural grassland management in some nature protection areas are left in the field and "wasted".

The Viva Grass BioEnergy module uses additional sources of information, for example the 10 semi-natural grassland classes are updated with information about the Natura 2000 habitat type they belong to. The tool is able to provide detailed information to the user about the average biomass production and average grass calorific power per semi-natural grassland type.

The Viva Grass BioEnergy module is accessible for everybody without registration and allows to select and summarize bioenergy potential from several grasslands. Additionally, it provides information on the current management status of the selected grasslands, as well as information about the presence of reed encroachment and recommended grazing pressures per habitat type. Currently it includes data only about Estonia.

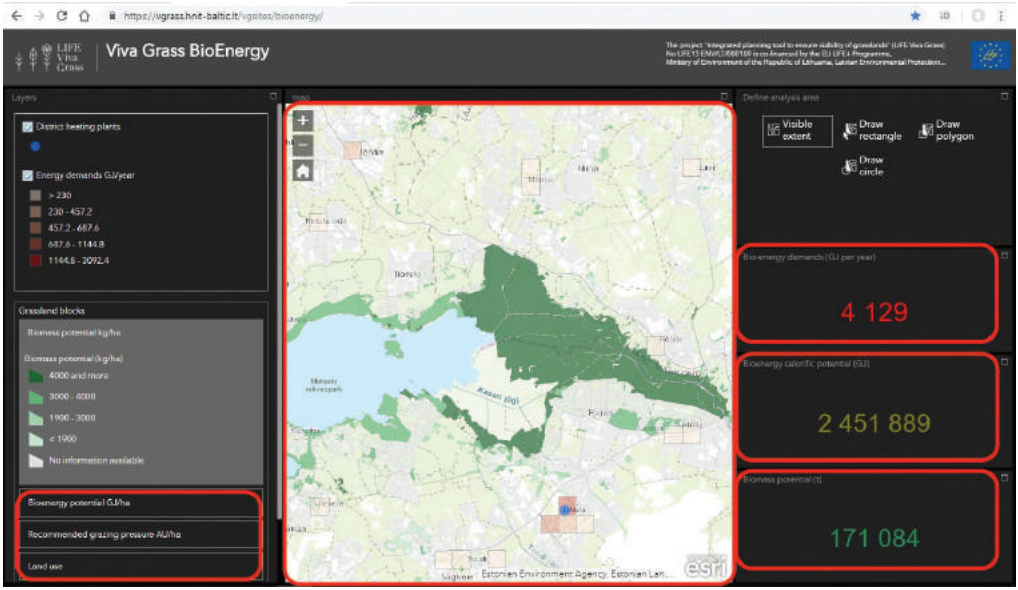


Figure 8. *Viva Grass BioEnergy module. Example from Matsalu National Park, Estonia. Reddish brown colours displayed in the map show the energy demand (GJ/year; based on the number of inhabitants in block houses). The green colours show biomass potential (t/ha). The blue dot is an existing district heating plant. The numbers on the right side show bioenergy demand (red, GJ/y), bioenergy calorific potential (yellow, GJ) and biomass potential (green, t) for the area selected by the user (currently the visible extent). Additionally from the drop-down menu on the left side it is possible to select bioenergy potential, recommended grazing pressure or land use.*

Viva Grass Planner

The Viva Grass Planner module is targeted at professional users, who could apply the ecosystem services' information in the spatial planning process. Viva Grass Planner is accessible for registered users only; registration is carried out by the system administrator.

The Viva Grass Planner enables the carrying out prioritization and classification functions, to visualise the results in a map as well as to export the processed data.

Prioritization is performed in the following steps: choosing the criteria, weighting the criteria (setting the importance for each criterion in %) and displaying the results. Criteria can be selected out of available attributes consisting of the results of the assessment of ecosystem services or from additional data added by the user containing case specific attributes. To indicate the relative importance of the chosen criteria, the user can assign weight ranging from 0-100%, so that the sum of all percentage would be 100% (Fig. 9). To create the final prioritization of alternatives, additional classification can be performed by employing supplementary data specified by the objective of an enquiry. Classification is an arrangement of data based on selected attributes (classification rules) and can be done both based on performed prioritization and standalone (Fig. 10).

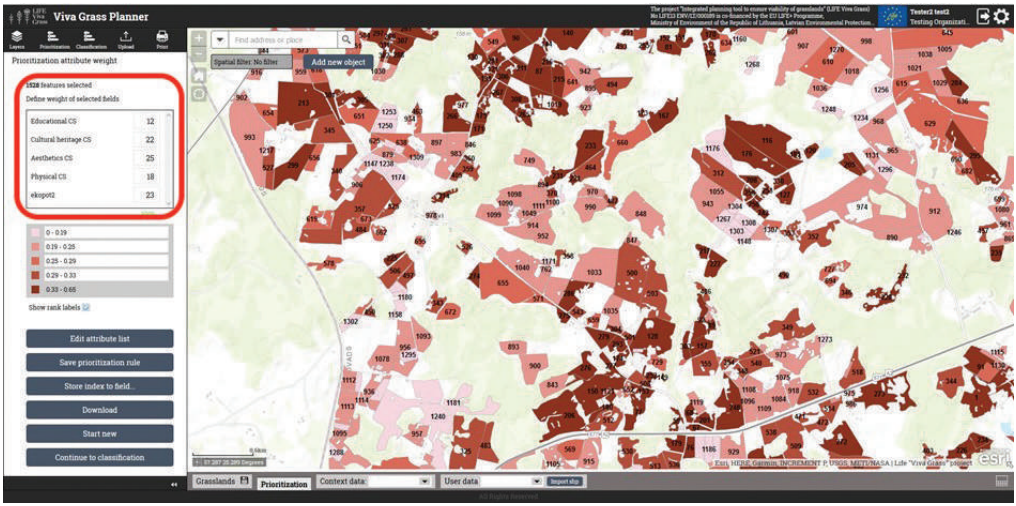


Figure 9. *Weighting the criteria in Viva Grass Planner. The dark red areas show grasslands that correspond best to the selected criteria.*

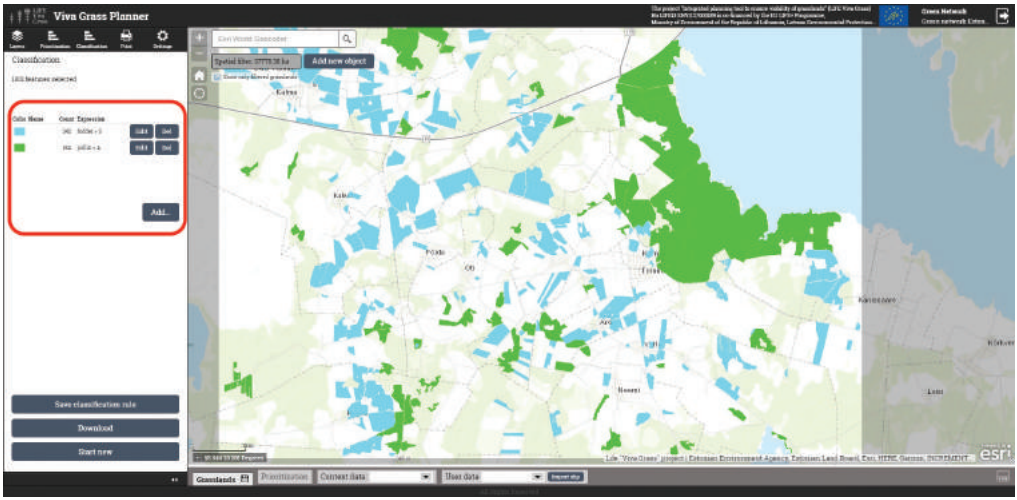


Figure 10. *Classification in Viva Grass Planner. The user can determine the classification rules. The example shows grasslands where fodder provision is higher than 3 (blue areas) and grasslands where pollination provision is higher than 4 (green areas).*

To demonstrate possibilities for practical use of the Viva Grass Planner, we have developed some example applications.

One example of using Viva Grass Planner is Landscape planning decision support, where according to certain expert developed criteria (importance of grasslands from recreation, education, cultural heritage, aesthetical and ecological value point of view as

well as risk of farmland abandonment and Sosnowsky hogweed invasion) prioritization and classification of farmland is calculated, subsequent order and intensity of landscape management practices are suggested. The workflow of Landscape management decision support is presented in Figure 11

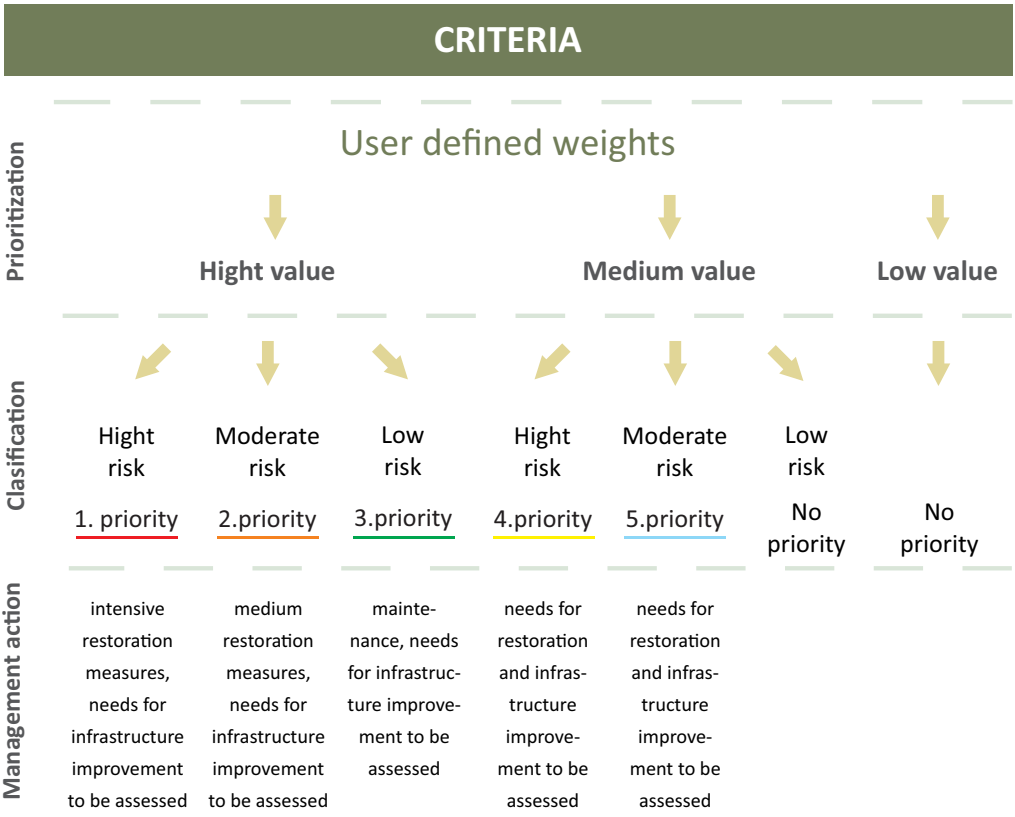


Figure 11. *Workflow of Landscape management decision support tool. The first priority for management are areas with high landscape value and high risks of abandonment and/or Sosnowsky hogweed invasion.*

Another example is the decision support tool for planning the Green Network.

It shows grasslands that are important to protect to ensure the functioning of the Green Network. A set of predefined scenarios with a gradually increasing degree of inclusion and protection of grasslands in the Green Network is proposed to the planners in the tool. By including grasslands belonging to habitats and soils bundles in the Green Network, we ensure the protection of *regulating and maintenance* ecosystem services (e.g. pollination and seed dispersal, maintaining habitats, protecting soil and cleaning water), which are essential to preserve the overall coherence and functioning of the Green Network. The analysis also includes the layer of presence of protected species to account for areas that fall outside of protected areas or County Green Network but still show a high biodiversity value. The example works in a three scenario way:

Scenario 1. Bare minimum: grasslands in the habitats bundle;

Scenario 2. Medium ecological coherence: grasslands in the habitats bundle + presence of protected species;

Scenario 3. High ecological coherence: grasslands in the habitats bundle + grasslands in the soils bundle + presence of protected species.

Each scenario is analysed in terms of: conflict detection with other land uses (data provided by the user), preservation of biodiversity, keeping Green Network coherence and supply of ecosystem services. Based on this information, the planner can make an informed decision, which scenario to choose.

The Viva Grass Integrated Planning Tool incorporates data for the entire area of Estonia, Latvia and Lithuania, which means that it can be applied for any location in these countries. The use possibilities of the Tool are not limited to the presented examples – it can be applied for different planning and decision making situations. We invite all users of the **Viva Grass Tool** to develop their own use cases and share these also with us.

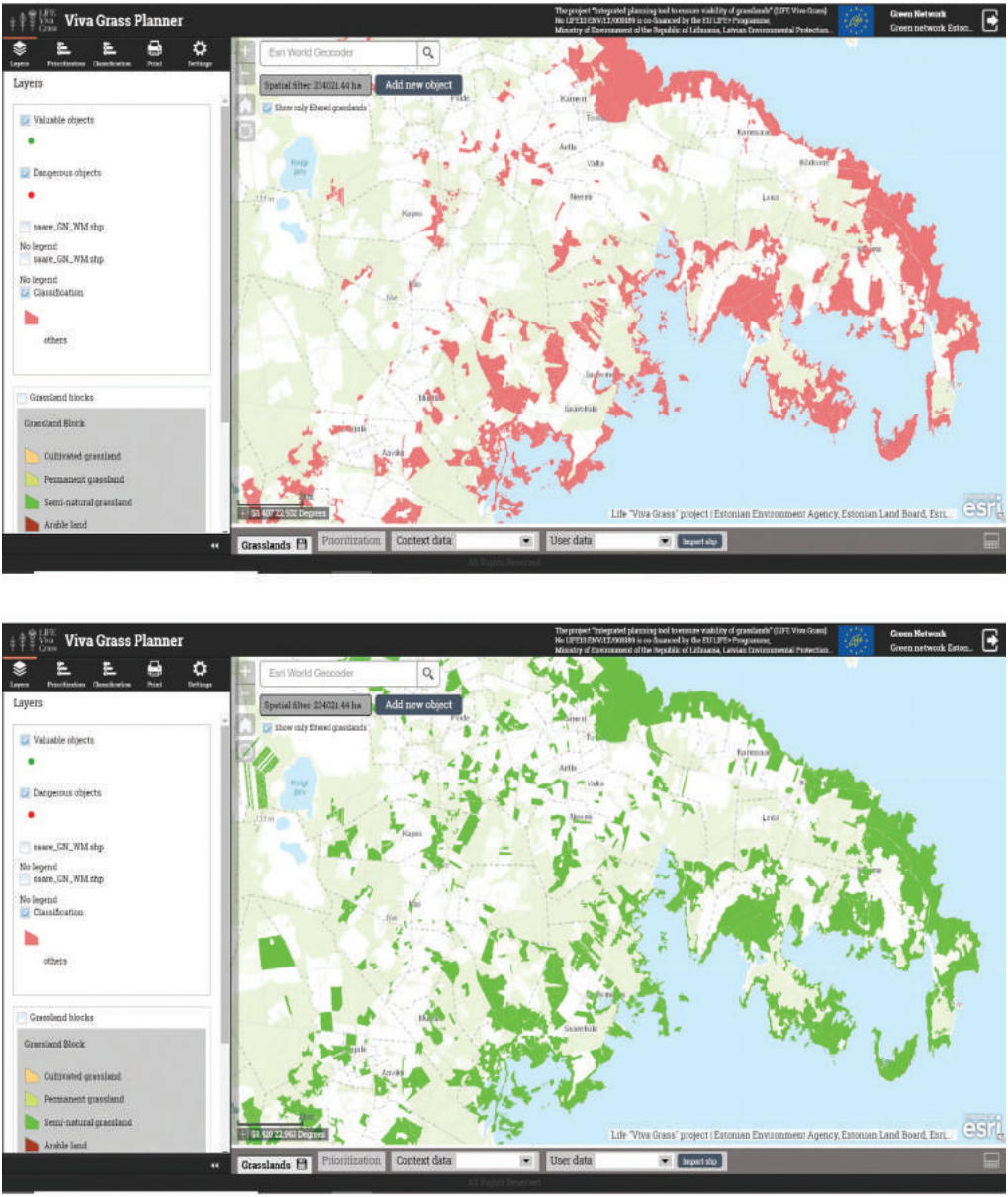


Figure 12 (1). *Example of the three different Green Network grassland scenarios from East-Saaremaa, Estonia. Red – grasslands proposed to be included in Green Network according to bear minimum scenario; green – grasslands proposed to be included in Green Network to achieve medium ecological coherence; Continuation of the figure in other page.*

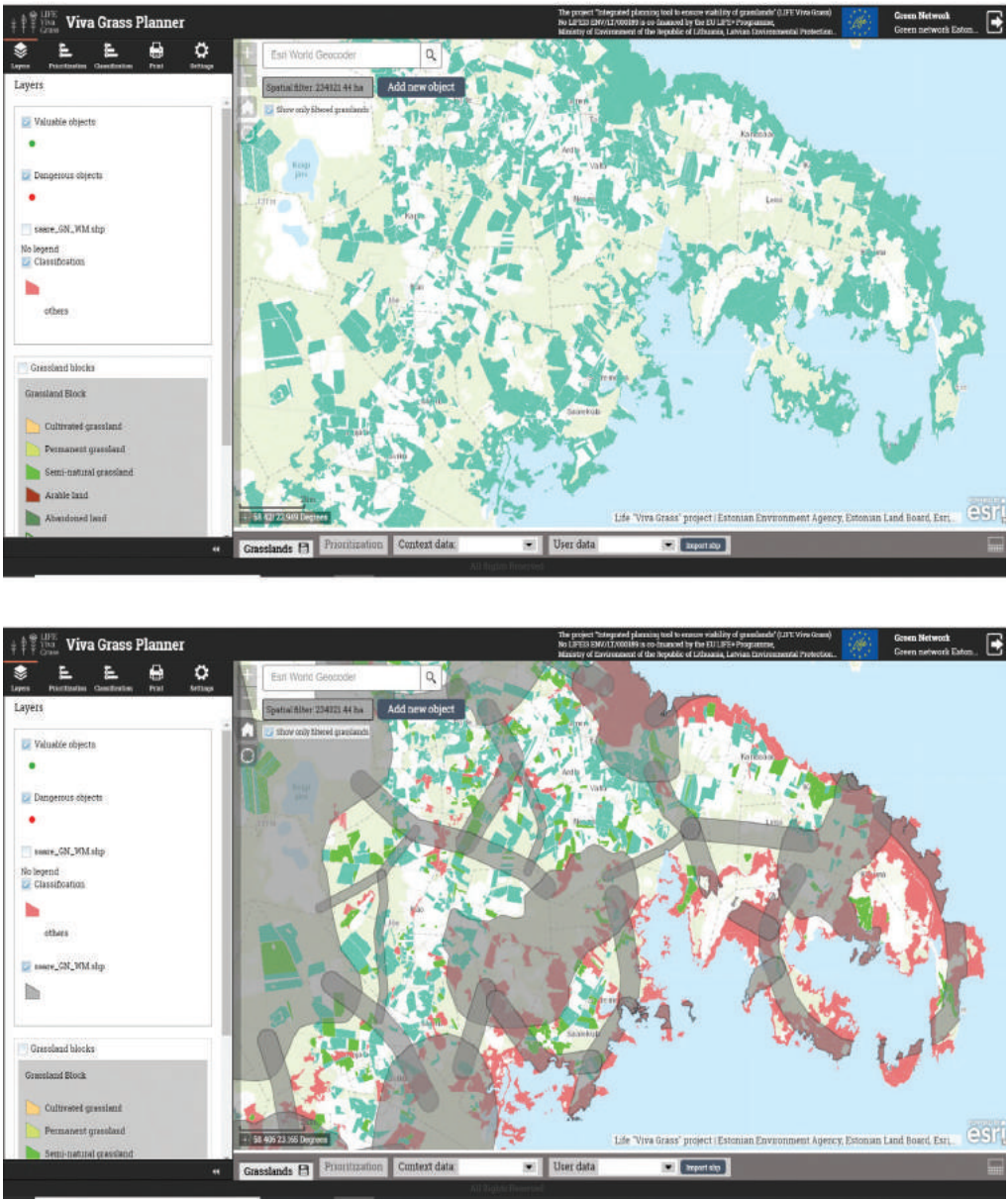


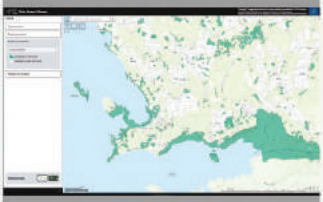
Figure 12 (2). *Example of the three different Green Network grassland scenarios from East-Saaremaa, Estonia. Red – grasslands proposed to be included in Green Network according to bear minimum scenario; green – grasslands proposed to be included in Green Network to achieve medium ecological coherence; blue-green – grasslands proposed to be included in Green Network to achieve high ecological coherence; grey – the existing Green Network.*

We hope that this introduction helped you understand the benefits of considering ecosystem services in planning and decision making and gave you a brief overview of the possibilities of the **Viva Grass Integrated Planning Tool.**

You are welcome to explore it further and try out the Tool at *www.vivagrass.eu.*

VIVA GRASS INTEGRATED PLANNING TOOL

VIVA GRASS VIEWER

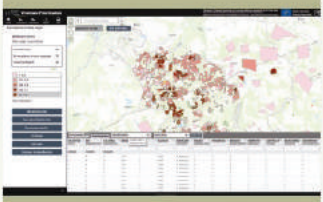


For all of us
To understand grasslands' ecosystem services and their spatial distribution

VIVA GRASS BIOENERGY

For farmers & planners
To support grassland management decisions related to bioenergy

VIVA GRASS PLANNER



For planners
To support grassland management decisions by prioritization of different ecosystem services

LIFE Viva Grass

The aim of the LIFE Viva Grass project is to find economically viable and area specific management models for the multifunctional use of grasslands.

www.vivagrass.eu

LIFE Viva Grass