Funded by

Bundesministerium
für Bildung
und Forschung

TECHNISCHE UNIVERSITÄT DRESDEN

Multi-criteria decision analysis for suitability mapping with the INOWAS platform

Tutorial 4: MAR suitability analysis with three criteria

INOWAS

MAR Junior Research Group

The INOWAS Platform

The INOWAS platform is a free web-based platform to provide a collection of simple, practical and reliable tools to solve groundwater related issues.

This tutorial uses the Tool 5 - "**GIS Multi criteria decision analysis**" to create suitability maps for MAR location analysis.

The benefits of creating suitability maps on the platform:

- ✓ **1. User-friendly** (easy to access, free)
- ✓ **2. Shareable maps** (shared via platform or download)
- ✓ **3. Intuitive results visualization**

Introduction

This tutorial provides an overview of the "**GIS Multi criteria decision analysis**" tool on the INOWAS platform and guides users to create a simple **suitability map** with three criteria through the platform.

More information about the tool can be found on the respective documentation page:

https://inowas.com/tools/t05-gis-mcda/

The tutorial takes about 30 min for completion.

Before you start, please register your user account here: https://inowas.com/

Example background

The tutorial uses multi-criteria decision analysis (MCDA) to create a suitability map from three criteria (=GIS maps). The following maps will be used and are provided through a download here:

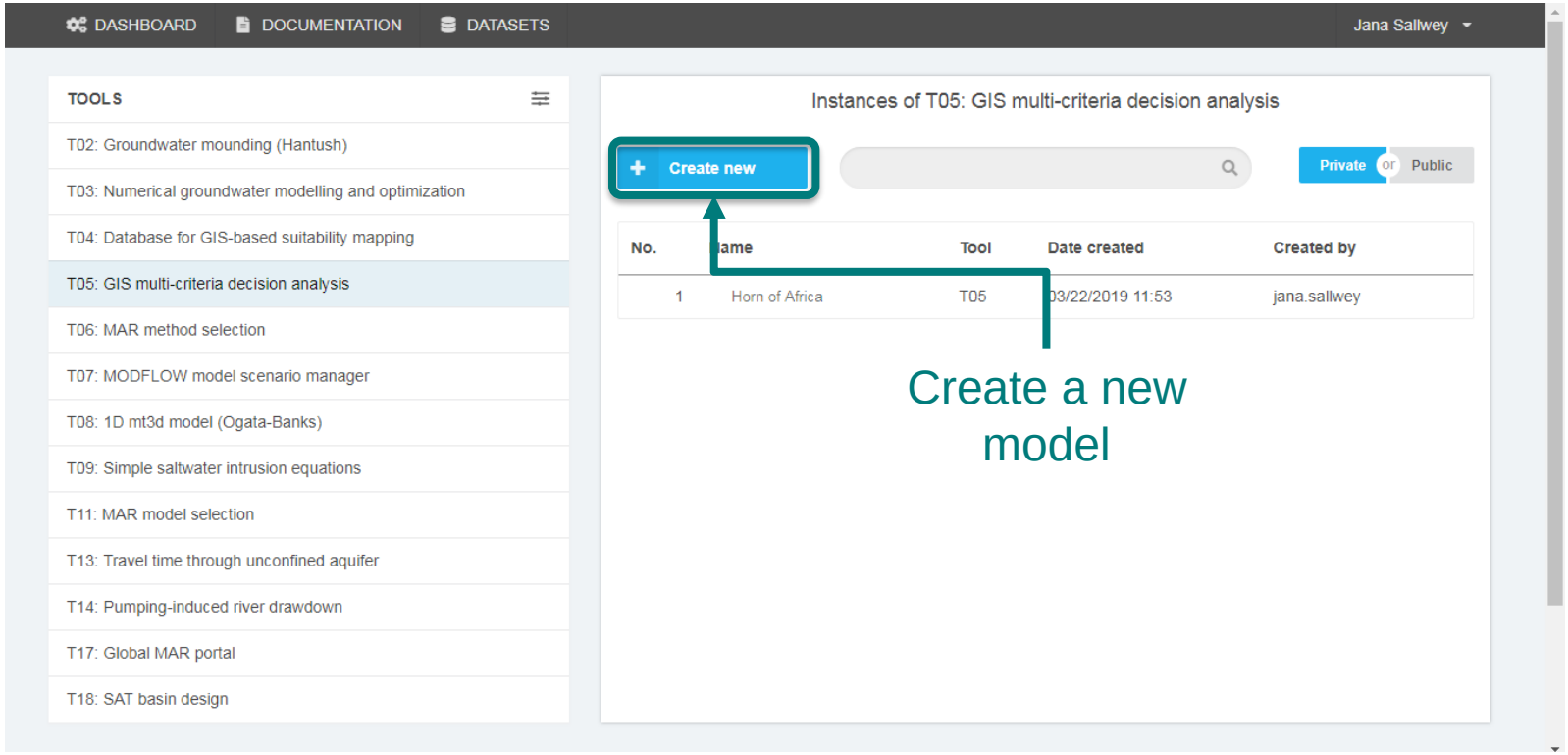
1. Slope
2. Geology
3. Land cover

All maps are provided as simplified 10x10 raster files (tiff-file). The user is guided through MCDA steps, namely:

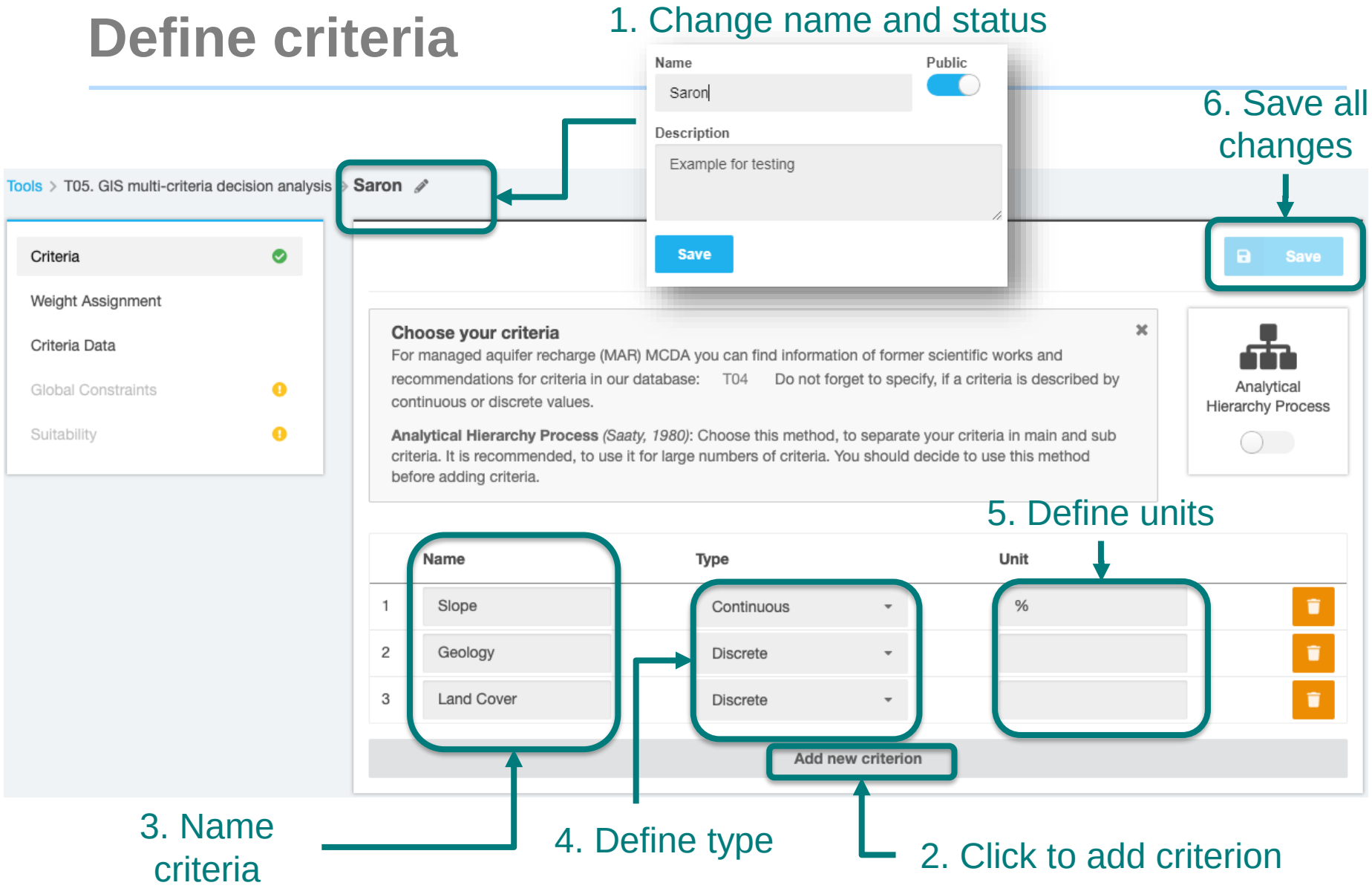
- Criteria definition
- Weight assignment
- Criteria standardization and reclassification
- Constraint mapping
- Decision Rules

Create a new model on the platform

Step 1. Log in to the web-based INOWAS platform
Step 2. Navigate to the dashboard and select “T05. GIS multi-criteria decision analysis”
Step 3. Create a new model by clicking on the “Create new” button

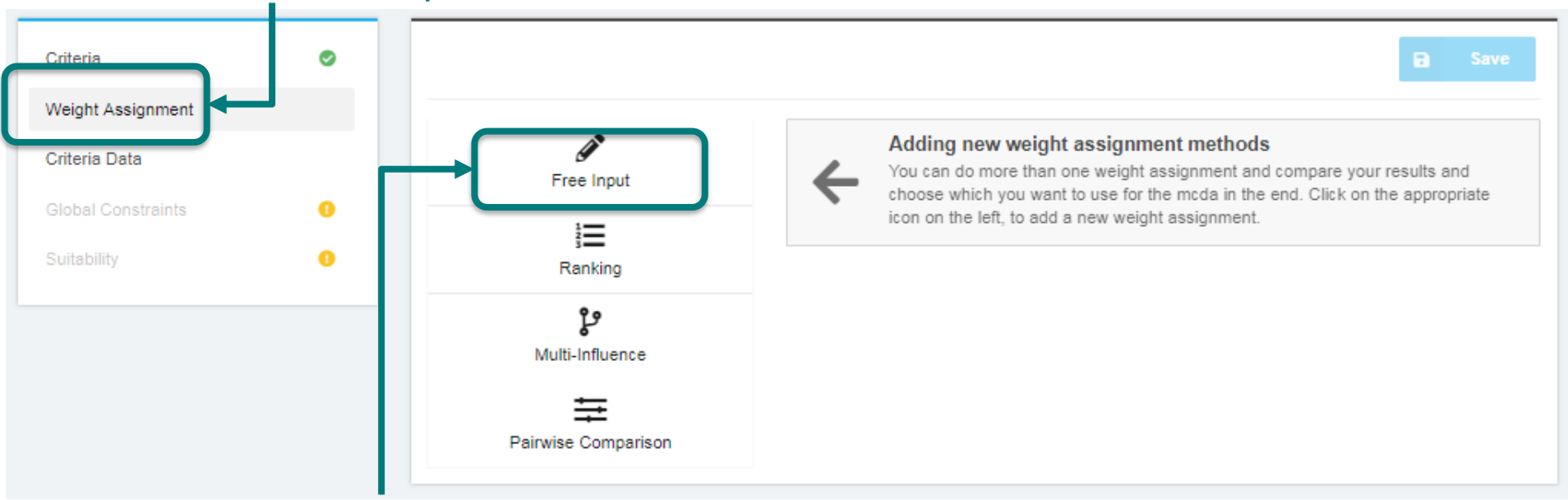


Define criteria



Assign weights to criteria

1. Click weight assignment to proceed to next step



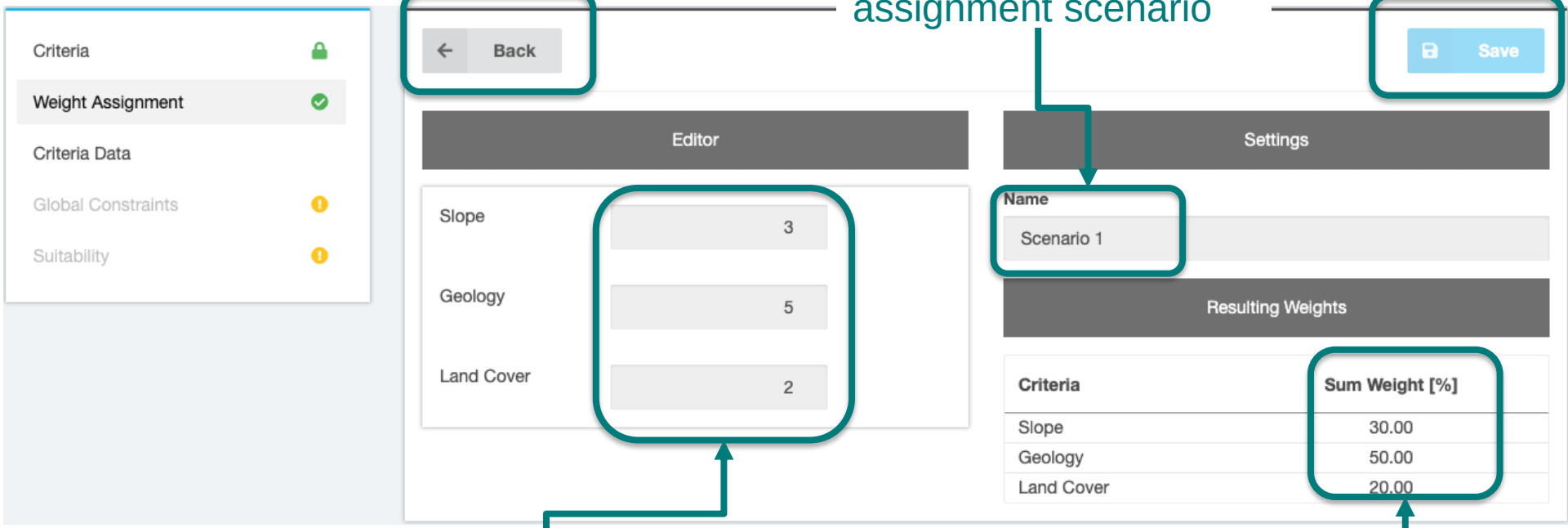
Four different weight assignment methods are available, the user can choose one or various methods for comparison.
For this tutorial we will test all methods.
2. Start Free input by clicking it.

Weight assignment – Free input

4. Go back to menu

3. Save changes

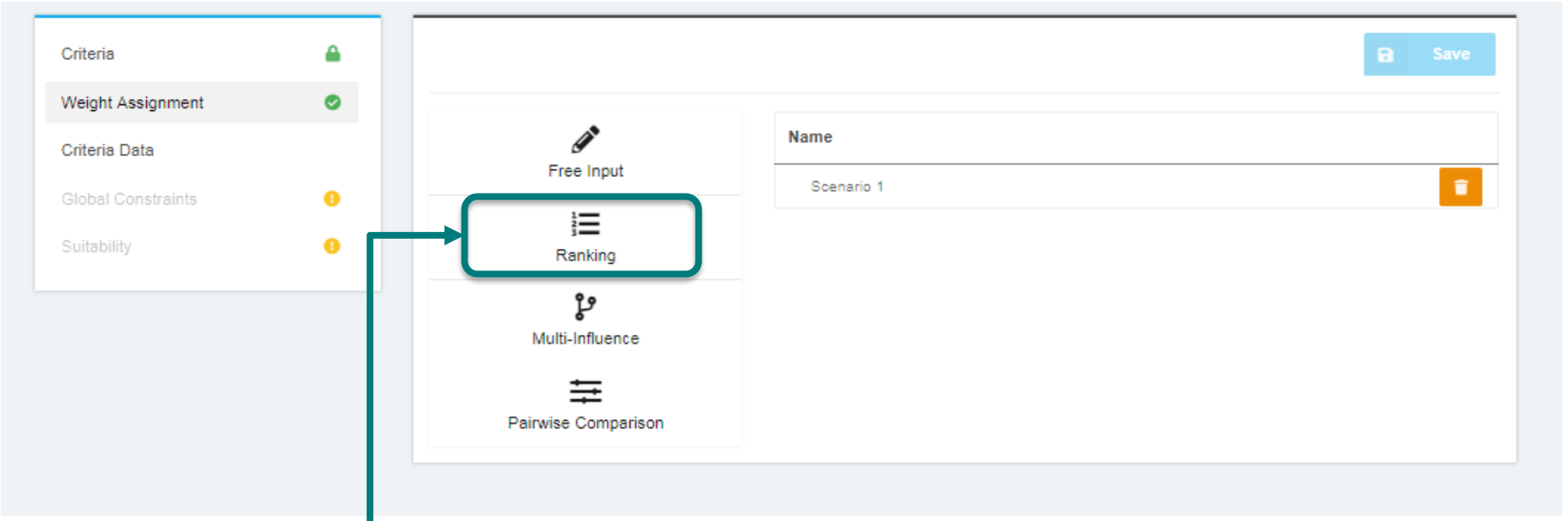
2. Name weight assignment scenario



1. Assign weights to criteria by giving the highest number to the most important criterion (range of weights is defined by user)

Standardized weights are calculated automatically

Assign weights to criteria



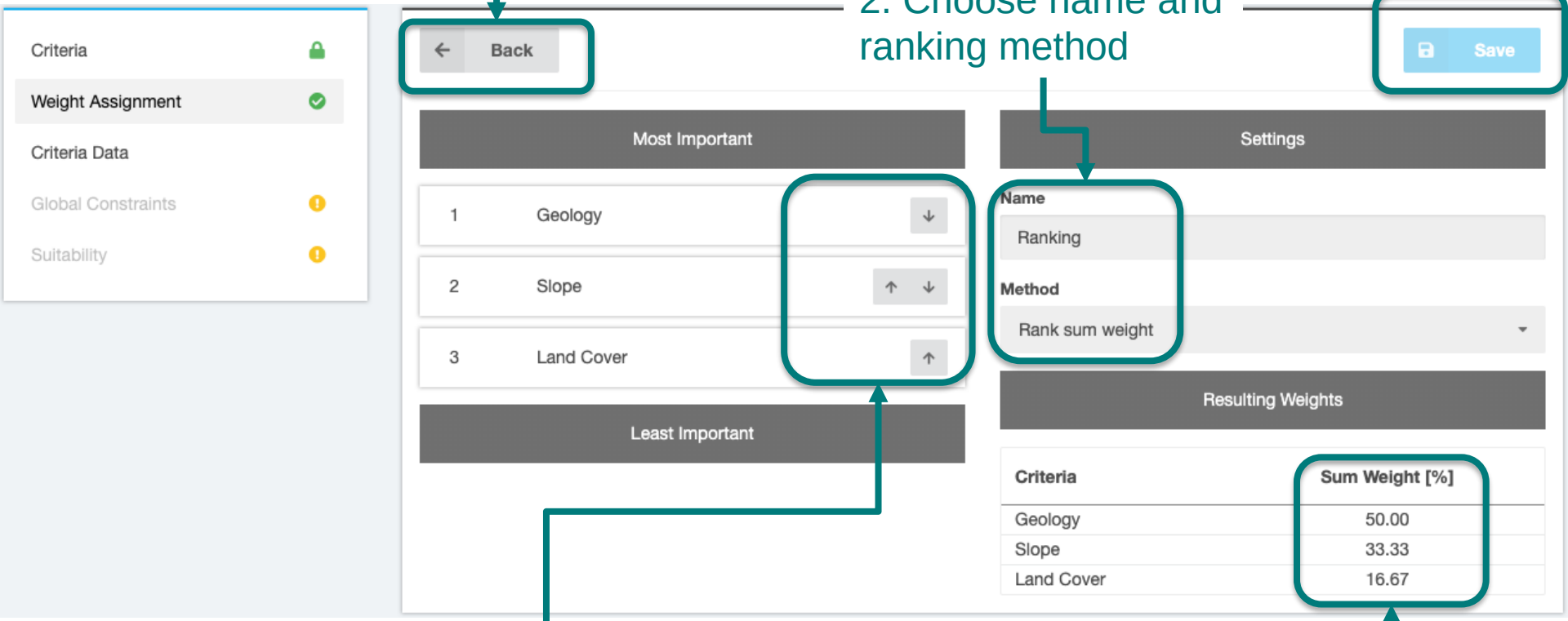
Choose ranking method by clicking it.

Weight assignment – Ranking

3. Save changes

4. Go back to menu

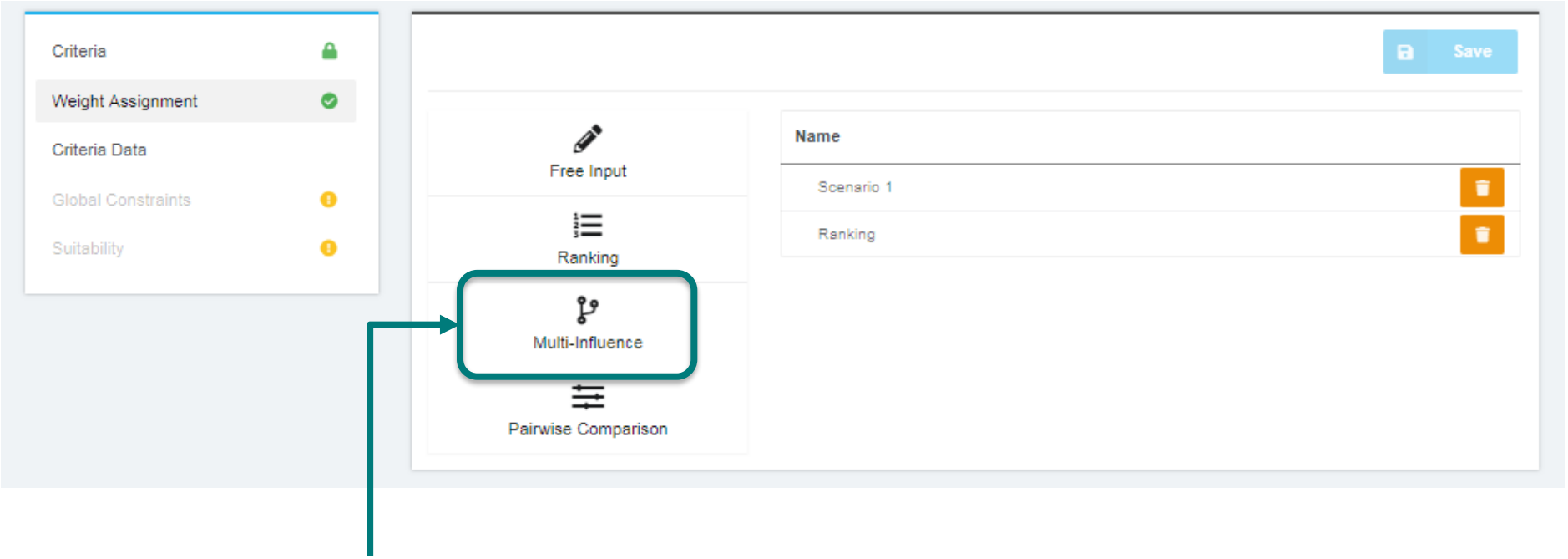
2. Choose name and ranking method



1. Rank criteria by clicking the up and down arrows

Standardized weights are calculated automatically

Assign weights to criteria

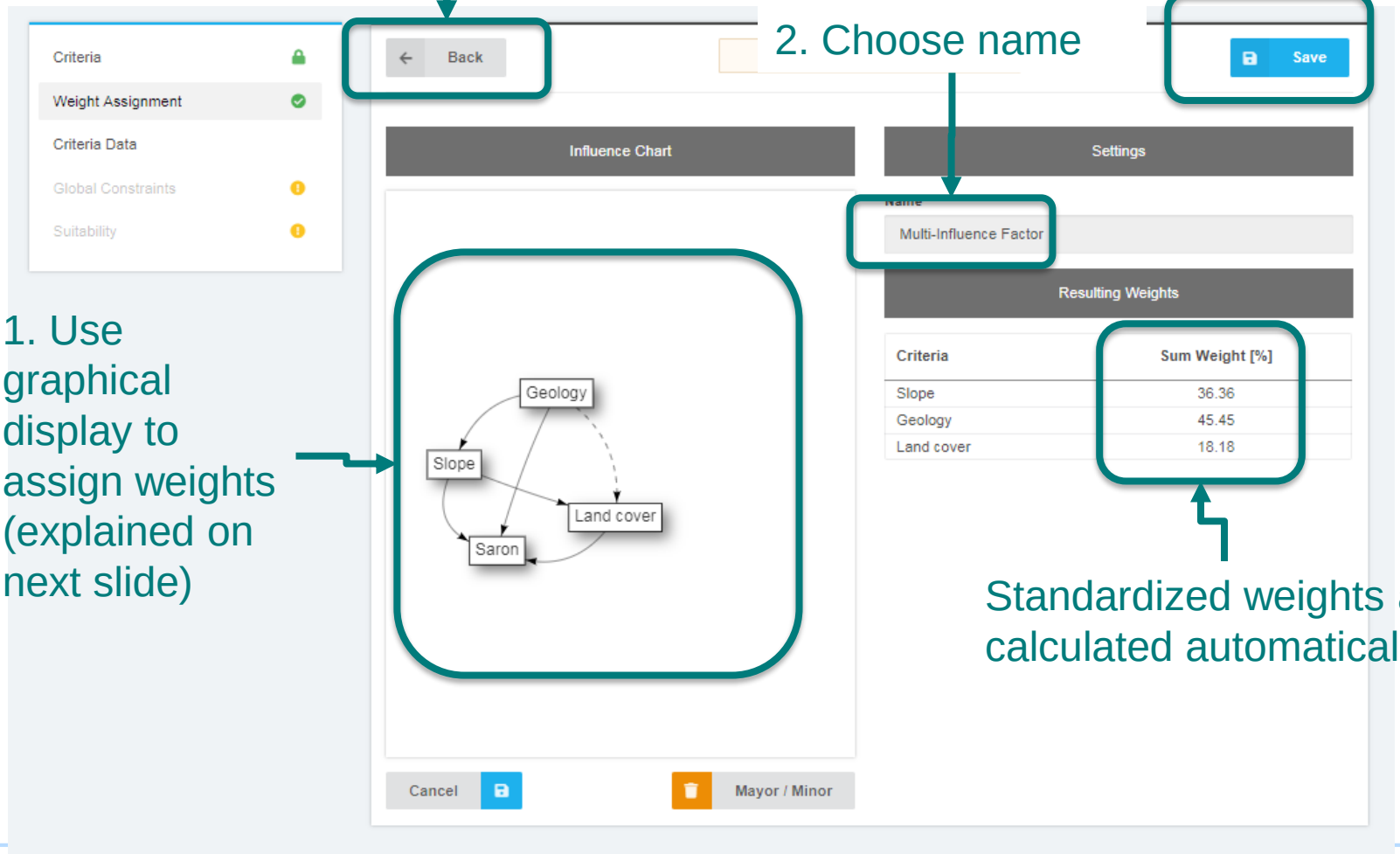


Choose multi-influence method by clicking it.

Weight assignment – Multi influence

3. Save changes

4. Go back to menu



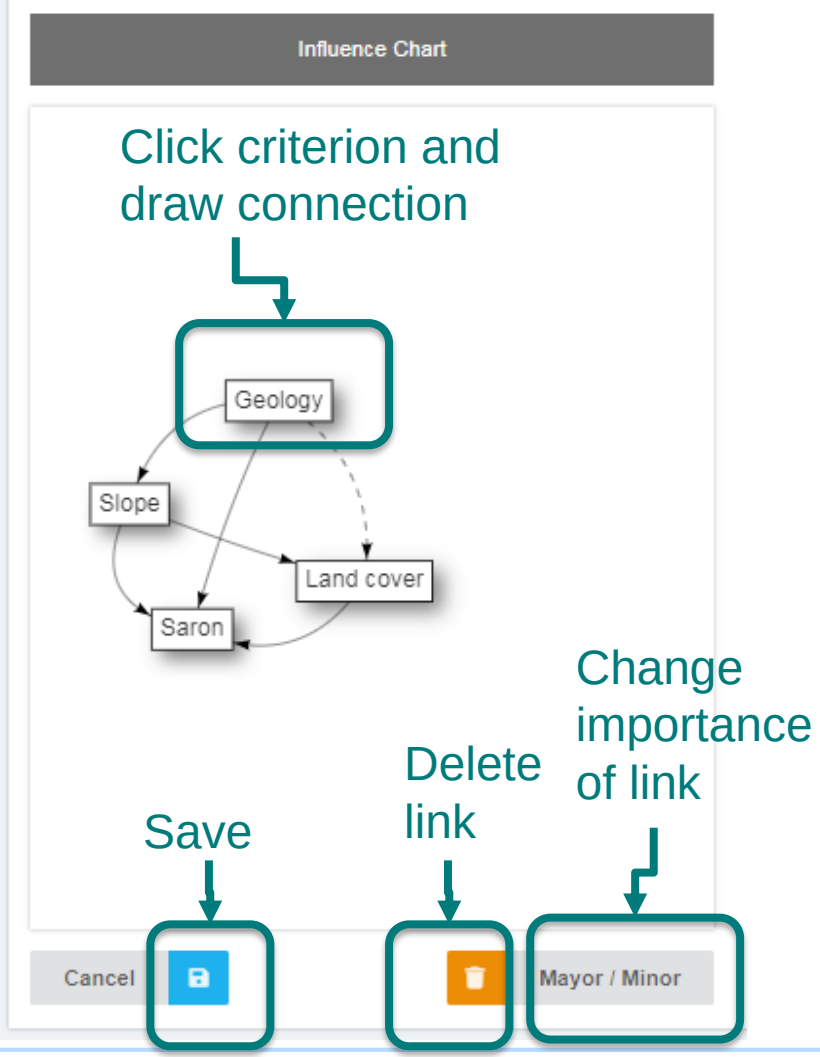
1. Use graphical display to assign weights (explained on next slide)

Standardized weights are calculated automatically

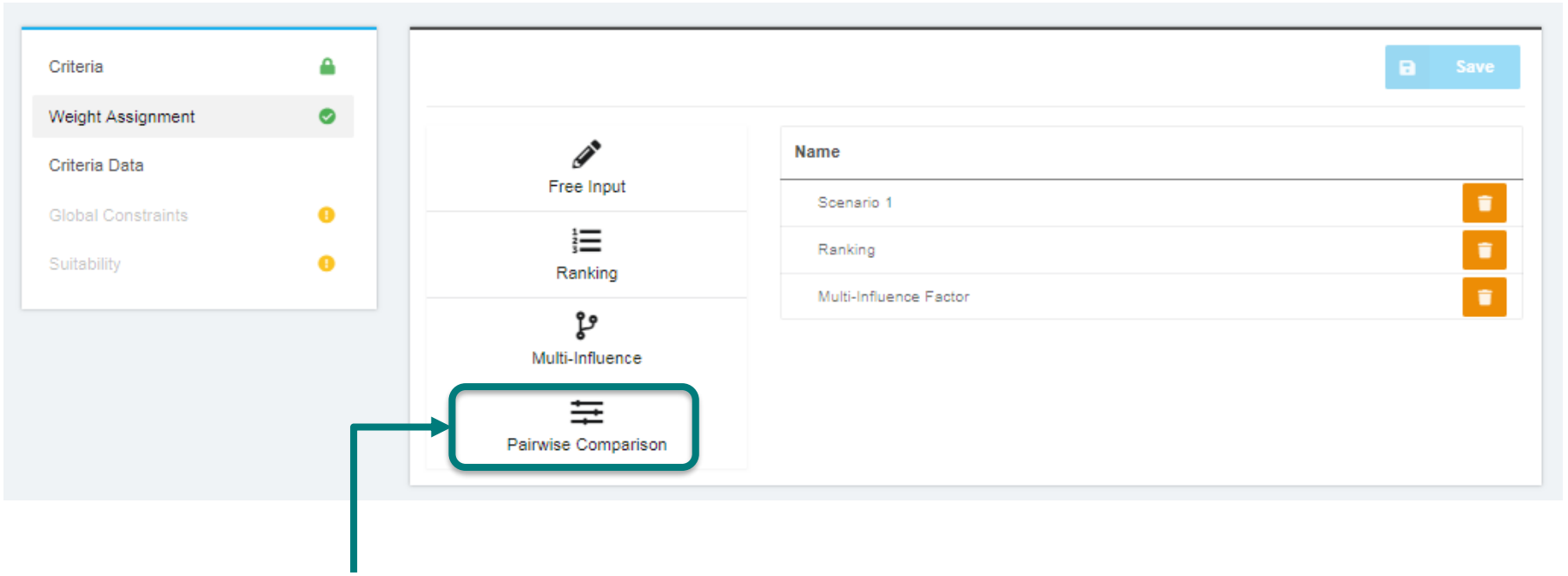
Weight assignment – Multi influence

Steps for multi influence method:

1. Click: Start editing
2. Click on a criterion and then draw a connection to another criterion or the project itself to indicate that they influence each other (arrow appears)
3. Click on an arrow and then the major/minor button to change importance of link for geology/land cover link. Minor links are indicated by dashed lines.
4. Save changes



Assign weights to criteria



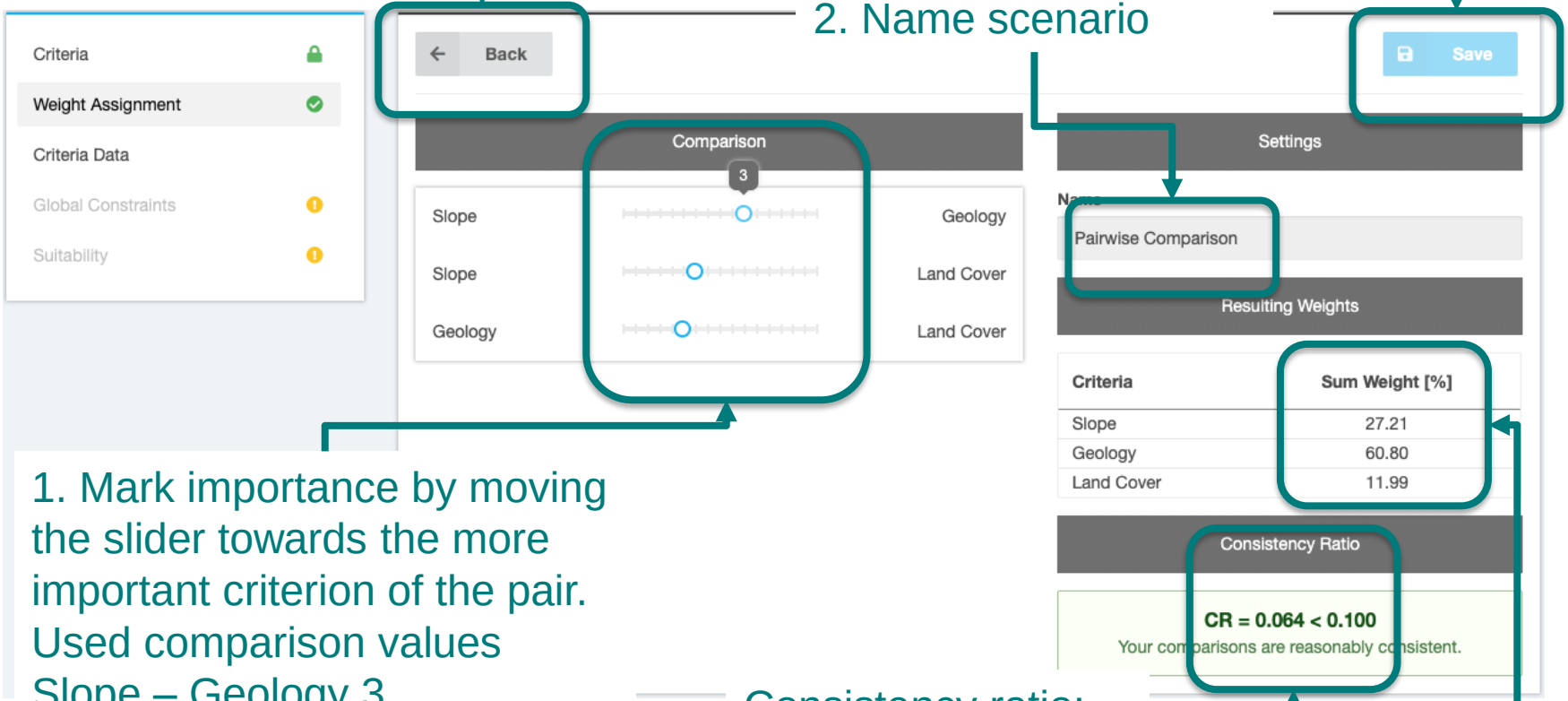
Choose pairwise comparison by clicking it.

Weight assignment – Pairwise comparison

4. Go back to menu

3. Save changes

2. Name scenario



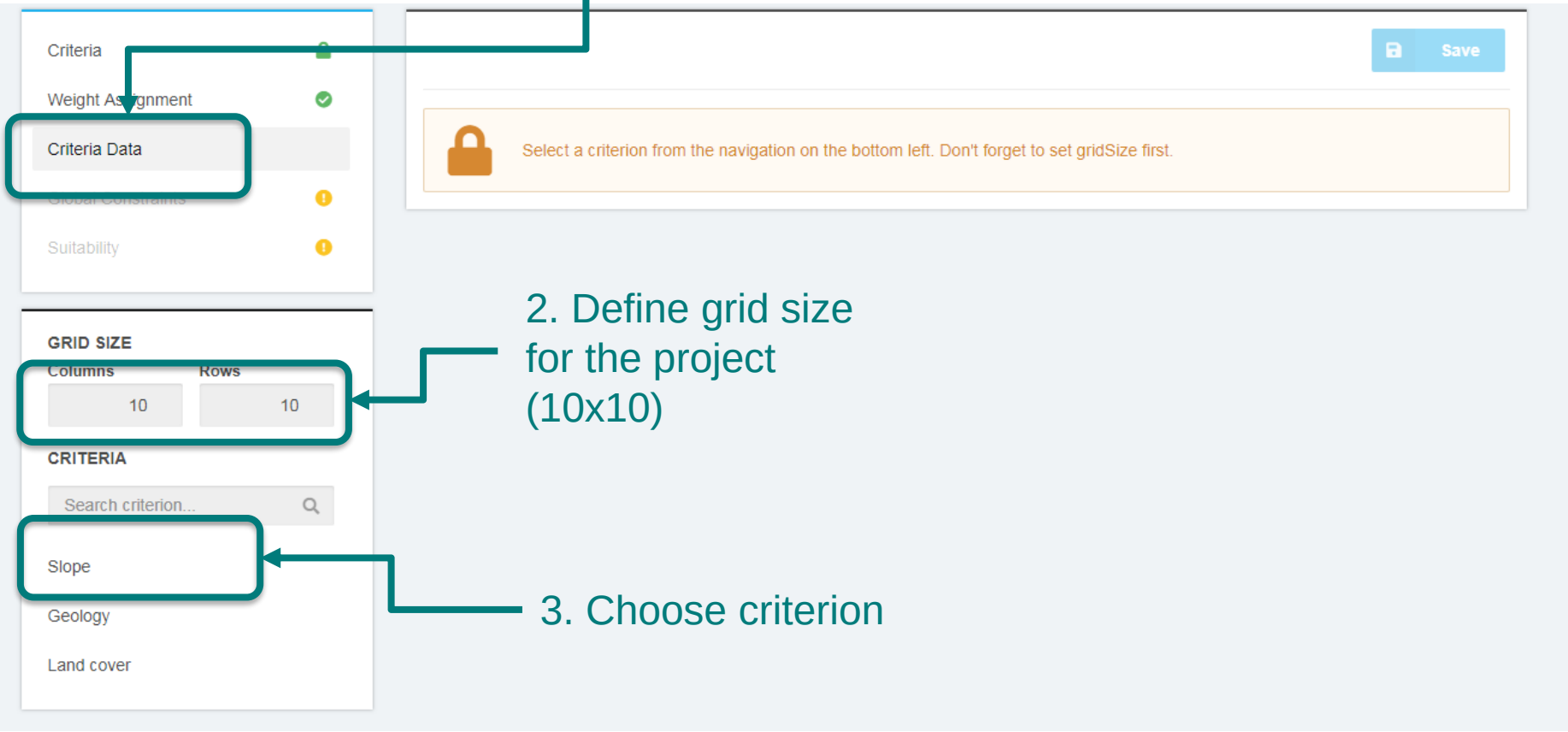
1. Mark importance by moving the slider towards the more important criterion of the pair.
Used comparison values
Slope – Geology 3
Slope – Land cover -3
Geology – Land cover -4

Consistency ratio: shows robustness of comparison, should be below 0.1

Standardized weights

Criteria upload

1. Click on criteria data to start uploading data

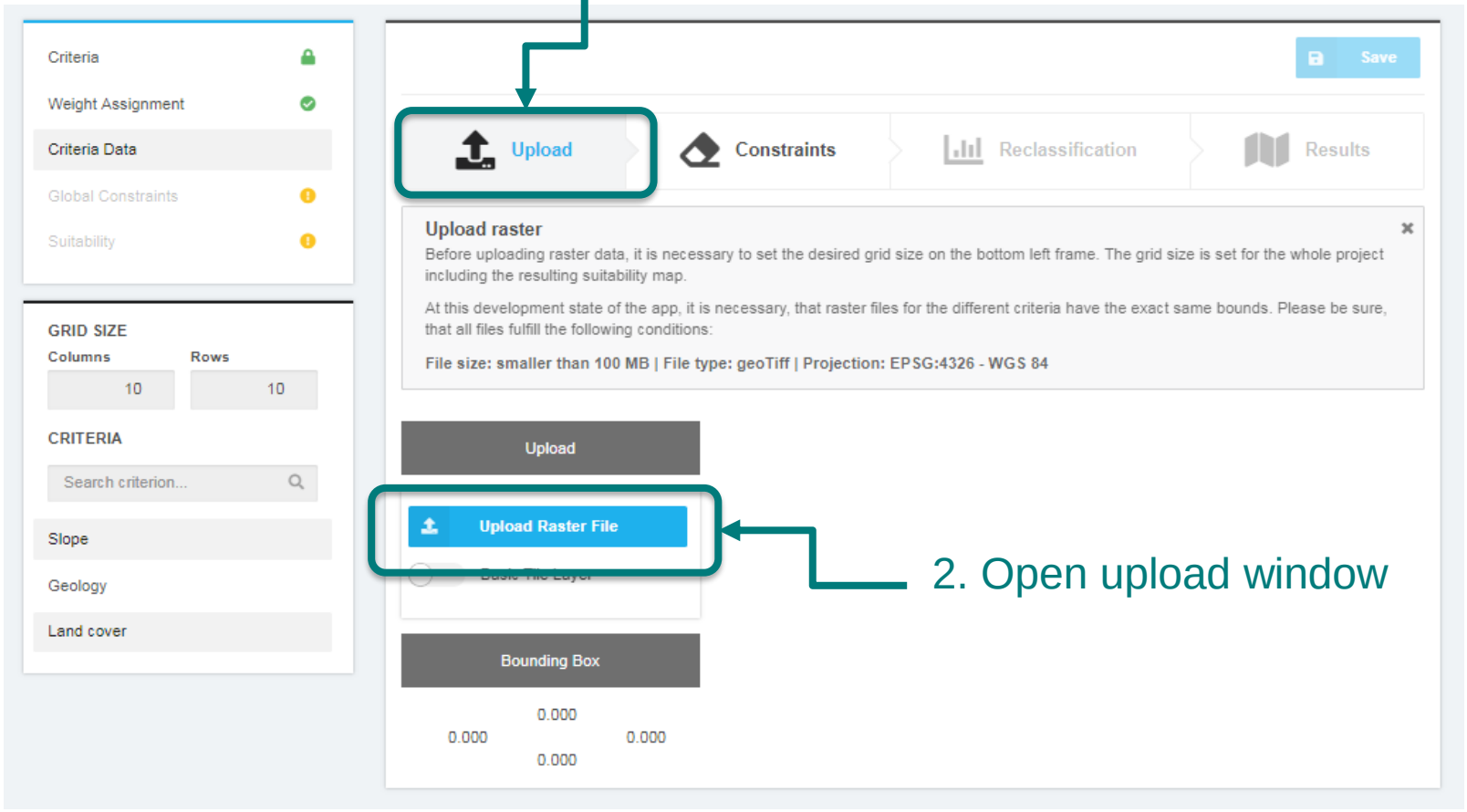


2. Define grid size for the project (10x10)

3. Choose criterion

Criteria upload

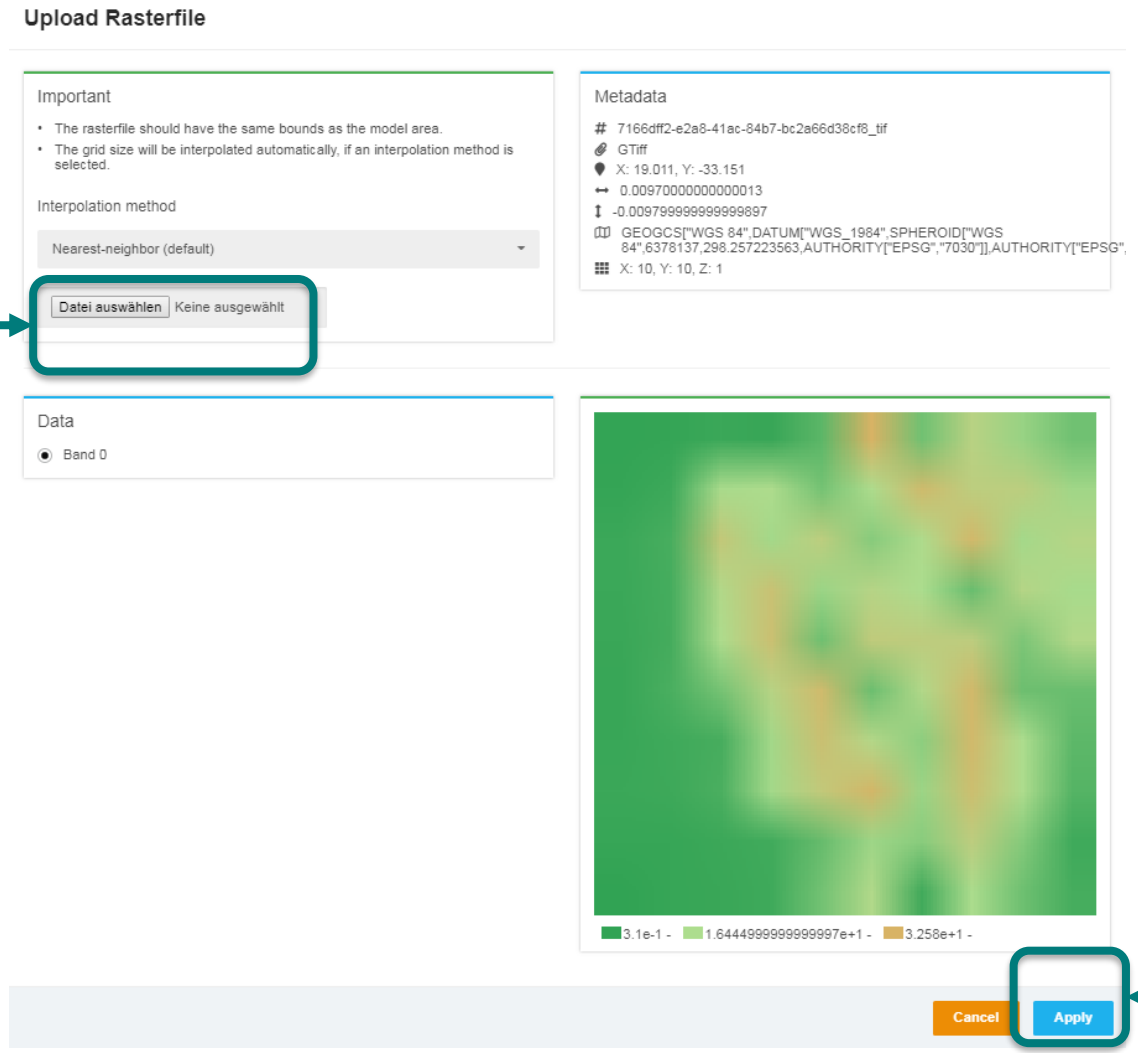
1. Click to start data upload



2. Open upload window

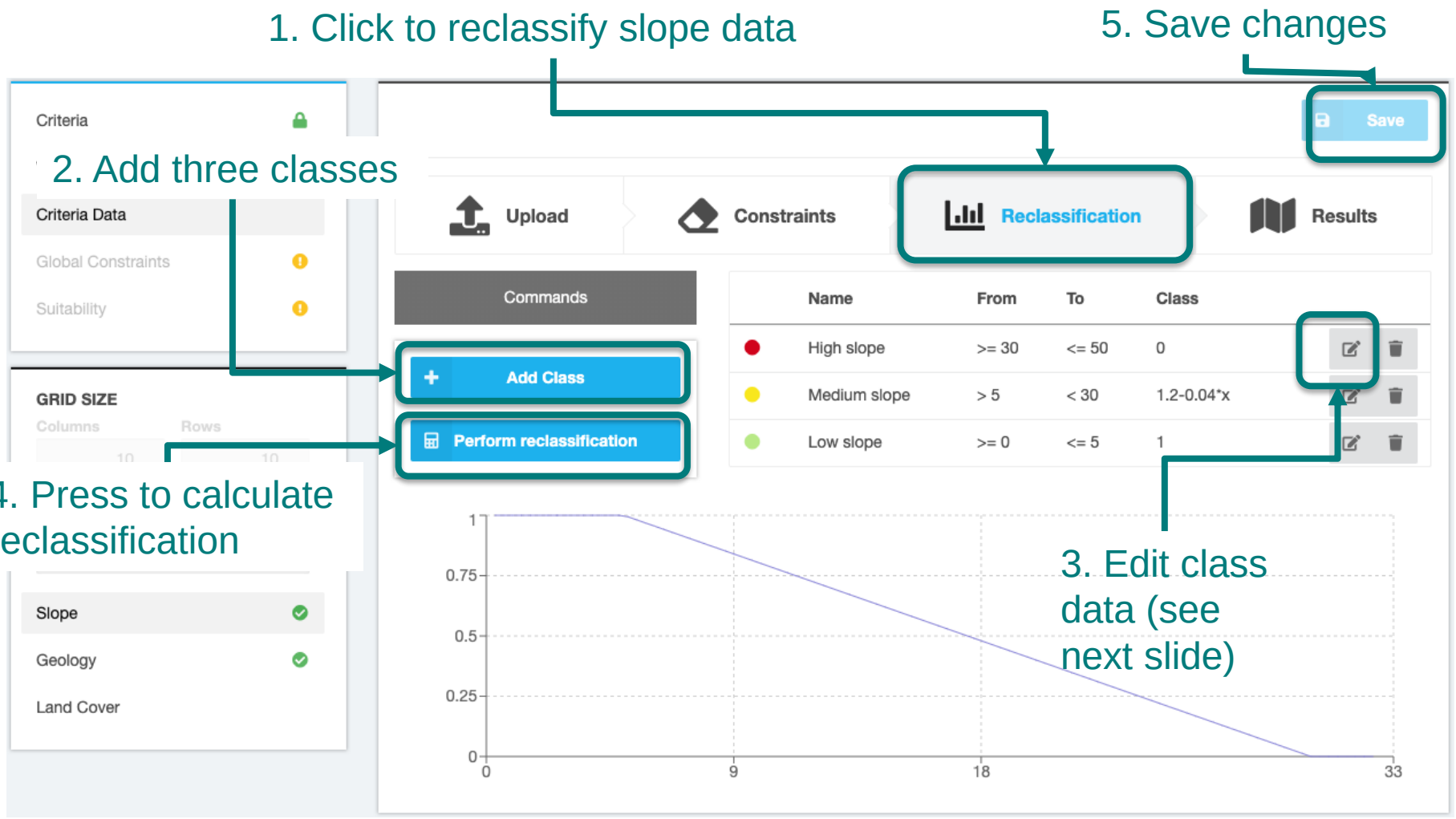
Criteria upload

1. Choose file for data upload (slope.tiff)



2. Upload

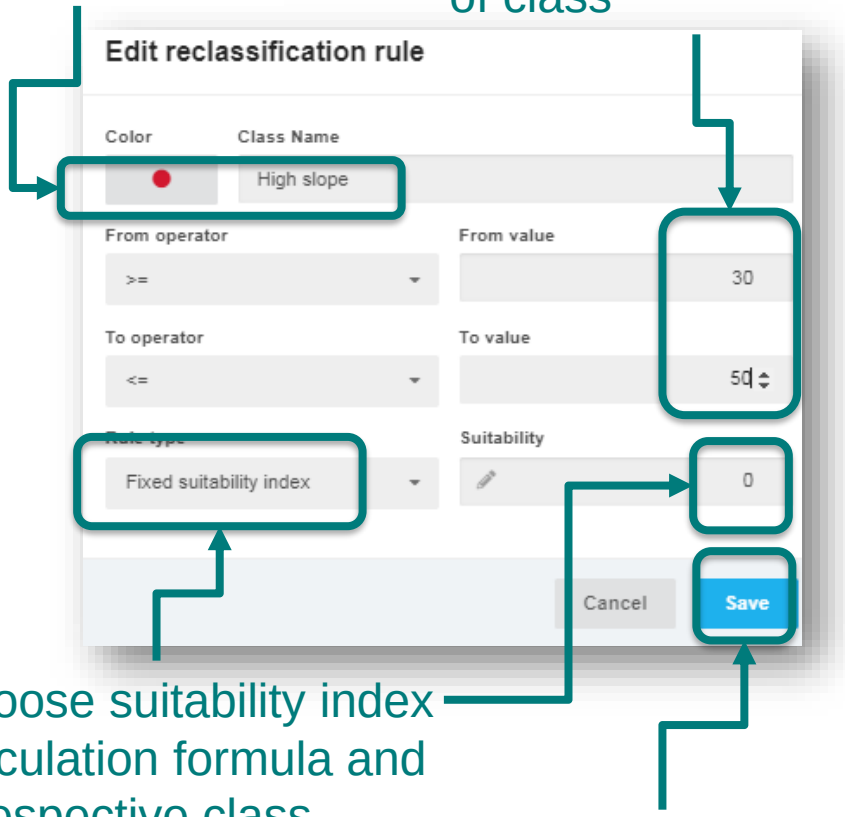
Criteria reclassification slope



Criteria reclassification slope

1. Chose name and display color

2. Choose minimum and maximum values of class



3. Choose suitability index or calculation formula and add respective class value

4. Save

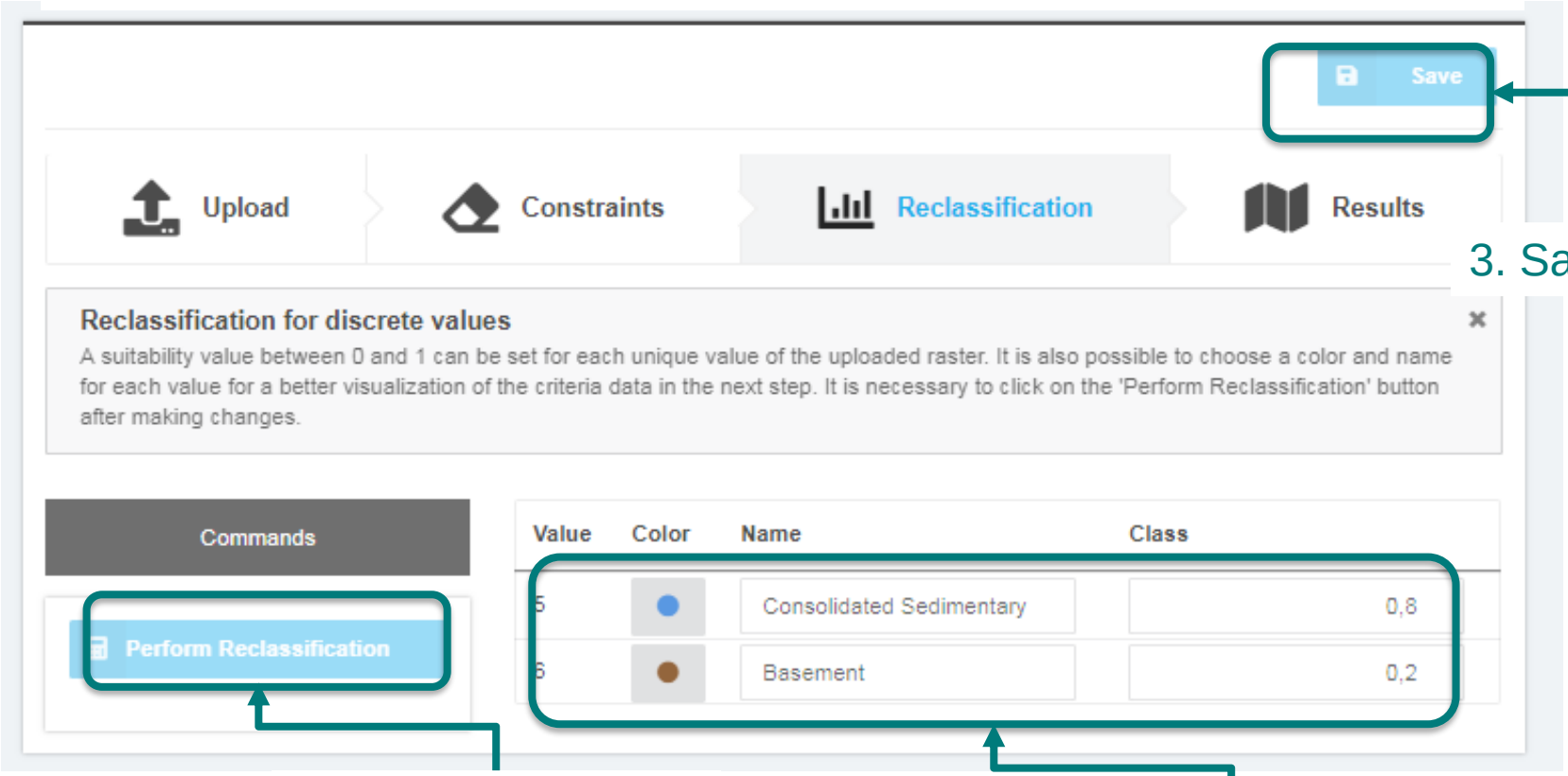
Values used for three classes:

	Name	From	To	Class
●	High slope	>= 30	<= 50	0
●	Medium slope	> 5	< 30	1.2-0.04*x
●	Low slope	>= 0	<= 5	1

For medium slope use Rule type “calculation formula” instead of “fixed suitability index” and type in 1.2-0.04*x which represents a linear connection between the highest and lowest suitability index

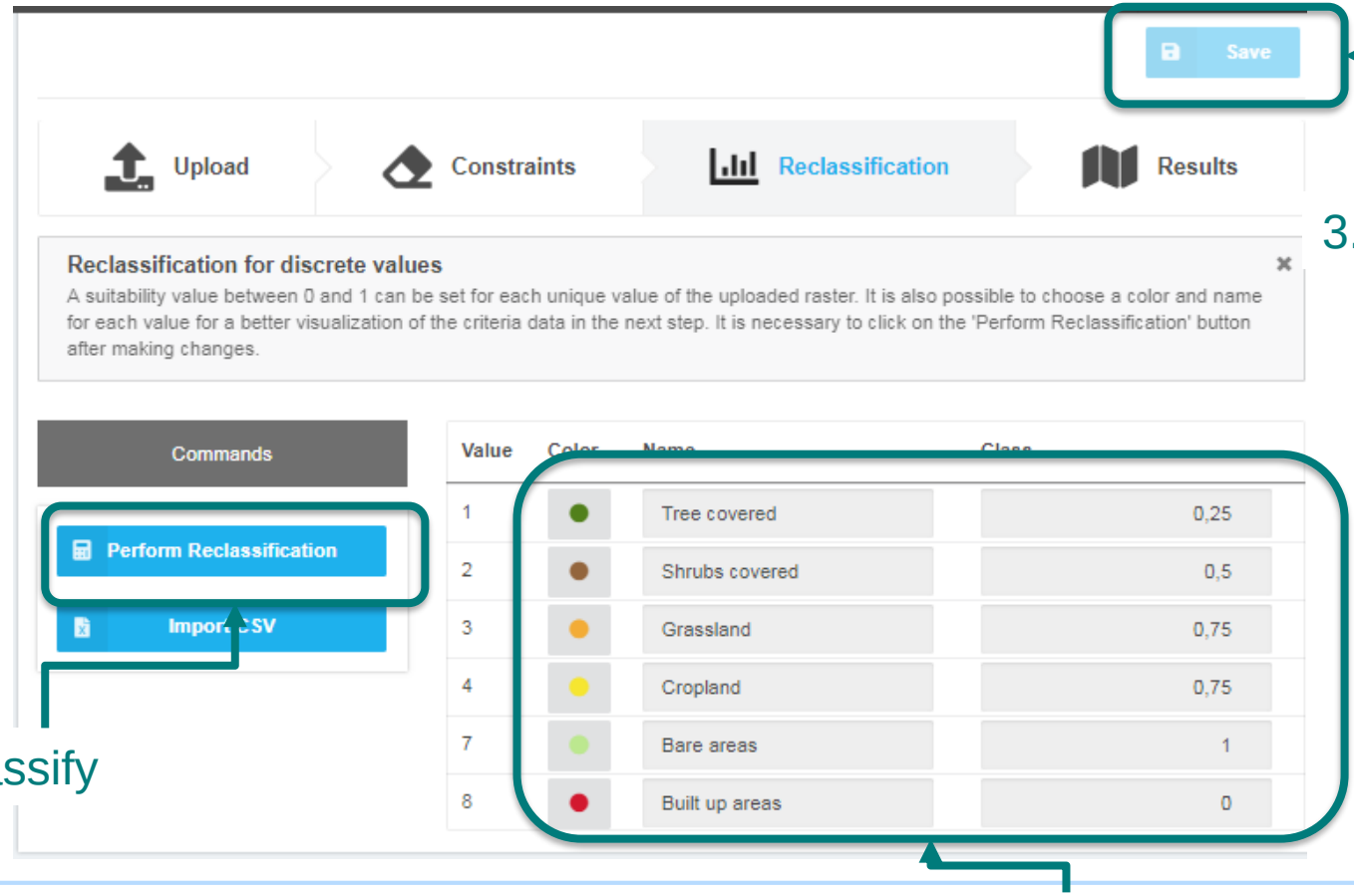
Criteria reclassification geology

Upload geology data (geology.tiff) and reclassify according to data below. Don’t forget to save!

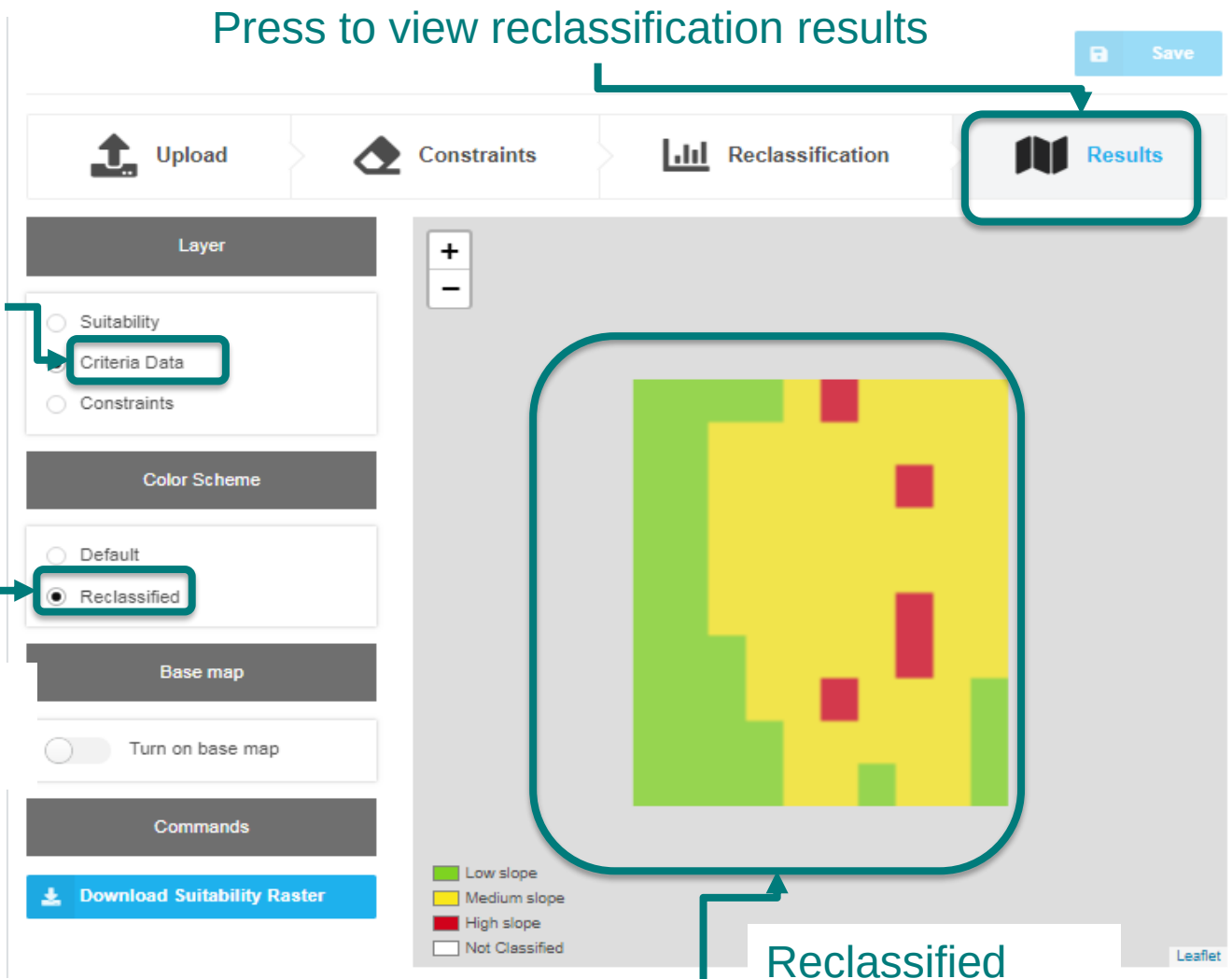


Criteria reclassification land cover

Upload land cover data (landcover.tiff) and reclassify according to data below. Don’t forget to save!



Criteria reclassification results

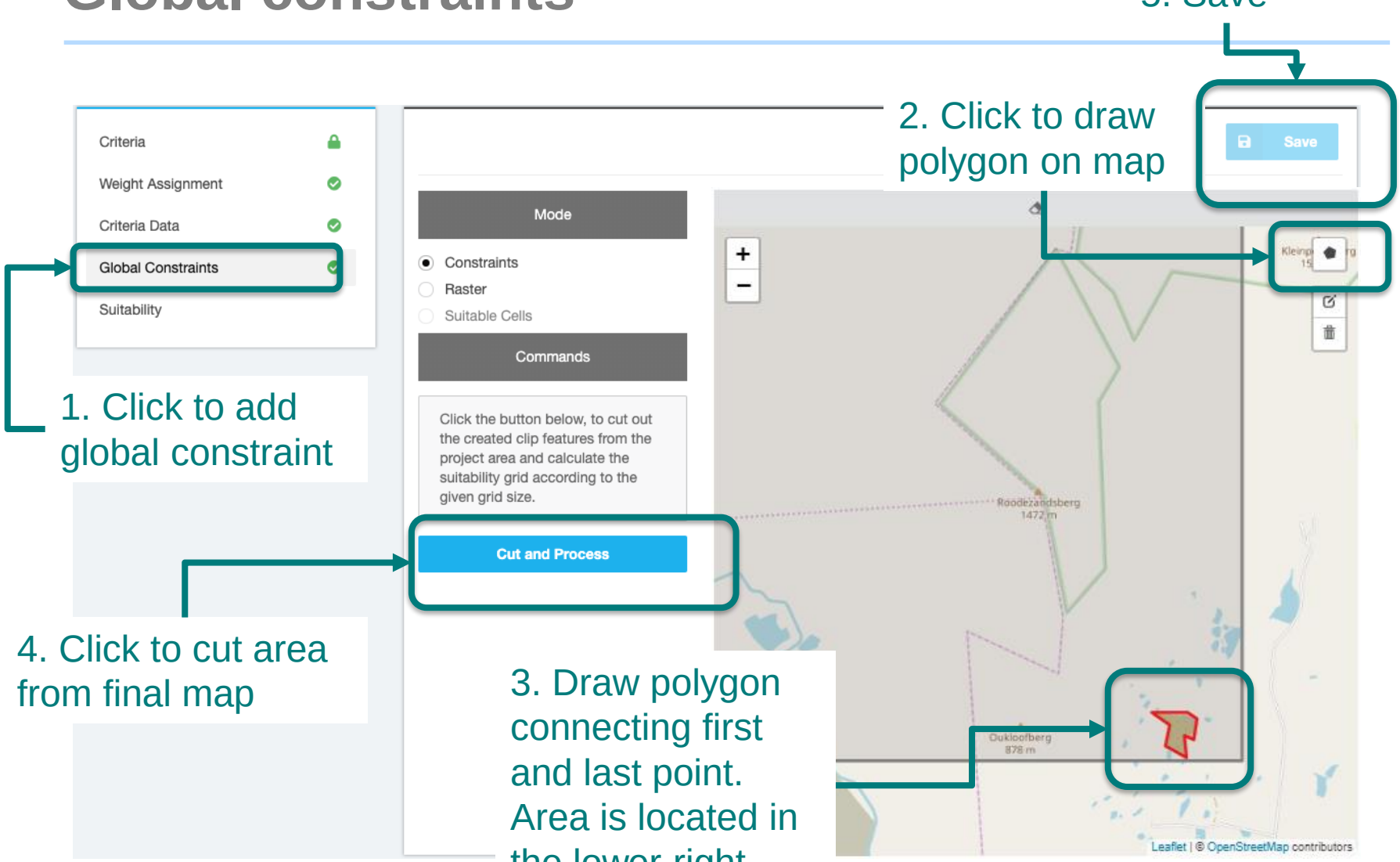


Choose criteria data

Choose reclassified

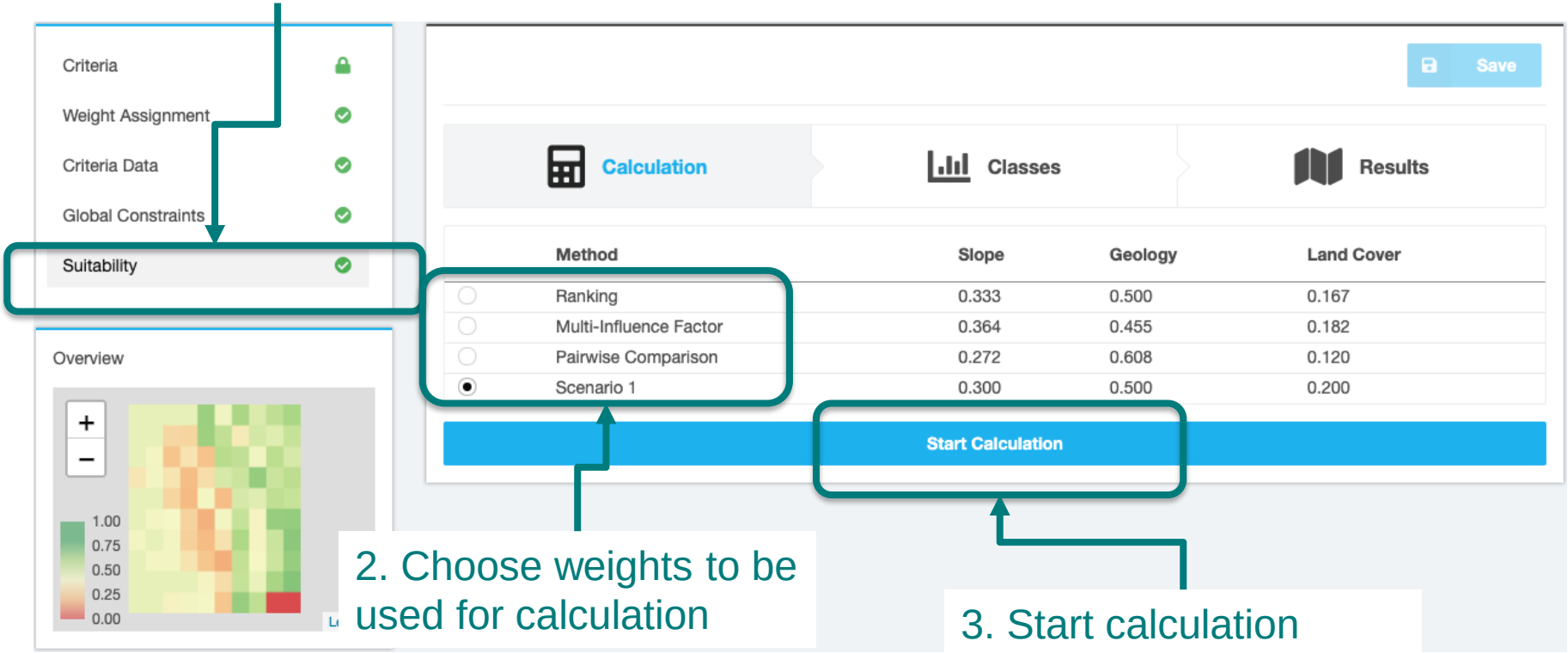
Reclassified slope map

Global constraints

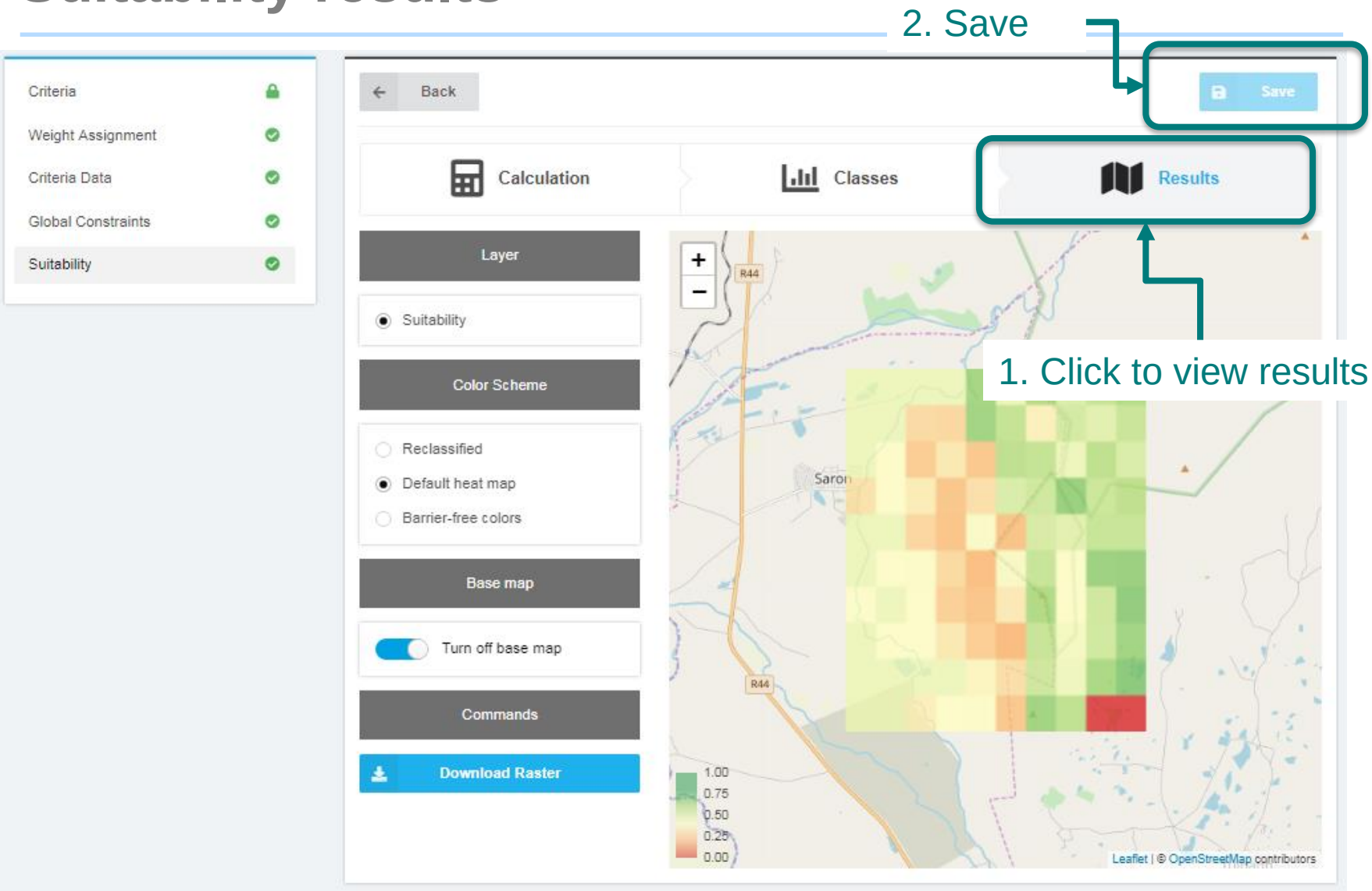


Suitability calculation

1. Click to start suitability calculation



Suitability results



Contact

Thank you for going through this tutorial. If you have any comments or questions, please contact us!

Further Tutorials about the INOWAS platform:

Tutorial 1 - Setup of steady-state groundwater flow model

Tutorial 2 - transient groundwater flow modeling and scenario analysis

Tutorial 3 - set up of solute transport model