JECAMI 2.0 – User Guide

Integrative Alpine wildlife and habitat management for the next generation

Interreg Alpine Space

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Content

A Introduction

JECAMI – The Joint Ecological Continuum Analysing and Mapping Initiative – is a web-based mapping and analysing application on ecological connectivity. JECAMI consists of a section providing information on ecological connectivity for users not familiar with the topic which may be also applied for educational purposes. The experts section provides users with layers and tools for in-depth analysis of important aspects of ecological connectivity within and around the Alps.

Section B allows the user to quickly become familiar with the application. It consists of a short overview (section B.1) and examples to start with - for beginners (section B.2) as well as for experts (section B.3). For users familiar with the application a comprehensive reference manual is included in section C.

A.1 Why is ecological connectivity important?

Functioning ecosystems provide humans with a multitude of services such as clean drinking water, pollination of crops and clean air. At the same time, nature conservation in Western Europe is almost only established in remote areas where few conflicts exist. It is thus not astonishing that biodiversity is decreasing considerably. Biodiversity is also decreasing worldwide (Pimm et al., 2014). In order to be able to halter extinction crisis and to sustain human livelihood Noss et al. (2012) and Dinerstein et al. (2017) claim to conserve 50% of Earth. Based on island biogeography (Simberloff and Abele, 1976) areas rich in biodiversity need a certain size in order to maintain their biodiversity, small disconnected areas not allowing for movement lose their biodiversity within short time (Fig. 1). The importance of ecological connectivity rises even more in the face of climatic changes forcing movement in order to adapt to changing environmental conditions (e.g. Klausmeyer and Shaw, 2009; Mawdsley et al., 2009; Stein et al., 2013; Wessely et al., 2017). Heller and Zavaleta (2009) reviewed 22 years of recommendations for biodiversity management in the face of climatic changes pointing to the importance of connecting areas.

Fig. 1: Schematic sketch of the island biogeography theory (Simberloff and Abele, 1976).

Initiatives pursuing an improved ecological connectivity in Europe include the green infrastructure concept of the European Union or the foreseen creation of a “network of existing national and transboundary protected areas, of biotopes and other protected elements or those to be protected” of the Alpine Convention.

Ecological connectivity is usually defined as the degree to which the landscape facilitates or impedes movement" (Taylor et al., 1993). It may be distinguished between species-specific connectivity of habitats, connectivity of human-defined patterns of landcover or the connectedness of ecological processes (Lindenmayer and Fischer, 2007). Since only around 20 percent of the extant worldwide species richness is known (Kim and Byrne, 2006) – limited to frequent taxa and the insects (mainly not well studied taxa) diversity and abundance declines considerably (Hallmann et al., 2017), it is important to focus on a landscape approach. Within JECAMI we therefore consider landscape as an ecological continuum.

A.2 Aims of JECAMI 2.0

JECAMI 2.0 was developed with the following purposes in mind:

Beginners:

- Provide people not familiar with ecological connectivity with basic concepts and allow them to easily get familiar with the subject.
- Raise the awareness on the importance of ecological connectivity.

Experts:

- Elaborate homogenous datasets on important aspects of ecological connectivity covering the whole EUSALP perimeter and more detailed datasets in selected project working regions.
- Depict areas which are strategically important for ecological connectivity.
- Provide analysis tools which could be used in various sectors and for a multitude of applications.

A.3 Concepts

A.3.1 Continuum suitability indicators (CSI)

One core item of JECAMI is a set of indicators valuating the landscape with regard to their suitability as an ecological continuum. The continuum suitability indicators contain relevant factors for ecological connectivity:

- Land use indicator
- Population pressure indicator
- Environmental protection status indicator
- Topography and altitude indicator
- Fragmentation indicator
- Infrastructure indicator

A.3.2 Strategic Alpine Connectivity Areas (SACA)

Areas which are strategically important for ecological connectivity are subdivided into three types of strategic important areas. They are defined as follows:

- **SACA1**: Ecological conservation areas
- **SACA2**: Ecological Intervention areas
- **SACA3**: Connectivity restoration areas

The delimitation of the different SACA types is based on spatial analyses of the continuum suitability indicators.

B Getting started

B.1 JECAMI at a glance

JECAMI 2.0 provides several access possibilities for different user groups (section B.1.1) leading the user to the content relevant for the specific user group. The general composition of the mapping application is summarized in section B.1.2.

B.1.1 Access possibilities

Users not familiar with the topic choose the section “Ecology beyond borders”. It consists of games providing a hands-on access to ecological connectivity and on generalized data and tools on ecological connectivity. Experienced users choose one of the topics provided in the section “Ecological connectivity for experts” (Fig. 2).

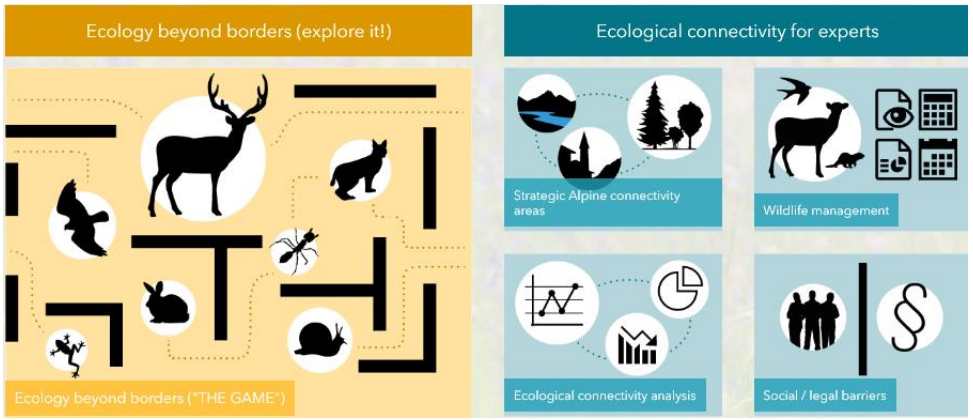


Fig. 2: Access possibilities

B.1.2 Mapping application

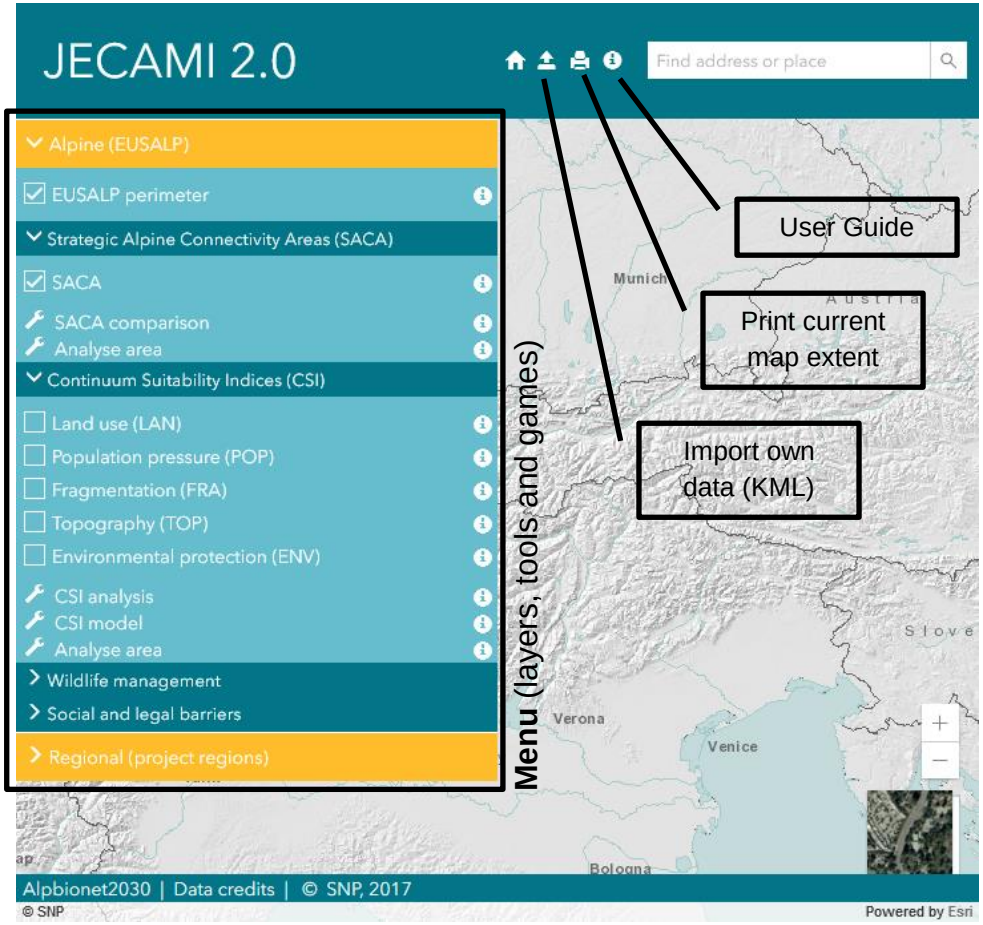


Fig. 3: Mapping and analysing application

Both versions of the mapping and analysing application consist of a header containing basic functions such as printing the current map extent, accessing the user guide, importing own data and/or selecting the language (Fig. 3). All layers, tools (🔧) and games (⊙) are ordered thematically in the menu and subdivided into an Alpine

(EUSALP perimeter) and a regional (project working regions) section. The extent of the EUSALP perimeter and the project working regions are shown in Fig. 4. Each element of the menu is described in an info box (ℹ) containing a legend and/or a link to the detailed documentation of the layer / tool.

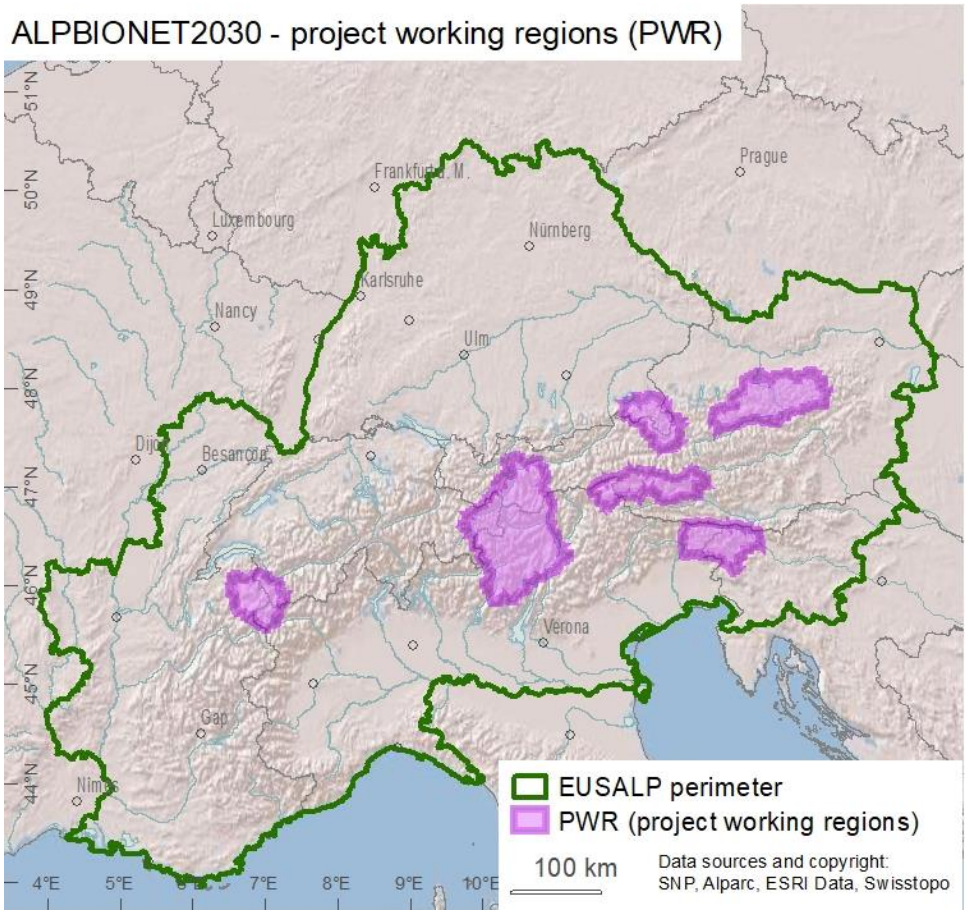


Fig. 4: Perimeters considered for the regional and Alpine analysis.

B.2 Tutorial for beginners

The tutorial shows by the example of a few use cases of the section “Ecology beyond borders” (Fig. 2) how the application works and how content is structured. Users looking for a comprehensive composition of all functions, datasets and tools are referred to section C.1.

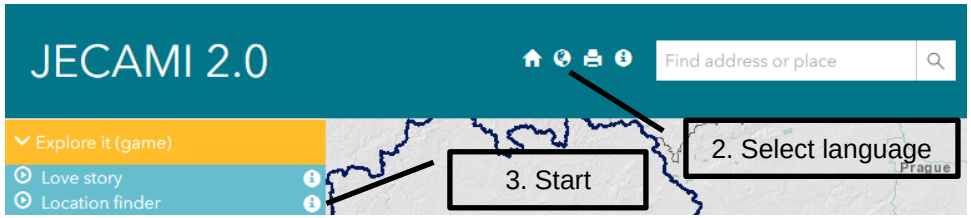
B.2.1 Game “Site identification”

B.2.1.1 Overview

In this example you get to know basic functionality of Jecami 2.0 and you are introduced to one out of three games – the “Site identification”. It shows various aspects of ecological connectivity based on real world data.

B.2.1.2 Step-by-step procedure

1. If you have not already done, read section B.1 in order to get to know how JECAMI 2.0 is structured in general.



2. Fig. 5: Tutorial of the game “Site identification” step 2 and 3.

3. Select language (Fig. 5). “Ecology beyond borders” is available in English and German (it will be available in additional languages soon).
4. Open the section “Explore it (game)” in the menu. Start the game “site identification” by clicking on it (Fig. 5).

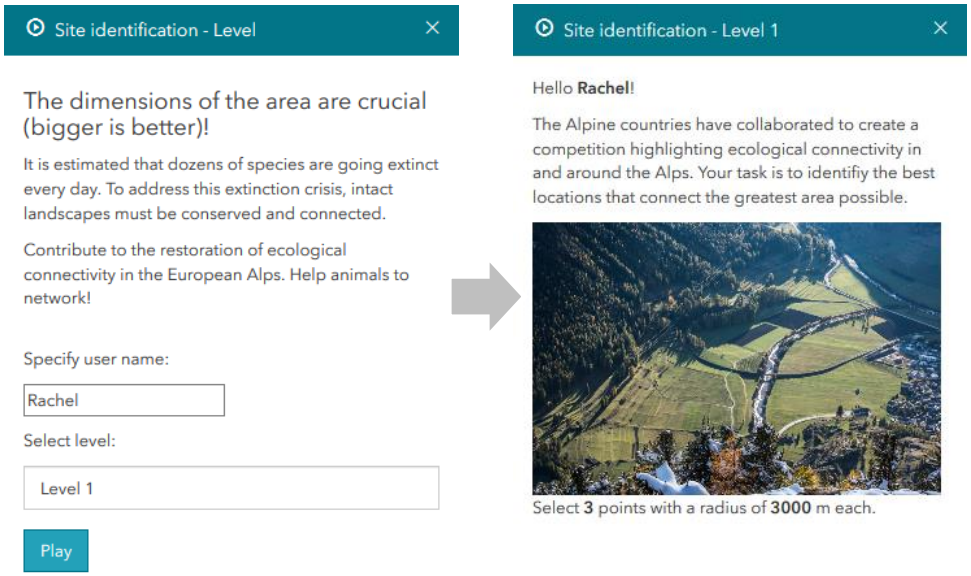


Fig. 6: Tutorial of the game “Site identification” step 4 and 5.

5. The click event opens a panel providing you with a short explanation on why ecological connectivity is important. At the bottom of the panel you need to specify a user name which will be used for the ranking and you can choose between three levels. Each level is linked to another story and is based on different scenarios for ecological connectivity.

6. Your task is to find locations where existing good quality areas could be connected and measures could be taken in order to improve the overall ecological situation. Depending on the level you have chosen, you can place a predefined amount of points with a predefined radius connecting high quality areas (Fig. 7). As soon as you are satisfied with your locations press the submit button in order to get your result.

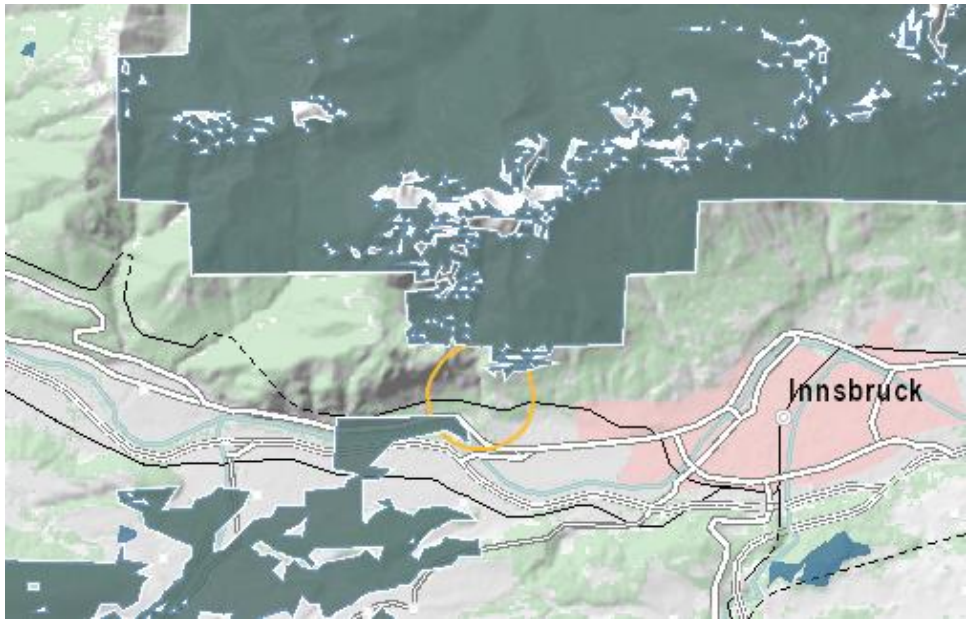


Fig. 7: Find places where high quality areas could be connected.

B.2.2 Strategic Alpine Connectivity Areas

B.2.2.1 Overview

In this example you get to know basic functionality of Jecami 2.0 and you are introduced to the SACA concept. SACAs are **S**trategic **A**lpine **C**onnectivity **A**reas. Three categories of SACAs are defined and identified:

- **SACA1**: Ecological conservation areas
  Areas where ecological connectivity works quite well (CSI ≥ 8)
  Recommendation: conservation of the status
- **SACA2**: Ecological Intervention areas
  Important links between SACA1; connectivity is (partly) working
  Recommendation: improvement / restoration measurements
- **SACA3**: Connectivity restoration areas
  Important barriers between SACA1
  Recommendation: remove barriers

B.2.2.2 Step-by-step procedure

1. Activate the regional or the Alpine strategic connectivity area layer in the menu (Fig. 8). Via the info sign you can access a short description of the layer and the corresponding legend. A link to further information (e.g. pdf-documents) is provided.

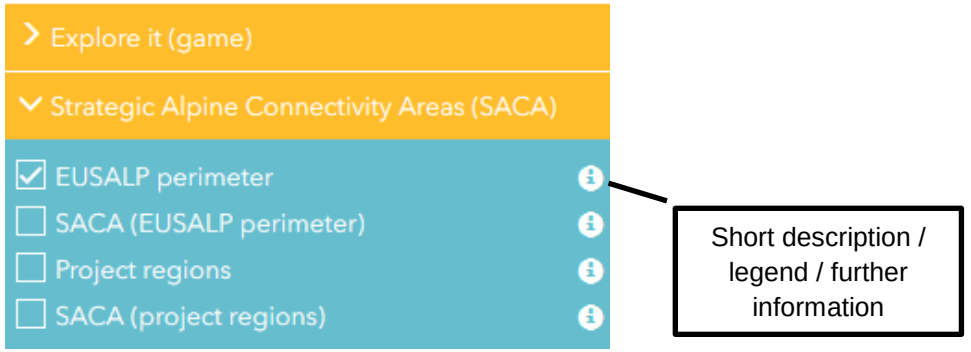


Fig. 8: Menu of the web application.

2. Go to a location you know well (zoom and pan OR search location).
3. Analyse the SACA distribution in the displayed region and compare it to your personal perception of the situation of ecological connectivity.
   ☞If you wish to go more into detail we refer to the experts' version where you can explore different aspects of ecological connectivity.
4. Export the current map extent with the displayed layers Fig. 9.

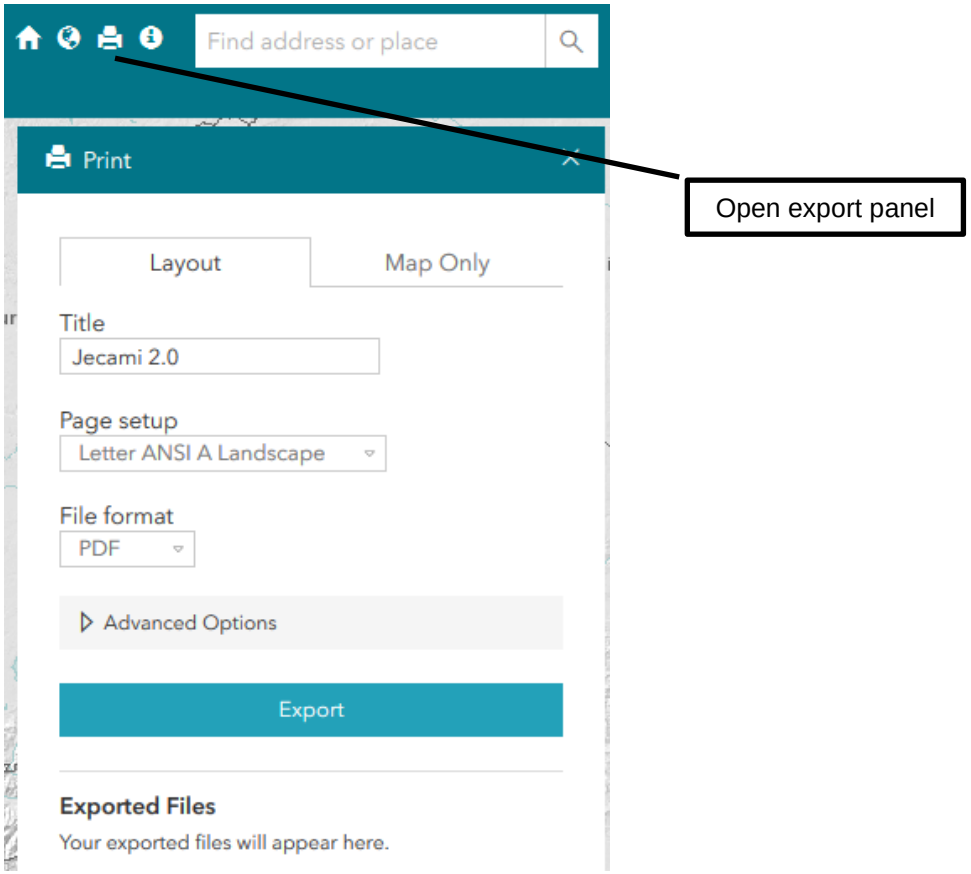


Fig. 9: Export the current map extent.

B.3 Tutorial for experts

The tutorial shows by the example of a few use cases how the application works and how content is structured. Users looking for a comprehensive composition of all functions, datasets and tools are referred to section C.2.

B.3.1 CSI analysis

B.3.1.1 Overview

In this example you learn to know basic functionality of Jecami 2.0 and you are introduced to the “CSI analysis” tool. The continuum suitability indices (CSI) are a set of indicators of relevant factors for the ecological connectivity. The landscape is analysed with regard to their quality as an ecological continuum and classified accordingly. The CSI analysis tool calculates the average of each indicator for a specified area.

B.3.1.2 Step-by-step procedure

1. If you have not already done, read section B.1 in order to get to know how JECAMI 2.0 is structured in general.
2. Open the “Continuum Suitability Indices (CSI)” subsection in the “Alpine (EUSALP)” section. Start the tool “CSI analysis” by clicking on it (Fig. 10).
3. Specify the data extent for the CSI analysis. Click the button “Draw extent” (Fig. 11). It enables you to draw a polygon on the map.
4. Select the “Alpine (EUSALP)” data (Fig. 11).

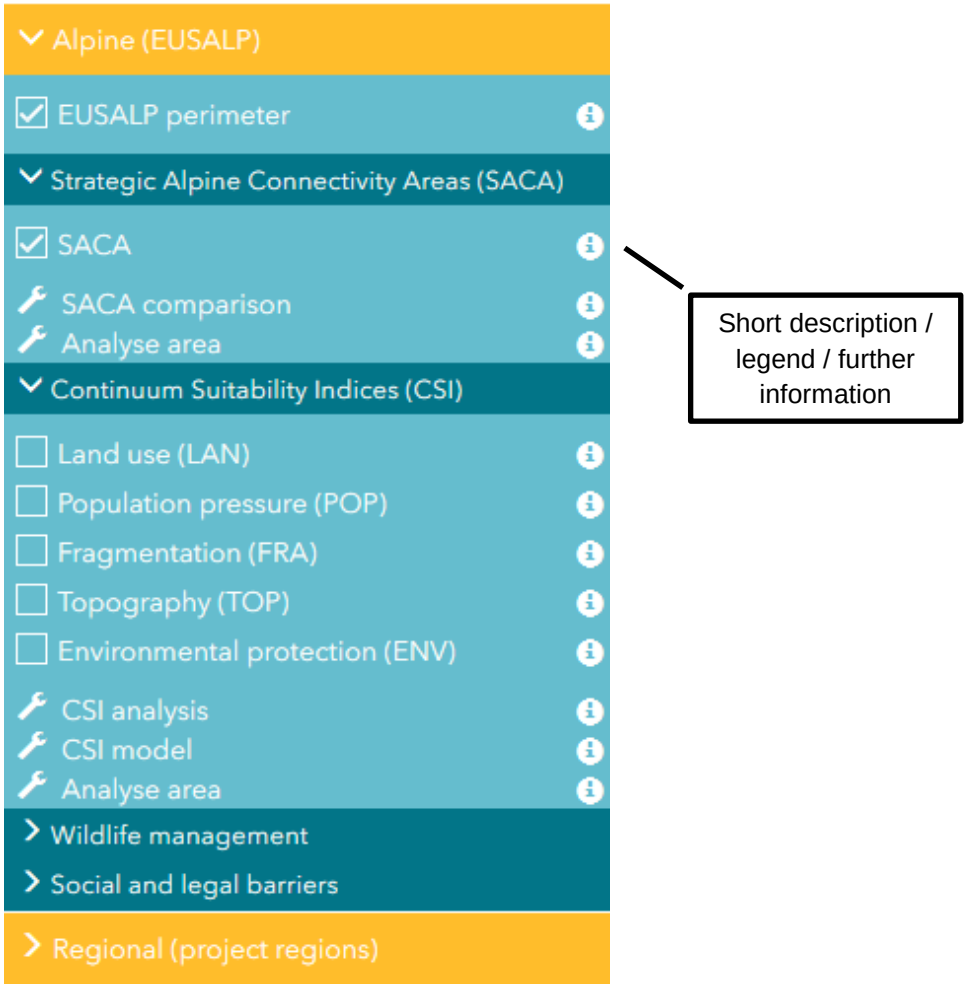


Fig. 10: Menu of the web mapping and analysing application.

5. Start the CSI analysis tool by clicking on the “Analyse CSI” button (Fig. 11). Depending on the drawn extent this may take some time.

6. After completion a panel showing the CSI analysis result and the current map extent with the area of investigation is displayed. You can export it as a PDF file.

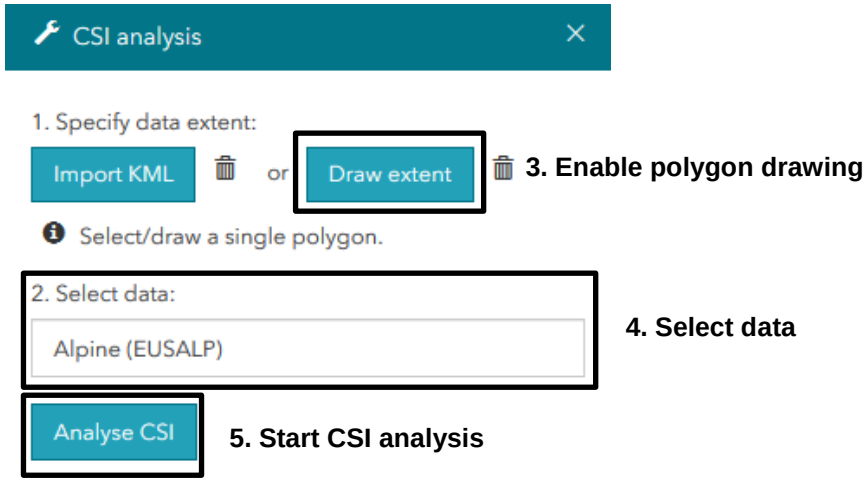


Fig. 11: “CSI analysis” panel.

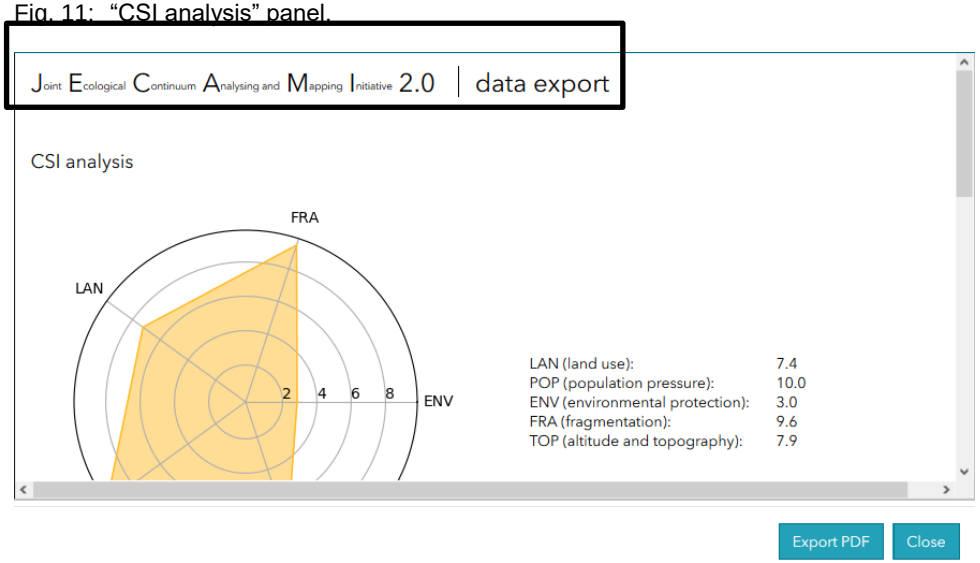


Fig. 12: “CSI analysis” result.

B.3.2 CSI model

B.3.2.1 Overview

In this example you learn to know basic functionality of Jecami 2.0 and you are introduced to the “CSI model” tool. The CSI model tool allows you to calculate the weighted mean of combinations of the different CSI indicators and to display it.

B.3.2.2 Step-by-step procedure

Upload your own data (optional):

1. Convert your data (e.g. hotspots, corridors or species distribution) into a KML file. A maximum file size of 2.5 MB is allowed.
2. Start the import panel by clicking on the import button in the header (Fig. 13).

Fig. 13: Header of the web mapping and analysing application. The import button is marked.

3. Fill in the required fields in the “Import own data” panel (Fig. 14), browse files and specify the geometry of the data. If your file contains several geometries only the selected one will be used. Click the “Upload file” button. Depending on the file size this may take some time.
4. After completion of the upload a panel is displayed where you can choose the attribute field to be used for classification (Fig. 15).
5. The data is then displayed on the map (Fig. 16). You can access the attributes of individual features by clicking on them. The layer is also listed in the “My documents” section of the menu (Fig. 16). You can toggle the visibility of your layer. By clicking on the settings sign (⚙) you can access the section where you can delete your layer, change its opacity or access the legend.

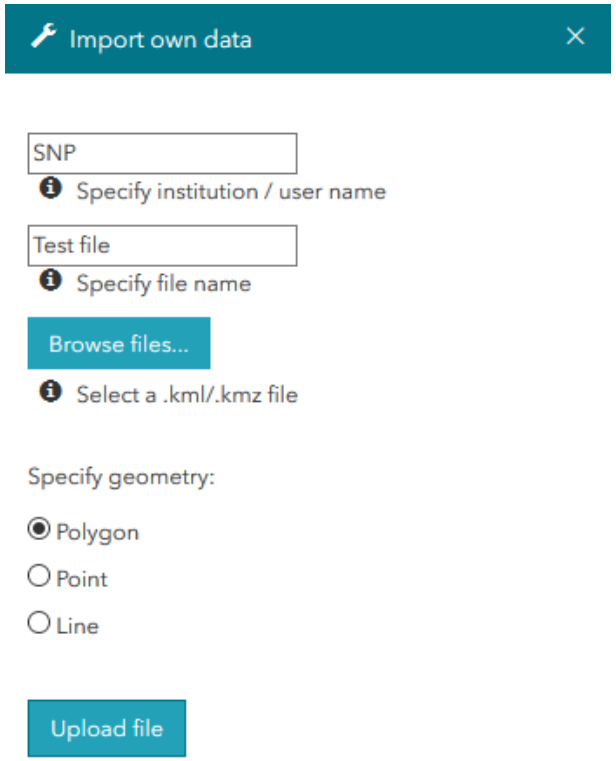


Fig. 14: “Import own data” panel.

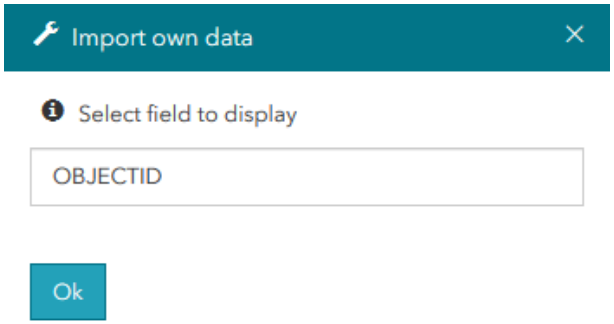


Fig. 15: Select attribute field to be used for classification.

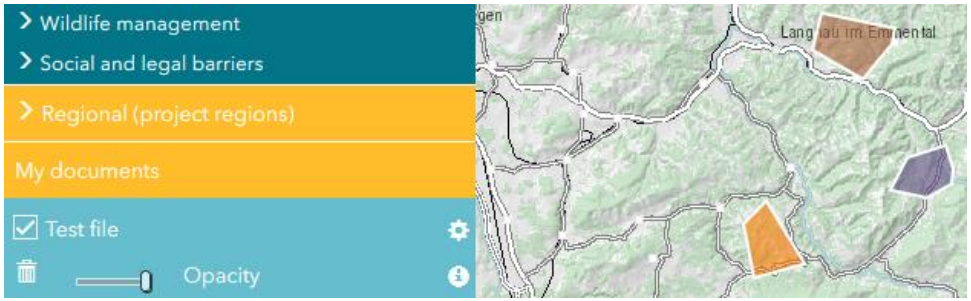


Fig. 16: Example of KML data import.

CSI model tool

6. Open the “Continuum Suitability Indices (CSI)” subsection in the “Alpine (EUSALP)” section. Start the tool “CSI model” by clicking on it (Fig. 10).
7. Choose a combination of indicators you are interested in and click then the “Calculate CSI” button (Fig. 17). The CSI model will be displayed on the map (Fig. 18).
8. You can now export your result. Click on the export button (🖶) in the header in order to access the print panel. The print function exports the current map in various formats and with many options you can choose.

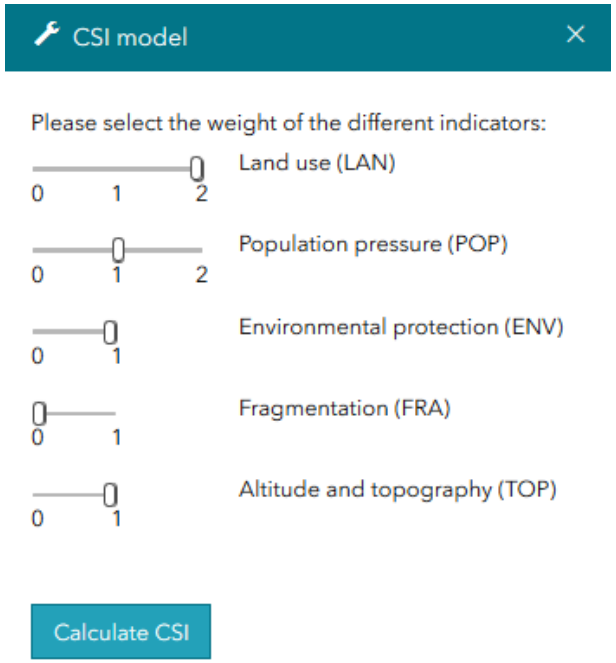


Fig. 17: “CSI model” panel.

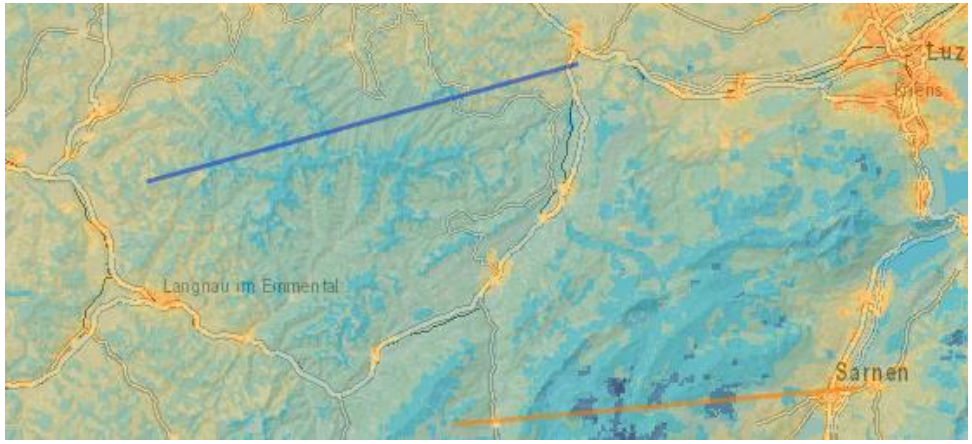


Fig. 18: Example of a “CSI model” result. The lines are test layers representing data uploaded by the user.

C Reference manual

The reference manual is not yet complete. It will be updated on a regular base in parallel with the development of the web mapping and analysing application.

C.1 Ecology beyond borders (explore it!)

C.1.1 Layers

The following layers are included:

- **EUSALP Perimeter**: Perimeter of the macroregional strategy for the Alpine area
- **Project regions:** Perimeter for in-depth analyses and investigations as well as for case-studies.

C.1.2 Games

C.1.2.1 Love story

The game “Love story” deals with dispersal difficulties of specific species. By the example of roe deer, brown hare and wildcats you discover various barriers between populations. In the game you help individual animals to find a partner. Select the game in the menu in order to start it and follow the instructions. Good luck!

C.1.2.2 Site identification

The game “Site identification” deals with the fragmentation of suitable landscape. On the basis of three examples you are asked to find location where especially large areas can be connected ecologically. Select the game in the menu in order to start it and follow the instructions. Good luck!

C.2 Ecological connectivity for experts

C.2.1 Layers

C.2.1.1 Alpine (EUSALP perimeter)

The following layers are included:

- **EUSALP Perimeter**: Perimeter of the macroregional strategy for the Alpine area
- **Environmental protection (ENV)**: Measure of ecological integrity. Protected areas are classified based on their legal protection status. The classification ranges from 0 (no protection) to 10 (strict conservation status; no economic use).
- **Fragmentation (FRA)**: Representation of the influence of landscape fragmentation on ecological connectivity. Fragmentation is expressed as the effective mesh density.
- **Land use (LAN)**: Classification of land use categories according to their influence on ecological connectivity and based on principles of sustainability.
- **Population pressure (POP)**: Classification of human pressure on ecological connectivity. It is expressed as a combination of permanent inhabitants and tourism demand.
- **Topography (TOP)**: Representation of ecological networks at lower altitude and the topographic influence on dispersal axes. Altitude and slope are classified from 0 to 10 and combined within the topography indicator.

C.2.1.2 Regional (project working regions)

Under construction

C.2.2 Tools

C.2.2.1 Analyse area

Under construction

C.2.2.2 CSI analysis

The “CSI analysis” tool calculates the average of the individual continuum suitability indicators within a given area. The Alpine analysis contains the indicators LAN, POP, ENV, TOP and FRA. The regional analysis additionally includes the indicator INF.

Start the tool by selecting it in the menu. A panel opens where you can choose to define the extent either by drawing on the map or by uploading a .KML file. In a second step you can choose whether the analysis shall be conducted with the Alpine or the regional dataset. The results are displayed in a window and can be exported as a .PDF file.

C.2.2.3 CSI model

Depending on your problem different combinations of the individual CSI indicators may be needed. The “CSI model” tool allows you to calculate the weighted mean of several continuum suitability indicators.

Start the tool by selecting it in the menu. A panel opens where you can change the weight of the individual indicators by moving them with the pointer. When you have chosen the desired combination, you can click on the “Calculate CSI” button in order to get the result.

D References

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Pimm, S. L., Jenkins, C. N., Abell, R., Brooks, T. M., Gittleman, J. L., Joppa, L. N., Raven, P. H., Roberts, C. M., Sexton, J. O., 2014, The biodiversity of species and their rates of extinction, distribution, and protection, *Science* **344**(6187).

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Stein, B. A., Staudt, A., Cross, M. S., Dubois, N. S., Enquist, C., Griffis, R., Hansen, L. J., Hellmann, J. J., Lawler, J. J., Nelson, E. J., 2013, Preparing for and managing change: climate adaptation for biodiversity and ecosystems, *Frontiers in Ecology and the Environment* **11**(9)**:**502-510.

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