MISLAND AFRICA USER MANUAL

version

LocateIT Kenya Limited

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Contents

Monitoring Integrated Service for Land Degradation - MISLAND

The Monitoring Integrated System for Land Degradation MISLAND was developed under The Monitoring Integrated System for Land Degradation MISLAND was developed under GMES & Africa programme through a collaboration between the OSS and LocateIT as a Decision Support System (DSS) utilizing Earth Observation data to deliver information, promote awareness, and support decision making toward achieving Land Degradation Neutrality (LDN) in African countries.

At the very core, the service provides information to monitor SDG indicator 15.3.1 (Proportion of land that is degraded over the total land area). In addition, and to improve the understanding and the multi-faceted nature of the active processes behind land degradation, MISLAND service also provides information on vegetation loss and gain hotspots, forest change, forest fires and the Mediterranean Desertification and Land Use Model (MEDALUS), to assess desertification indicators.

> **Note**
>
> You can download the PDF Version of this doucument here.

General Information

MISLAND-Africa is an operational instrument relying on the international standards for reporting SDG 15.3.1 and technical approaches allowing the delivery of regular information on vegetation cover gain/loss to decision makers and environmental agencies at the first place.

The core-service provides land degradation indicators for the African Countries at two levels:

- At the continental level(Africa) and five regional levels(North Africa, West Africa, East Africa, Central Africa, and South Africa) where low and medium resolution EO are used.
- At the pilot site level, where(customized indicators) can be developed, using medium resoultion data(landsat time series imagery and derived vegetation indices, combined with different satellite-derived climate data)

Get in touch with the team

Contact the MISLAND-Africa team with any comments or suggestions. If you have specific bugs to report or improvements to the tool that you would like to suggest, you can also submit them in the issue tracker on Github for MISLAND-Africa.

Authors

The MISLAND-Africa is a project by the OSS under the Global Monitoring for Environment and Security and Africa(GMES & Africa) framework that is co-funded by the African Union and the European Union.

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Aknowledgement

Special appreciation to the Trends.Earth. Conservation International. Available online at http://trends.earth .2018. for providing input on the implementation of the SDG 15.3 and LDN indicators in MISLAND-Africa, on the UNCCD reporting process, and also provided early input and testing of the tool.

The project also acknowledges the contribution of national and regional stakeholders; Algerian Space Agency(ASAL), ASAL (Algeria), DRC (Egypt), LCRSSS (Libya), CRTS (Morocco), AL-Aasriya University of Nouakchott (Mauritania) and CNCT (Tunisia) for the national level and CRTEAN and CRASTE-LF for the regional level

Linces

Data sources

MISLAND-Africa draws on a number of data sources. The data sets listed below are owned/made available by the following organizations and individuals under separate terms as indicated in their respective metadata.

NDVI

Sensor/Dataset	Temporal	Spatial	Extent	License
LANDSAT7	2001-2020	30 m	Global	Public Domain
AVHRR/GIMMS	1982-2015	8 km	Global	Public Domain
MOD13Q1-coll6	2001-2016	250 m	Global	Public Domain

Soil moisture

Sensor/Dataset	Temporal	Spatial	Extent	License
MERRA 2	1980-2016	0.5° x 0.625°	Global	Public Domain
ERA I	1979-2016	0.75° x 0.75°	Global	Public Domain

Precipitation

Sensor/Dataset	Temporal	Spatial	Extent	License
GPCP v2.3 1 month	1979-2019	2.5° x 2.5°	Global	Public Domain
GPCC V6	1891-2019	1° x 1°	Global	Public Domain
CHIRPS	1981-2016	5 km	50N-50S	Public Domain
PERSIANN-CDR	1983-2015	25 km	60N-60S	Public Domain

Evapotranspiration

Sensor/Dataset	Temporal	Spatial	Extent	License
MOD16A2	2000-2014	1 km	Global	Public Domain

Land cover

Sensor/Dataset	Temporal	Spatial	Extent	License
ESA CCI Land Cover	1992-2018	300 m	Global	CC by-SA 3.0

Soil carbon

Sensor/Dataset	Temporal	Spatial	Extent	License
Soil Grids (ISRIC)	Present	250 m	Global	CC by-SA 4.0

Agroecological Zones

Sensor/Dataset	Temporal	Spatial	Extent	License
FAO - IIASA Global Agroecological Zones (GAEZ)	2000	8 km	Global	Public Domain

Soil Quality

Sensor/Dataset	Temporal	Spatial	Extent	License
Soil Texture and Depth	Present	250 m	Global	CC by-SA 4.0
Parent Material	Present	N/A	Global	CC by-SA 4.0
Slope	Present	30 m	Global | JPL public	

Climate

Sensor/Dataset	Temporal	Spatial	Extent	License
Terra Climate	1985-2019	30 m	Global	Public Domain

Administrative Boundaries

Sensor/Dataset	Temporal	Spatial	Extent	License
Natural Earth Administrative Boundaries	Present	10/50m	Global	Public Domain

Note

The Natural Earth Administrative Boundaries provided in MISLAND-Africa are in the public domain. The boundaries and names used, and the designations used, in MISLAND-Africa do not imply official endorsement or acceptance by Conservation International Foundation, or by its partner organizations and contributors.

If using MISLAND-Africa for official purposes, it is recommended that users choose an official boundary provided by the designated office of their country.

Dataset coding

The spatial data produced by MISLAND-Africa is in GeoTiff format. This is a widely supported format, so theese datasets can be used within QGIS as well as within any other GIS software.

If you wish to use MISLAND-Africa data outside of the tool itself, you will need to know how the data is coded. The tables below provide guidance on what the exact layers are that are produced by each analysis in MISLAND-Africa.

To see which of the below layers is contained within a MISLAND-Africa output file, use the load data tool. When you choose a file with that toool, it will show you a list of the layers within that file, as well as the band number for each layer.

SDG 15.3.1 Indicator

Value	Meaning
-32768	No data
-1	Degradation
0	No change
1	Improvement

Productivity

Productivity trajectory (trend)

Value	Meaning
-32768	No data
Any other value	Linear trend of annually integrated NDVI, scaled by 10,000

Productivity trajectory (significance)

Value	Meaning
-32768	No data
-3	Significant decline (p > .99)
-2	Significant decline (p > .95)
-1	Significant decline (p > .90)
0	No significant change
1	Significant increase (p > .90)
2	Significant increase (p > .95)
3	Significant increase (p > .99)

Productivity performance (degradation)

Value	Meaning
-32768	No data
-1	Degradation
0	No change

Productivity performance (ratio)

Value	Meaning
-32768	No data
0	Ratio of mean NDVI and maximum productivity. See background on performance.

Productivity performance (units)

Value	Meaning

-32768	No data
Any other value	ID number of unit used to calculate performance. See background on performance.

Productivity state (degradation)

Value	Meaning
-32768	No data
Any other value	Change in productivity state classes between baseline and target period, calculated as the rank in the target period minus the rank in the baseline period. Positive values indicate improvement, negative values indicate decline.

Productivity state classes

Value	Meaning
-32768	No data
Any other value	Percentile class for productivity state. See background on productivity state.

Productivity state NDVI mean

Value	Meaning
-32768	No data
Any other value	Mean annually integrated NDVI for the baseline period chosen for productivity state, scaled by 10,000. See background on productivity state.

SDG 15.3.1 productivity indicator

Value	Meaning
-32768	No data
1	Declining
2	Early signs of decline
3	Stable but stressed
4	Stable
5	Increasing

Land productivity dynamics

Value	Meaning
-32768	No data
1	Declining
2	Moderate decline
3	Stressed
4	Stable
5	Increasing

Land cover

Land cover (degradation)

Value	Meaning
-32768	No data
-1	Degradation
0	No change
1	Improvement

Land cover (7 class)

Value	Meaning
-32768	No data
1	Tree-covered
2	Grasslands
3	Cropland
4	Wetland
5	Artificial
6	Other land
7	Water body

Land cover (ESA classes)

Value	Meaning
-32768	No data
10	Cropland, rainfed
11	Herbaceous cover
12	Tree or shrub cover
20	Cropland, irrigated or post■flooding
30	Mosaic cropland (>50%) / natural vegetation (tree, shrub, herbaceous cover) (<50%)
40	Mosaic natural vegetation (tree, shrub, herbaceous cover) (>50%) / cropland (<50%)
50	Tree cover, broadleaved, evergreen, closed to open (>15%)
60	Tree cover, broadleaved, deciduous, closed to open (>15%)
61	Tree cover, broadleaved, deciduous, closed (>40%)
62	Tree cover, broadleaved, deciduous, open (15■40%)
70	Tree cover, needleleaved, evergreen, closed to open (>15%)
71	Tree cover, needleleaved, evergreen, closed (>40%)
72	Tree cover, needleleaved, evergreen, open (15■40%)
80	Tree cover, needleleaved, deciduous, closed to open (>15%)
81	Tree cover, needleleaved, deciduous, closed (>40%)
82	Tree cover, needleleaved, deciduous, open (15■40%)
90	Tree cover, mixed leaf type (broadleaved and needleleaved)

100	Mosaic tree and shrub (>50%) / herbaceous cover (<50%)
110	Mosaic herbaceous cover (>50%) / tree and shrub (<50%)
120	Shrubland
121	Evergreen shrubland
122	Deciduous shrubland
130	Grassland
140	Lichens and mosses
150	Sparse vegetation (tree, shrub, herbaceous cover) (<15%)
151	Sparse tree (<15%)
152	Sparse shrub (<15%)
153	Sparse herbaceous cover (<15%)
160	Tree cover, flooded, fresh or brakish water
170	Tree cover, flooded, saline water
180	Shrub or herbaceous cover, flooded, fresh/saline/brakish water
190	Urban areas
200	Bare areas
201	Consolidated bare areas
202	Unconsolidated bare areas
210	Water bodies
220	Permanent snow and ice

Land cover (transitions)

Value	Meaning
-32768	No data
1	Tree-covered - Tree-covered (no change)
2	Grassland - Grassland (no change)
3	Cropland - Cropland (no change)
4	Wetland - Wetland (no change)
5	Artificial - Artificial (no change)
6	Other land - Other land (no change)
7	Water body - Water body (no change)
12	Forest - Grassland
13	Forest - Cropland
14	Forest - Wetland
15	Forest - Artificial
16	Forest - Other land
17	Forest - Water body
21	Grassland - Forest
23	Grassland - Cropland
24	Grassland - Wetland

25	Grassland - Artificial
26	Grassland - Other land
27	Grassland - Water body
31	Cropland - Forest
32	Cropland - Grassland
34	Cropland - Wetland
35	Cropland - Artificial
36	Cropland - Other land
37	Cropland - Water body
41	Wetland - Forest
42	Wetland - Grassland
43	Wetland - Cropland
45	Wetland - Artificial
46	Wetland - Other land
47	Wetland - Water body
51	Artificial - Forest
52	Artificial - Grassland
53	Artificial - Cropland
54	Artificial - Wetland
56	Artificial - Other land
57	Artificial - Water body
61	Other land - Forest
62	Other land - Grassland
63	Other land - Cropland
64	Other land - Wetland
65	Other land - Artificial
67	Other land - Water body
71	Water body - Forest
72	Water body - Grassland
73	Water body - Cropland
74	Water body - Wetland
75	Water body - Artificial
76	Water body - Other land

Soil organic carbon

Soil organic carbon (degradation)

Value	Meaning
-32768	No data

Any other value	Percentage change in soil organic carbon content (0 - 30 cm depth) from baseline to target year. Positive values indicate increase, negative values indicate decrease.

Soil organic carbon

Value	Meaning
-32768	No data
Any other value	Soil organic carbon content (0 - 30 cm depth) in metric tons per hectare

Population

Value	Meaning
-32768	No data
Any other value	Total population within grid cell

Delta Normalized Burnt Ratio

Value	Meaning
-500	No data
-350	Hight Severety
-300	Moderate High Severety
-200	Moderate Low Severety
-100	Low Severety
100	Unburned
300	Enhanced Growth Low
1000	Enhanced Growth High

Frequently asked questions

This page lists some Frequently Asked Questions (FAQs) for the MISLAND-Africa tool.

Installation of MISLAND-Africa

What version of Quantum GIS (QGIS) do I need for the toolbox?

To download QGIS, please go to the QGIS Downloads page. As of February 2018, version 3.0 was released.

Do I need to download a 32-bit or 64 bit version of QGIS?

We recommend downloading 64-bit version (2.18), but you may need to download the 32-bit version for 32-bit operating systems. To find out if your computer is running a 32-bit or 64-bit version of Windows, search for System or msinfo32. This is found in the Control Panel and will bring up a window that says the system type e.g. System type: 64-bit Operating System, x64-based processor.

Windows 7 or Windows Vista:

1. Open System by clicking the Start button , right-clicking Computer, and then clicking Properties.
2. Under System, you can view the system type.

Windows 8 or Windows 10:

1. From the Start screen, type This PC.

2. Right Click (or tap and hold) This PC, and click Properties.

Mac:

1. Click the Apple icon in the top left and select "About this Mac".
2. For more advanced details click "More Info…" in the About This Mac window.

How do I install the plugin?

Open QGIS, navigate to Plugins on the menu bar, and select Install From Zipfile and install the Zipfile provided.

How do I upgrade the plugin?

If you have already installed the plugin, navigate to Plugins on the menu bar, and select Manage and install plugins. On the side menu, select Installed to view the plugins that you have installed in your computer. At the bottom of the window, select Upgrade all to upgrade the toolbox to the latest version.

How do I uninstall the plugin?

If you would like to uninstall the plugin, normally you can do so with the QGIS plugins manager. To access the tool, choose "Plugins" and then "Manage and Install Plugins…" from the QGIS menu bar. From the plugin manager screen, select "Installed" from the menu on the left-hand side. Then click on "MISLAND-Africa" in the list of plugins, and on "Uninstall Plugin" to uninstall it.

If you encounter an error uninstalling the plugin, it is also possible to remove it manually. To manually remove the plugin:

1. Open QGIS
2. Navigate to where the plugin is installed by selecting "Open Active Profile Folder" from the menu under "Settings" - "User Profiles" on the menu bar.
3. Quit QGIS. You may not be able to uninstall the plugin if QGIS is not closed.
4. In the file browser window that opened, double click on "python", and then double click on "plugins". Delete the LDMP folder within that directory.
5. Restart QGIS.

Datasets

When will you update datasets for the current year?

MISLAND-Africa uses publicly available data, as such the most up to date datasets will be added to the toolbox as soon as the original data providers make them public. If you notice any update that we missed, please do let us know.

Is there an option to download the original data?

Users can download the original data using the Download option within the toolbox.

Will the toolbox support higher resolution datasets?

The toolbox currently supports AVHRR (8km), LANDSAT 7 (30m) and MODIS (250m) data for primary productivity analysis, and ESA LCC CCI (300m) for land cover change analysis.

Methods

Who was the default time period for the analysis determined?

The default time period of analysis is from years 2001 to 2015. These were recommended by the Good Practice Guidelines., a document that provides detailed recommendations for measuring land degradation and has been adopted by the UNCCD.

Productivity

How does the result provided by state differs from trajectory?

The trajectory analysis uses linear regressions and non-parametric tests to identify long term significant trends in primary productivity. This method however, is not able to capture more recent changes in primary productivity, which could be signals of short term processes of improvement or degradation. By comparing a long term mean to the most recent period, state is able to capture such recent changes.

Land cover

Currently, the land cover aggregation is done following the UNCCD guidelines, but that classification does not take into account country level characteristics. Could it be possible to allow the user to define the aggregation criteria?

Users are able to make these changes using the advanced settings in the land cover GUI so that appropriate aggregations occur depending on the context of your country.

How can we isolate woody plant encroachment within the toolbox?

This can be altered using the land cover change matrix in the toolbox. For every transition, the user can mark the change as stable, improvement or degraded. The transition from grassland/rangeland to shrubland may indicate woody encroachment and this transition can be marked as an indicator of degradation.

Carbon stocks

Why use soil organic carbon (SOC) instead of above and below-ground carbon to measure carbon stocks?

The original proposed indicator is Carbon Stocks, which would include above and below ground biomass. However, given the lack of consistently generated and comparable dataset which assess carbon stocks in woody plants (including shrubs), grasses, croplands, and other land cover types both above and below ground, the Good Practice Guidelines published by the UNCCD recommends for the time being to use SOC as a proxy.

Is it possible to measure identify processes of degradation linked to salinization using this tool?

Not directly. If salinization caused a reduction in primary productivity, that decrease would be identified by the productivity indicators, but the users would have to use their local knowledge to assign the causes.

Land degradation outputs

How were the layers combined to define the final land degradation layer?

Performance, state, and trajectory (the three indicators of change in productivity) are combined following a modified version of the good practice guidance developed by the UNCCD (in section SDG Indicator 15.3.1 of this manual a table is presented). Productivity, soil carbon, and land cover chance (the three sub-indicators of SDG 15.3.1) are combined using a “one out, all out” principle. In other words: if there is a decline in any of the three indicators at a particular pixel, then that pixel is mapped as being “degraded”.

Why do I see areas the data says are improving or degrading when I know they are not?

The final output should be interpreted as showing areas potentially degraded. The indicator of land degradation is based on changes in productivity, land cover and soil organic carbon. Several factor could lead to the identification of patterns of degradation which do not seem to correlate to what is happening on the ground, the date of analysis being a very important one. If the climatic conditions at the beginning of the analysis were particularly wet, for example, trends from that moment on could show significant decreases in primary productivity, and degradation. The user can use LMDS to address some of this issues correcting by the effect of climate. The resolution of the data could potentially be another limitation. MISLAND-Africa by default uses global datasets which will not be the most relevant at all scales and geographies. A functionality to use local data will be added shortly.

All of the sub-indicators are measuring vegetation: how does this contribute to understanding and identifying land degradation?

Vegetation is a key component of most ecosystems, and serve as a good proxy for their overall functioning and health. The three subindicators used for SDG 15.3.1 measure different aspects of land cover, which do relate to vegetation. Primary productivity directly measures the change in amount of biomass present in one area, but it does not inform us if that change is positive or not (not all increases in plant biomass should be interpreted as improvement). Land cover fills that gap by interpreting the landscape from a thematic perspective looking at what was there before and what is there now. It does include vegetation, but also bare land, urban and water. Finally, the soil organic carbon indicator uses the land cover map to inform the changes in soil organic carbon over time. This method is not ideal, but given the current state of global soil science and surveying, there is consensus that it this point in time and globally, this is the best approach.

Future plans

When will there be an offline version of the toolbox?

The final toolbox will be available as both as an offline and online version. The online version allows users to access current datasets more easily, while also allowing users to leverage Google Earth Engine to provide computing in the cloud. An offline version allows users to access data and perform analyses where internet connectivity may be limited, but it does have the disadvantage of requiring users to have enough local computing capacity to run analyses locally. The technical team intends to build the offline version of the toolbox and provide countries with data relevant for reporting at the national level within the pilot project countries.

Land Degradation

Contents

Land Degradation Indicators

Land degradation, as defined by the United Nations Convention to Combat Desertification (UNCCD), is a complex process that refers to the long-lasting reduction or loss of biological and economic productivity of lands, caused by human activities, sometimes exacerbated by natural phenomena. Terrestrial vegetation including crops depend on appropriate soil which is the substrate on which vegetation/crops grow, besides other climatic factor requirements.

Different land masses are however affected by different factors at different levels. The factors pan from the climatic to soil properties, from land use land cover and to surface roughness which depends on the conditions that a given land mass is exposed to. Apart from the natural and geophysical causes, land degradation may also be influenced by anthropogenic factors which yield conditions for land degradation to take place, these activities may span from uncouth agricultural practices, desertification through illegal logging, top soil harvesting, mining activities among others.

The OSS.LDMS focuses on provision of evidence-based proofs on land degradation and its spatiotemporal distribution and therefore the hotspots where priority actions should be taken or awareness-raising campaigns should be planed. The figure below show key land degradation indicators included in the OSS.LDMS service

Summary of included services on the OSS.LDMS service platform

SDG15.3.1 Indicator

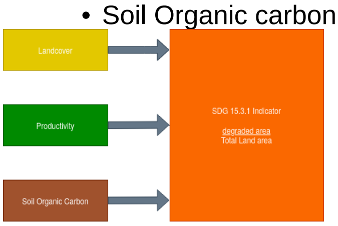
As part of the Sustainable development Goals(SDGs), SDG 15 is to: “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forest, combat desertification, and halt and reverse land degradation and halt biodiversity loss”

Target 15.3 aims to: “By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, floods, and strive to achieve land degradation-neutral world”

The indicator used to assess the progress of each SDG target is the 15.3.1 indicator: “Proportion of land that is degraded over total land area’’

The basic land degradation indicators include three main sub-indicators of the SDG target 15.3.1 (proportion of land that is degraded over the total land area). As the custodian agency of SDG 15.3, the United Nations Convention to Combat Desertification (UNCCD) has developed recommendations/Good practice guide on how to compute SDG indicator 15.3.1 from 3 sub-indicators:

- Vegetation productivity
- Landcover
- Soil Organic carbon

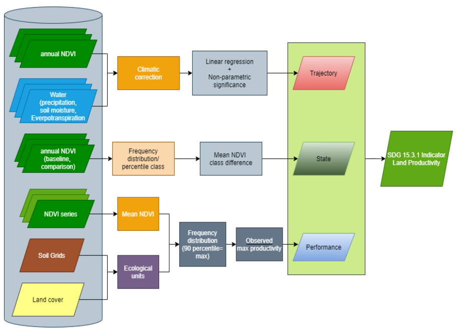


SDG 15.3.1 Indicators

SDG 15.3.1 Sub-indicators

Productivity

Land productivity is the biological productive capacity of the land (i.e. the ability to produce food, fibre and fuel that sustain life). For easy interpretation the annual mean vegetation indices values at the pixel level will be used to assess three measures of change (trajectory, state and performance) as summarized in the figure below and explained in the subsequent sub-sections:



Sammury methodology for conputing Land Productivity

Trajectory

The rate of change in primary productivity over time which will be computed using linear regression at the pixel level for various Landsat derived vegetation indices (NDVI, MSAVI2, SAVI). To identify areas experiencing changes in the primary productivity, a non-parametric significance test will be performed to show the significant changes (p-value of 0.05). Positive significant trends in the vegetation indices will indicate potential improvement while a negative significant trend will indicate potential degradation.

The annual integrals of the vegetation indices are interpreted alongside historical precipitation data as a context. The climatic correction method that will be applied is the Rain Use Efficiency (RUE). The rain use efficiency is the ratio of annual NPP to annual precipitation. After the RUE is computed, linear regression and nonparametric significance testing will be applied to the RUE over time. Positive significance in RUE indicates improvement while negative significance will indicate potential degradation.

State

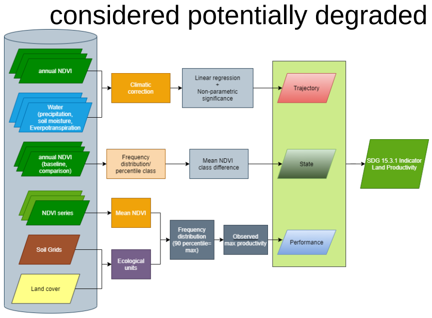
The Productivity State indicator will be used to show recent changes in primary productivity compared to a baseline period. The indicator is computed from (NDVI, MSAVI2, SAVI) derived from medium resolution Landsat imagery following the steps outlined below:

1. A baseline period (historical period for comparison to recent primary productivity) will be defined. (This will be left open for selection of different periods by the users).
2. A comparison period (recent years for which the state is being analysed) will be defined. (The definition of this period will also be left open for the users of the service)
3. The annual integrals of the selected vegetation index for the baseline period will be used to compute a frequency distribution at the selected pixel. That frequency distribution curve will then be used to classify the values to the 10th percentile(1 to 10).
4. The next step would involve computing the mean of the selected vegetation index for the baseline period, and to determine the percentile class it belongs to. The computed mean value for the baseline period is then assigned a number which corresponds to that percentile class if falls between 1 and 10.
5. The mean value of the selected index for the comparison period is the computed and percentile class to which it belongs to. It is determined and placed in a class corresponding to its percentile class.
6. The difference between the assigned class number for the comparison and the baseline period (comparison minus baseline) will be computed and thresholded to show the productivity state of the land.

Perfomance

The Productivity Performance indicator will measure the local productivity relative to other similar vegetation types in similar ecological units. A combination of soil units (based on Soil Grids data at 250m resolution) and land cover (ESA CCI at 300m resolution) will be used to define the ecological units. The indicator will be computed as follows:

1. The analysis period is defined, and time series data is used to compute mean value for the selected vegetation index at pixel level.
2. Similar ecological units are derived as the unique intersections of different land cover types and soil types.
3. For each ecological unit, the frequency distribution of the mean pixel values obtained in step 1 shall be computed. From the distribution the value representing the 90th percentile will be considered the maximum productivity for that unit.
4. The ratio of mean NDVI and maximum productivity (in each case compare the mean observed value to the maximum for its corresponding unit) is computed. If the computed ratio is less than 50 %, the pixel shall be considered potentially degraded for this indicator.



Sammury methodology for conputing Land Productivity

Landcover

Monitoring of Land Use and Land Cover Changes (LULCCs) at both regional and local scales presents a major opportunity for identifying areas threatened by land degradation where mitigation measures should be taken. Traditionally, LULCCs have been interpreted by distinguishing between two transformation types: conversion and modification.

To assess changes in land cover users need land cover maps covering the study area for the baseline and target years. These maps need to be of acceptable accuracy and created in such a way which allows for valid comparisons. LDMS uses ESA CCI land cover maps as the default dataset, but local maps can also be used. The indicator is computed as follows:

1. Reclassify both land cover maps to the 7 land cover classes needed for reporting to the UNCCD (forest, grassland, cropland, wetland, artificial area, bare land and water).
2. Perform a land cover transition analysis to identify which pixels remained in the same land cover class, and which ones changed.
3. Based on your local knowledge of the conditions in the study area and the land degradation processed occurring there, use the table below to identify which transitions correspond to degradation (- sign), improvement (+ sign), or no change in terms of land condition (zero).

Land cover in target year

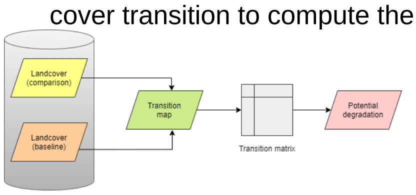
Land cover in baseline year	Forest	Grassland*	Cropland	Wetland	Artificial area	Bare land	Water body
Forest	0	-	-	-	-	-	0
Grassland*	+	0	+	-	-	-	0
Cropland	+	-	0	-	-	-	0
Wetland	-	-	-	0	-	-	0
Artificial area	+	+	+	+	0	+	0
Bare land	+	+	+	+	-	0	0
Water body	0	0	0	0	0	0	0

Legend

Degradation	Stable	Improvement
-	0	+

*The "Grassland" class consists of grassland, shrub, and sparsely vegetated areas (if the default aggregation is used).

4. LDMS will combine the information from the land cover maps and the table of degradation typologies by land cover transition to compute the land cover sub-indicator.



Sammary methodology for computing land cover change

Carbon-stocks

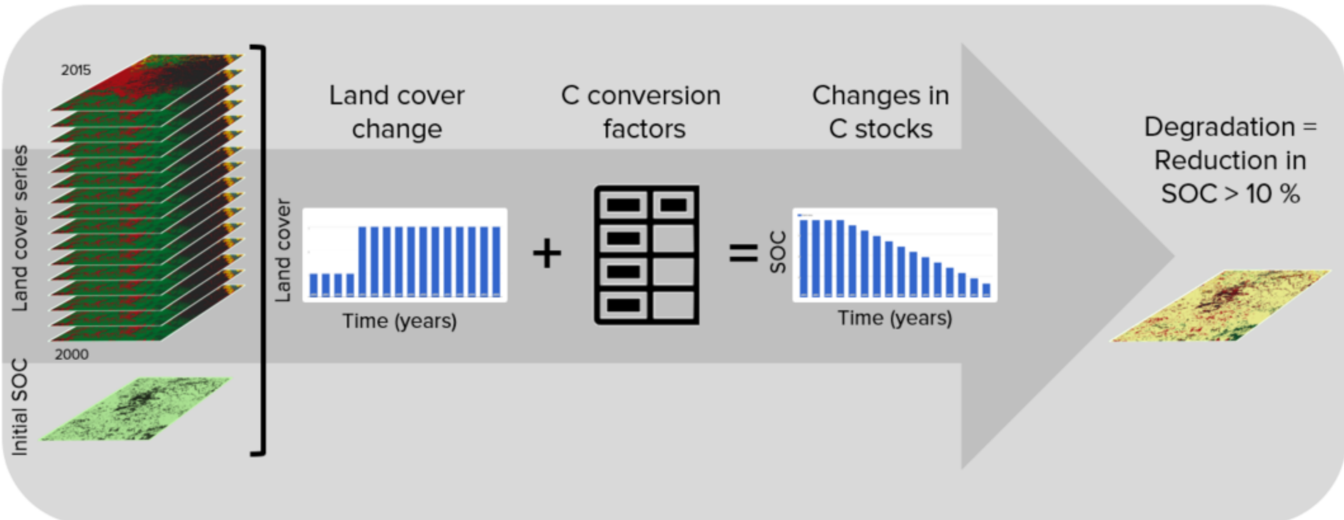
The third sub-indicator for monitoring land degradation as part of the SDG process quantifies changes in soil organic carbon (SOC) over the reporting period. Changes in SOC are particularly difficult to assess for several reasons, some of them being the high spatial variability of soil properties, the time and cost intensiveness of conducting representative soil surveys and the lack of time series data on SOC for most regions of the world. To address some of the limitations, a combined land cover/SOC method is used in LDMS to estimate changes in SOC and identify potentially degraded areas. The indicator is computed as follows:

1. Determine the SOC reference values. LDMS uses SoilGrids 250m carbon stocks for the first 30 cm of the soil profile as the reference values for calculation (NOTE: SoilGrids uses information from a variety of data sources and ranging from many years to produce this product, therefore assigning a date for calculations purposes could cause inaccuracies in the stock change calculations).
2. Reclassify the land cover maps to the 7 land cover classes needed for reporting to the UNCCD (forest, grassland, cropland, wetland, artificial area, bare land and water). Ideally annual land cover maps are preferred, but at least land cover maps for the starting and end years are needed.
3. To estimate the changes in C stocks for the reporting period C conversion coefficients for changes in land use, management and inputs are recommended by the IPCC and the UNCCD. However, spatially explicit information on management and C inputs is not available for most regions. As such, only land use conversion coefficient can be applied for estimating changes in C stocks (using land cover as a proxy for land use). The coefficients used were the result of a literature review performed by the UNCCD and are presented in the table below. Those coefficients represent the proportional in C stocks after 20 years of land cover change.

LU coefficients	Forest	Grasslands	Croplands	Wetlands	Artifical areas	Bare lands	Water bodies
Forest	1	1	f	1	0.1	0.1	1
Grasslands	1	1	f	1	0.1	0.1	1
Croplands	1/f	1/f	1	1/0.71	0.1	0.1	1
Wetlands	1	1	0.71	1	0.1	0.1	1
Artifical areas	2	2	2	2	1	1	1
Bare lands	2	2	2	2	1	1	1
Water bodies	1	1	1	1	1	1	1

Changes in SOC are better studied for land cover transitions involving agriculture, and for that reason there is a different set of coefficients for each of the main global climatic regions: Temperate Dry (f = 0.80), Temperate Moist (f = 0.69), Tropical Dry (f = 0.58), Tropical Moist (f = 0.48), and Tropical Montane (f = 0.64).

4. Compute relative different in SOC between the baseline and the target period, areas which experienced a loss in SOC of 10% of more during the reporting period will be considered potentially degraded, and areas experiencing a gain of 10% or more as potentially improved.



Combining Productivity Indicators

The three productivity sub-indicators are then combined as indicated in the tables below. For SDG 15.3.1 reporting, the 3-class indicator is required, but LDMS also produces a 5-class one which takes advantage of the information provided by State to inform the type of degradation occurring in the area.

Aggregating the productivity sub-indicators

Trajectory	State	Performance	3 Classes	5 Classes
Improvement	Improvement	Stable	Improvement	Improving
Improvement	Improvement	Degradation	Improvement	Improving
Improvement	Stable	Stable	Improvement	Improving
Improvement	Stable	Degradation	Improvement	Improving
Improvement	Degradation	Stable	Improvement	Improving
Improvement	Degradation	Degradation	Degradation	Stable
Stable	Improvement	Stable	Stable	Stable
Stable	Improvement	Degradation	Stable	Stable
Stable	Stable	Stable	Stable	Stable
Stable	Stable	Degradation	Degradation	Stable but stressed
Stable	Degradation	Stable	Degradation	Early signs of decline
Stable	Degradation	Degradation	Degradation	Declining
Degradation	Improvement	Stable	Degradation	Declining
Degradation	Improvement	Degradation	Degradation	Declining
Degradation	Stable	Stable	Degradation	Declining
Degradation	Stable	Degradation	Degradation	Declining
Degradation	Degradation	Stable	Degradation	Declining
Degradation	Degradation	Degradation	Degradation	Declining

Vegetation Loss/Gain hotspots

Land degradation hotsports (LDH) are produced via the analysis of time-series vegetation indices data and are used to characterize areas of different sizes, where the vegetation cover and the soil types are severely degraded.

Vegetation loss/gain hotspots will be calculated based on time series observation of selected suit of vegetation indices depending on the climatic zones and terrain morphology of the African countries. The selected indices derived from Landsat data are as listed below:

> -NDVI for humid zones, sub-humid and semi-arid zones -MSAVI2 for arid and stepic zones -SAVI for desert areas

Forest Change

Forest Gain/Loss

The quantification of the forest gain/loss hotspots will be based on pre-existing high-resolution global maps derived from Hansen Global Forest change dataset that can be accessed using Google Earth Engine API.

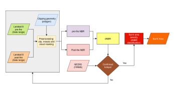
The maps are produced from time-series analysis of Landsat images characterizing forest extent and change over time.

Forest Fires

Burnt areas and forest fires will be highlighted and mapped out form remotely sensed Landsat/Sentinel data using the Normalized Burn Ratio (NBR). NBR is designed to highlight burned areas and estimate burn severity. It uses near-infrared (NIR) and shortwave-infrared (SWIR) wavelengths. Before fire events, healthy vegetation has very high NIR reflectance and a low SWIR reflectance. In contrast, recently burned areas show low reflectance in the NIR and high reflectance in the SWIR band.

The NBR will be calculated for Landsat/Sentinel images before the fire (pre-fire NBR) and after the fire (post-fire NBR). The difference between the pre-fire NBR and the post-fire NBR referred to as delta NBR (dNBR) is computed to highlight the areas of forest disturbance by fire event.

Classification of the dNBR will be used for burn severity assessment, as areas with higher dNBR values indicate more severe damage whereas areas with negative dNBR values might show increased vegetation productivity. dNBR will be classified according to burn severity ranges proposed by the United States Geological Survey(USGS)



Sammury methodology for conputing Burnt Areas

SDG15.3.1 Indicator

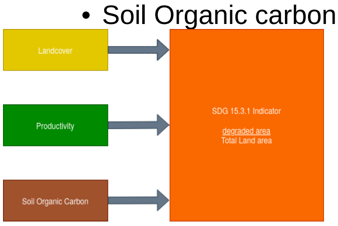
As part of the Sustainable development Goals(SDGs), SDG 15 is to: “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forest, combat desertification, and halt and reverse land degradation and halt biodiversity loss”

Target 15.3 aims to: “By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought, floods, and strive to achieve land degradation-neutral world”

The indicator used to assess the progress of each SDG target is the 15.3.1 indicator: “Proportion of land that is degraded over total land area’’

The basic land degradation indicators include three main sub-indicators of the SDG target 15.3.1 (proportion of land that is degraded over the total land area). As the custodian agency of SDG 15.3, the United Nations Convention to Combat Desertification (UNCCD) has developed recommendations/Good practice guide on how to compute SDG indicator 15.3.1 from 3 sub-indicators:

- Vegetation productivity
- Landcover
- Soil Organic carbon

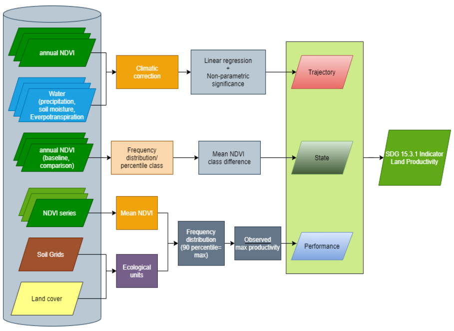


SDG 15.3.1 Indicators

SDG 15.3.1 Sub-indicators

Productivity

Land productivity is the biological productive capacity of the land (i.e. the ability to produce food, fibre and fuel that sustain life). For easy interpretation the annual mean vegetation indices values at the pixel level will be used to assess three measures of change (trajectory, state and performance) as summarized in the figure below and explained in the subsequent sub-sections:



Sammury methodology for conputing Land Productivity

Trajectory;

The rate of change in primary productivity over time which will be computed using linear regression at the pixel level for various Landsat derived vegetation indices (NDVI, MSAVI2, SAVI). To identify areas experiencing changes in the primary productivity, a non-parametric significance test will be performed to show the significant changes (p-value of 0.05). Positive significant trends in the vegetation indices will indicate potential improvement while a negative significant trend will indicate potential degradation.

The annual integrals of the vegetation indices are interpreted alongside historical precipitation data as a context. The climatic correction method that will be applied is the Rain Use Efficiency (RUE). The rain use efficiency is the ratio of annual NPP to annual precipitation. After the RUE is computed, linear regression and nonparametric significance testing will be applied to the RUE over time. Positive significance in RUE indicates improvement while negative significance will indicate potential degradation.

State;

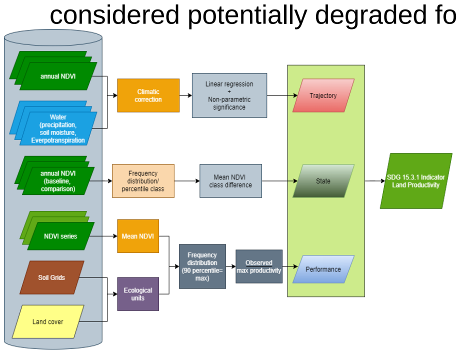
The Productivity State indicator will be used to show recent changes in primary productivity compared to a baseline period. The indicator is computed from (NDVI, MSAVI2, SAVI) derived from medium resolution Landsat imagery following the steps outlined below:

1. A baseline period (historical period for comparison to recent primary productivity) will be defined. (This will be left open for selection of different periods by the users).
2. A comparison period (recent years for which the state is being analysed) will be defined. (The definition of this period will also be left open for the users of the service)
3. The annual integrals of the selected vegetation index for the baseline period will be used to compute a frequency distribution at the selected pixel. That frequency distribution curve will then be used to classify the values to the 10th percentile(1 to 10).
4. The next step would involve computing the mean of the selected vegetation index for the baseline period, and to determine the percentile class it belongs to. The computed mean value for the baseline period is then assigned a number which corresponds to that percentile class if falls between 1 and 10.
5. The mean value of the selected index for the comparison period is the computed and percentile class to which it belongs to. It is determined and placed in a class corresponding to its percentile class.
6. The difference between the assigned class number for the comparison and the baseline period (comparison minus baseline) will be computed and thresholded to show the productivity state of the land.

Perfomance;

The Productivity Performance indicator will measure the local productivity relative to other similar vegetation types in similar ecological units. A combination of soil units (based on Soil Grids data at 250m resolution) and land cover (ESA CCI at 300m resolution) will be used to define the ecological units. The indicator will be computed as follows:

1. The analysis period is defined, and time series data is used to compute mean value for the selected vegetation index at pixel level.
2. Similar ecological units are derived as the unique intersections of different land cover types and soil types.
3. For each ecological unit, the frequency distribution of the mean pixel values obtained in step 1 shall be computed. From the distribution the value representing the 90th percentile will be considered the maximum productivity for that unit.
4. The ratio of mean NDVI and maximum productivity (in each case compare the mean observed value to the maximum for its corresponding unit) is computed. If the computed ratio is less than 50 %, the pixel shall be considered potentially degraded for this indicator.



Sammury methodology for conputing Land Productivity

Combining Productivity Indicators

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Aggregating the productivity sub-indicators

Trajectory	State	Performance	3 Classes	5 Classes
Improvement	Improvement	Stable	Improvement	Improving
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Landcover

Monitoring of Land Use and Land Cover Changes (LULCCs) at both regional and local scales presents a major opportunity for identifying areas threatened by land degradation where mitigation measures should be taken. Traditionally, LULCCs have been interpreted by distinguishing between two transformation types: conversion and modification.

To assess changes in land cover users need land cover maps covering the study area for the baseline and target years. These maps need to be of acceptable accuracy and created in such a way which allows for valid comparisons. LDMS uses ESA CCI land cover maps as the default dataset, but local maps can also be used. The indicator is computed as follows:

1. Reclassify both land cover maps to the 7 land cover classes needed for reporting to the UNCCD (forest, grassland, cropland, wetland, artificial area, bare land and water).
2. Perform a land cover transition analysis to identify which pixels remained in the same land cover class, and which ones changed.
3. Based on your local knowledge of the conditions in the study area and the land degradation processed occurring there, use the table below to identify which transitions correspond to degradation (- sign), improvement (+ sign), or no change in terms of land condition (zero).

Land cover in target year

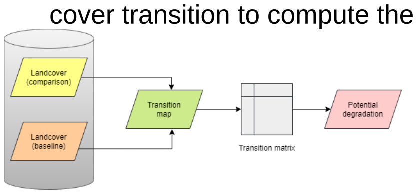
Land cover in baseline year	Forest	Grassland*	Cropland	Wetland	Artificial area	Bare land	Water body
Forest	0	-	-	-	-	-	0
Grassland*	+	0	+	-	-	-	0
Cropland	+	-	0	-	-	-	0
Wetland	-	-	-	0	-	-	0
Artificial area	+	+	+	+	0	+	0
Bare land	+	+	+	+	-	0	0
Water body	0	0	0	0	0	0	0

Legend

Degradation	Stable	Improvement
-	0	+

*The "Grassland" class consists of grassland, shrub, and sparsely vegetated areas (if the default aggregation is used).

1. LDMS will combine the information from the land cover maps and the table of degradation typologies by land cover transition to compute the land cover sub-indicator.



Sammary methodology for computing land cover change

Carbon-stocks

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Changes in SOC are better studied for land cover transitions involving agriculture, and for that reason there is a different set of coefficients for each of the main global climatic regions: Temperate Dry (f = 0.80), Temperate Moist (f = 0.69), Tropical Dry (f = 0.58), Tropical Moist (f = 0.48), and Tropical Montane (f = 0.64).

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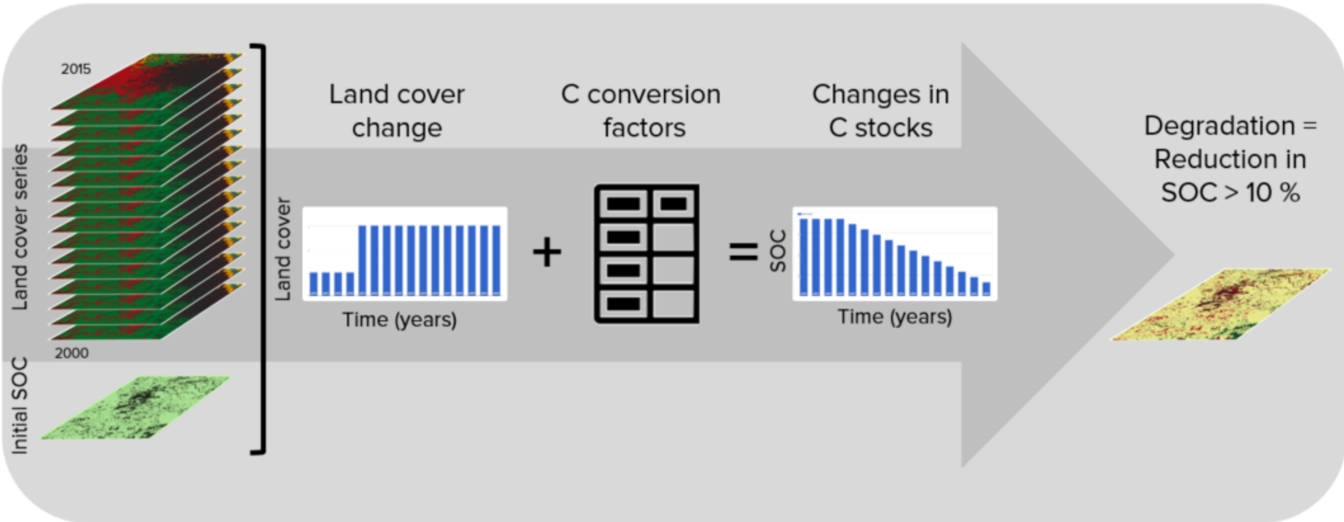

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Forest Change

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The quantification of the forest gain/loss hotspots will be based on pre-existing high-resolution global maps derived from Hansen Global Forest change dataset that can be accessed using Google Earth Engine API.

The maps are produced from time-series analysis of Landsat images characterizing forest extent and change over time.

Forest Carbon Emission

The UNFCCC framework on REDD+ (Reducing Emissions from Deforestation and Forest Degradation in Developing countries) encourages developing countries to take actions for reducing emissions in the forestry sector. For receiving performance-based payments countries need – among others – to implement national forest monitoring systems and mechanisms for Measuring, Reporting and Verification (MRV) of achievements in avoiding deforestation and forest degradation and in related emission savings.

Estimating emissions from deforestation or forest degradation may be based on Activity Data (AD) and on Emission Factors (EF):

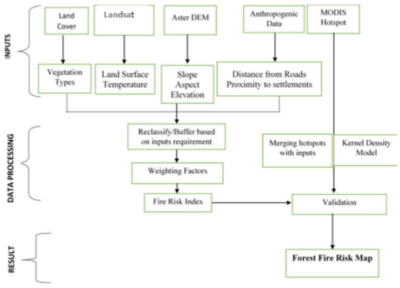
$$Emissions = AD \times EF$$

Emission factor equation

Where; *AD* is the change in forest area or in area of degraded forest (in ha) and EF = emissions expressed in tC/ha.

Forest Fire Risk

The methodological approach that will be adapted to highlight susceptibility to fire integrates Land cover, temperature, slope, proximity to road, proximity to settlement, elevation and Aspect as depicted in the flow diagram below:



Fire risk flow

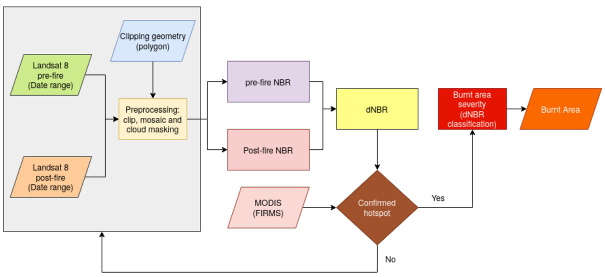
The Land cover layer is used to segment the different vegetation types within the forests acting as fuel load. Surface temperature measures the possibility of ignition. Digital elevation model is employed to derive the probability of spread and sustainability of fire. Additionally, the anthropogenic data is put in place to satiate human induced aspects of fire. weighting analysis is applied to combine the individual layers and derive a composite layer depicting susceptibility to forest fire.

Forest Fires

Burnt areas and forest fires will be highlighted and mapped out form remotely sensed Landsat/Sentinel data using the Normalized Burn Ratio (NBR). NBR is designed to highlight burned areas and estimate burn severity. It uses near-infrared (NIR) and shortwave-infrared (SWIR) wavelengths. Before fire events, healthy vegetation has very high NIR reflectance and a low SWIR reflectance. In contrast, recently burned areas show low reflectance in the NIR and high reflectance in the SWIR band.

The NBR will be calculated for Landsat/Sentinel images before the fire (pre-fire NBR) and after the fire (post-fire NBR). The difference between the pre-fire NBR and the post-fire NBR referred to as delta NBR (dNBR) is computed to highlight the areas of forest disturbance by fire event.

Classification of the dNBR will be used for burn severity assessment, as areas with higher dNBR values indicate more severe damage whereas areas with negative dNBR values might show increased vegetation productivity. dNBR will be classified according to burn severity ranges proposed by the United States Geological Survey(USGS)



Sammury methodology for conputing Burnt Areas

Serivice Guide

MISLAND Site Tour

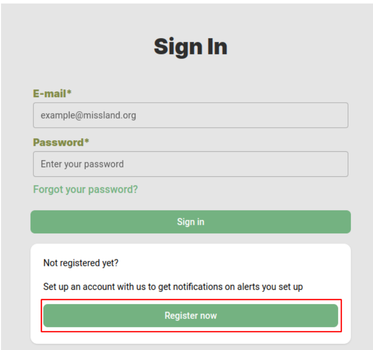
Registration and Log in

New users to the service will be required to register a new account to use the service. Registering a new account is a simple two step process

1. Click on the log-in icon on the right hand side of the navigation-bar

Finding the log in option

2. Choose the ‘Not a user? Sing up’ option on the log in menu that pops up



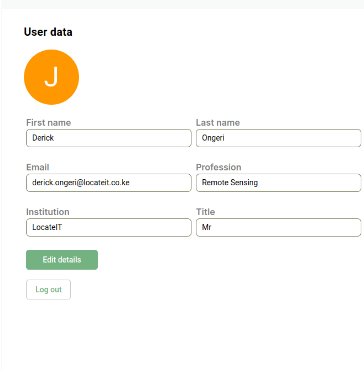
new user registration

Registered users can proceed to log in with their Email and password.

User profile and custom uploads

Once loged in, users can select their profile to edit their information and for custom uploads. For custom area uploads, follow the simple steps as outlined below:

1. Click on the user-name that appears on the navingation bar items



User profile and options

SDG 15.3.1 indicator

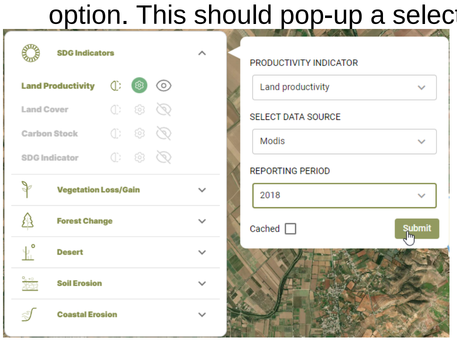
Compute SDG 15.3.1 Sub-indicators

On the Service Menu bar, users can select the SDG Indicators option which appears as the first item in the menu to compute SDG 15.3.1 indicator and its sub-indicators forllowing the steps described below:

Computing Land Productivity

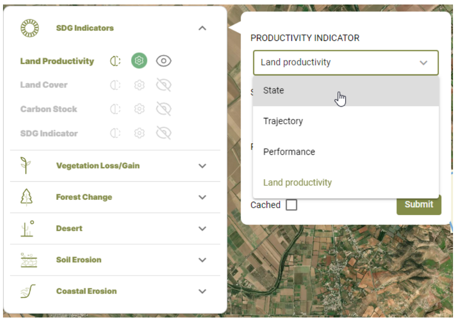
Land productivity is computed form vegetation indices using three measures of change i.e trajectory, state and performace. Any of the three sub-indicators measures of change as well as the productivity can be combuted as illustrated below

1. On the indicator menu bar that appears below the area selection panel click on the Land Productivity option. This should pop-up a selection panel as in the diagram below:



selecting the land productivity option

2. Under the productivity indicator option on the pop-up menu, users can select either of the three land productivity sub-indicators i.e. State, performance, and trajectory or the final aggregated land productivity for their selected area of interest.

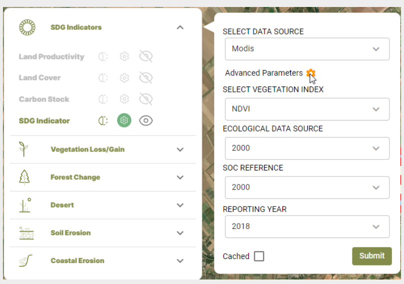


Computing land productivity by combining state, trajectory and performance

3. Complete the selection by selecting the data source and the reporting period.

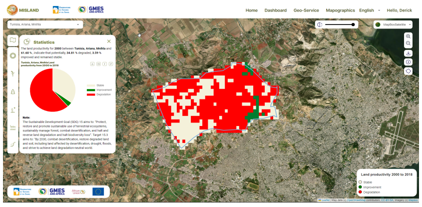
Note

MISLAND allows users to asses vegetation using high resolution Landsat derived vegetation indices. If the selection of the dataset is landsat the option to specify the vegetation index .i.e NDVI, MSAVI or SAVI will appear under the Advanced Parameters options.



Vegetation index selection

4. Once the selection of datasets and reporting period is complete click on the Submit button at the pottom of the selection pop-up window to compute the selected indicator. The map and statistics should be dispalyed as shown below.

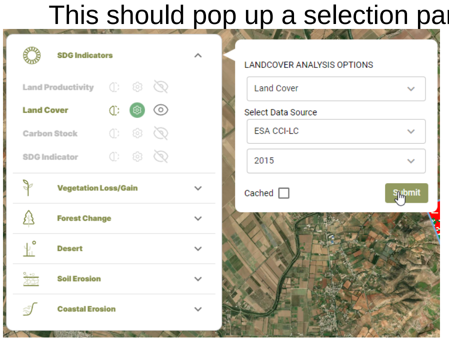


Land productivity output

Computing Landcover Change

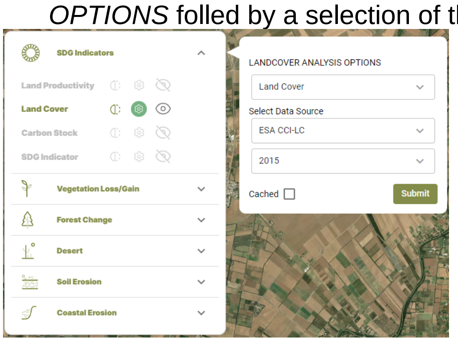
MISLAND allows the user to view land cover state for a particular year or to compute landcover changes between two years. The landcover change can be accessed from the Land Cover option under the SDG indicator menu as described in the steps below.

1. Select SDG Indicators option on the services menu-bar and clic on the Land Cover option. This should pop up a selection panel as the one shown below



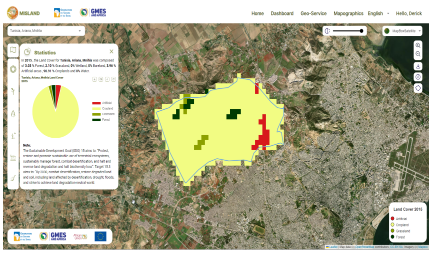
Selecting the Land cover change under SDG 15.3.1 sub-indicators

2. To view the land cover data for a particular year, select 'Land Cover' option under the *LANDCOVER ANALYSIS OPTIONS* folled by a selection of the landcover data source and the year as shown below



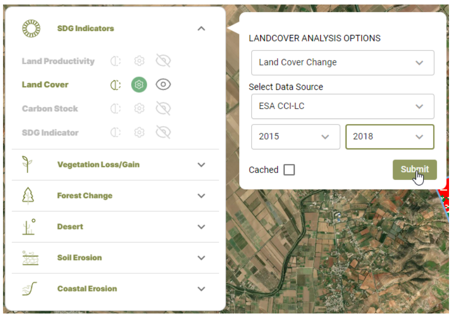
Viewing the Land cover data for a particular year

Click on the Submit button and the Land cover map for the chosen year and the summary statistics will be displayed on the map panel and the summary panel as shown below



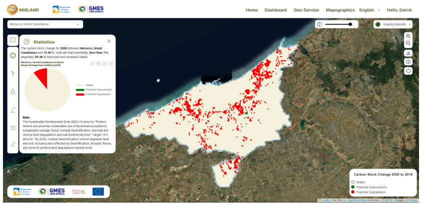
Viewing the Land cover data for a particular year

3. To compute landcover change, selec the ‘Landcover change’ option option under the *LANDCOVER ANALYSIS OPTIONS*. select the data landcover data source and the baseline and reporting year for comparison as shown



Selecting the Landcover change option

The results will be displayed on the map panel and the summary statistics panel as shown below

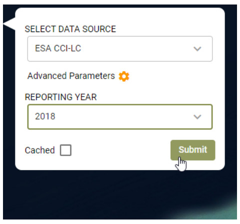


landcover change map and statistics

Carbon Stocks

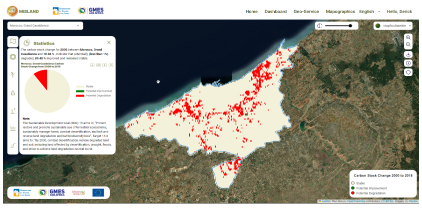
To compute changes in carbon stocks

1. Select SDG Indicators option on the services menu-bar. Choose Carbon Stock option and under the SDG indicator menu-bar. This should pop-up a dialog as the one shown below



Selecting the Carbon stock change SDG 15.3.1 sub-indicator

select the data source and the reporting period and click on the Submit button to view the carbon stock change for the selected reporting period



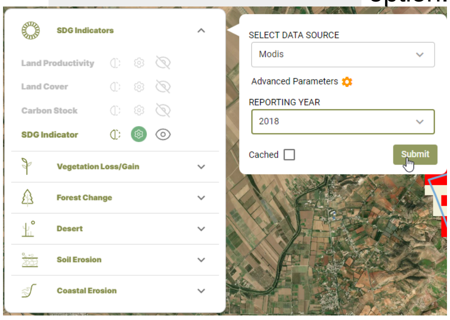
Carbon stock change map and statistics

Compute SDG 15.3.1 Indicator

The SDG 15.3.1 Indicator combines the three sub-indicators .i.e changes in land productivity, landcover and carbon stocks discussed previously to asses the land degradation status of the selected area and period. The one-out, all-out (1OAO) approach is used to combine the results from the three sub-indicators, to assess degradation status for each monitoring period at the Indicator level. Within the study region, degradation is considered to have occurred if degradation is reported in any one of the sub-indicators.

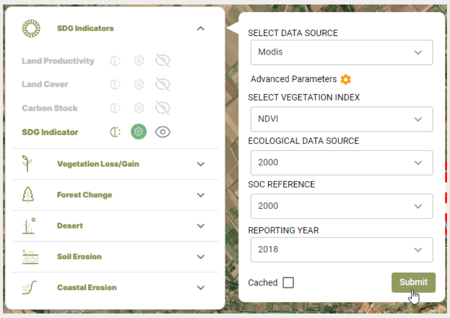
To compute the SDG 15.3.1 indicator, follow these simple steps,

1. Select the **SDG Indicators** service, on the services menu-bar and click on the **SDG INDICATOR 15.3.1** option. This should show a pop-up as the one shown below

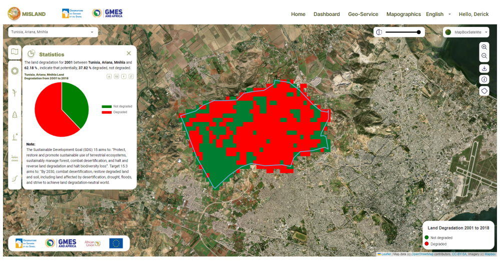


SDG 15.3.1 indicator

2. On the dialog that pops up, select the datasource and the reporting period. and click on the **Submit** button to get the results

> ## Note
>
> Clicking on the **Advanced Parameters** option provides more options to select the vegetation index of choise, the ecological unit dataset and the soil organic carbon reference raster as shown below.
>
> 
>
>
> *Setting advanced options for the SDG 15.3.1 indicator*

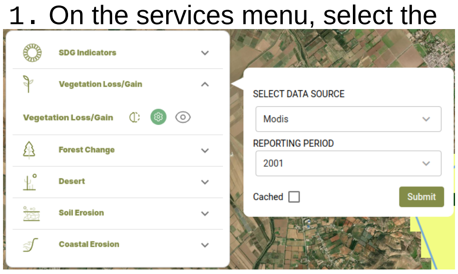
The map and computed statistics will be displayed on the map panel and summary pannel respectively.



Calculate Vegetation Loss/Gain indicators

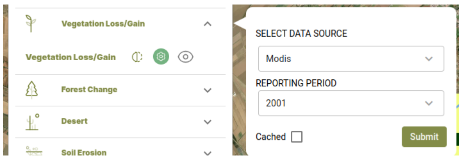
To compute vegetation loss/gain on the

1. On the services menu, select the **Vegetation Loss/Gain** option



Selecting the vegetation Loss/Gain Service

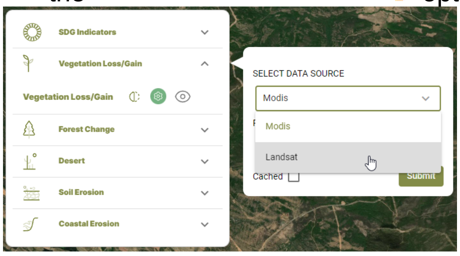
2. Click on the icon to open the layer settings dialog and select the data source and reporting year as shown below.



Vegetation gain/loss outputs

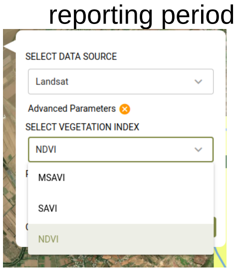
To compute vegetation indices using Landsat derived vegetation indices(NDVI, MSAVI, SAVI),

1. On the Vegetation loss/gain dialog, select Landsat under the SELECT DATA SOURCE dropdown and click on the Advanced Parameters options to access the list of indices.



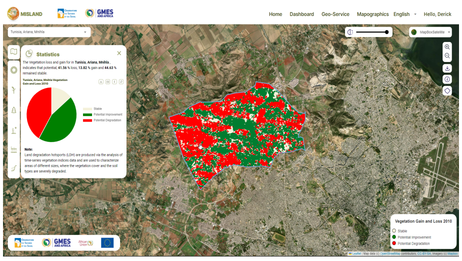
Selecting the Landsat-derived vegetation index option

2. select the vegetation index form the SELECT VEGEATATION INDEX dropdown that is revealed. Select the reporting period before clicking on the Submit button.



Choosing the vegetation index to compute

The map and computed statistics will be displayed on the map panel and summary pannel respectively.



Landsat derived vegetation loss and gain output

Calculate Forest Change

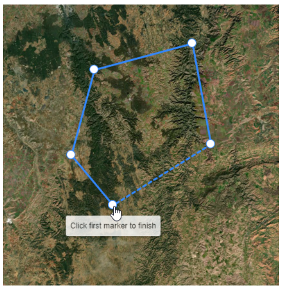
Computing Forest Loss

> **Note**
>
> The current release of the MISLAND-Africa uses the High resolution Hansen Global forest Change data to compute forest loss for selected area and year.

To compute forest loss using the Hansen Global forest change dataset;

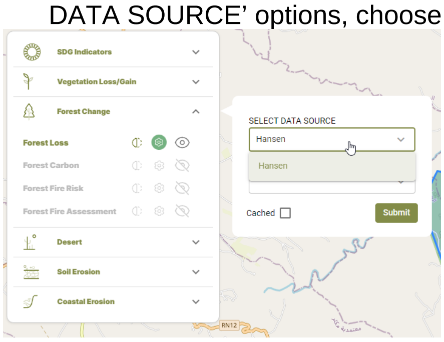
1. On the top left conner of the Map pannel, click on the tool to toggle the drowing tools. Once the drawing tools are revealed, click on the tool to start drowing a custom area on the map where you wish to compute the forest loss

Draw a polygon tool



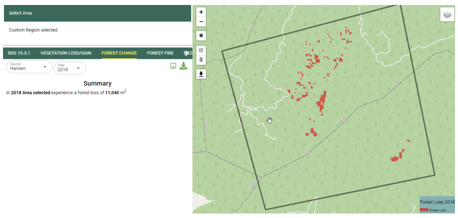
Draw a polygon tool

2. Select **Forest Loss** and click on the layer settings icon . On the layer settings dialog, under the 'SELECT DATA SOURCE' options, choose 'Hansen' and select the year you wish to compute the forest loss.



Selecting the Hansen Forest loss data

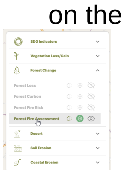
On clicking **Submit** The map and computed statistics will be displayed on the map panel and summary pannel respectively.



Foret change outputs

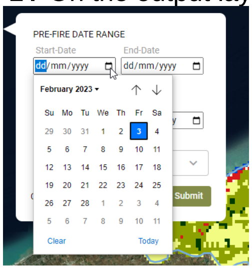
Forest Fires Assesment

1. Select the **Forest Change** option from the service menu. Under the **Forest Fire Assessment** click on the icon to toggle the layer settings as shown below.

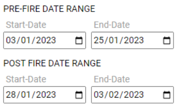


Selecting the Forest-fires option from the service menu.

2. On the output layer options, select the pre and post fire dates using the calender

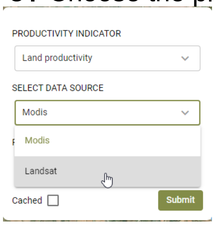


Selecting the date from the calender tool.



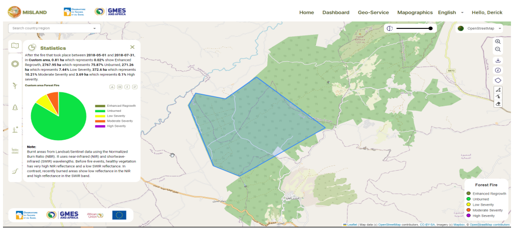
Pre-fire and Post-fire dates

3. Choose the platform to use to compute the burnt area



Choosing the Platform/Sensor for computing forest fires.

The output showing the extent and severity of the fire will be as shown below



Forest-fire Output.

Calculating Sensitivity to Desertification (MEDALUS)

Land degradation and desertification (LDD) analysis is done using the MEDALUS–(Mediterranean Desertification and Land Use Model, a series of international cooperation research projects funded by the European Union) is used worldwide to identify 'sensitive areas' that are potentially threatened by land degradation and desertification (LDD). The distinctive outcome of the approach is a multidimensional index (the ESAI) composed of partial indicators of climate, soil, vegetation, and management quality that are derived from the elaboration of 14 elementary variables.

All the varialbes are grouped into four Quality Indicators (Soil quality, SQI; vegetation quality, VQI; climate quality, CQI; and management quality, MQI), which were estimated as the geometric mean of the respective scores of the elementary variables.

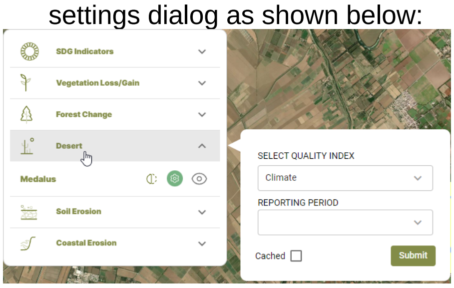
Calculating Individual Quality Indicators

The current implementation of the MEDALUS model in MISLAND overcomes the problem of no data by computing the geometric mean of Individual Quality Indicators by using the variables with available information for any of the elementary variables.

> **Note**
>
> To upscale the model for regional analysis, the following cosiderations were made for the selection of variables to be used in the computation of individual Quality indices: (a) Consistancy with the original MEDALUS Approach; (b) Time-series data availability and regularity for multi-temporal analysis; and (c) data source quality and reliability for future updates.

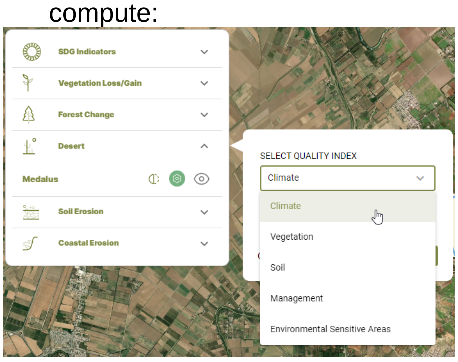
To compute the individual quality indicators(Soil quality, SQI; vegetation quality, VQI; climate quality, CQI; and management quality, MQI), Follow the following simple steps:

1. On the service menu-bar select the **Desert** option and click on the icon to togle the layer settings dialog as shown below:



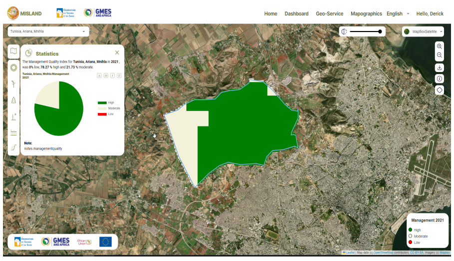
MEDALUS layer settings dialog.

2. On the layer settings dialog select the Quality index to compute from the dropdown list and the year you wish to compute:



Selecting the Quality index to compute

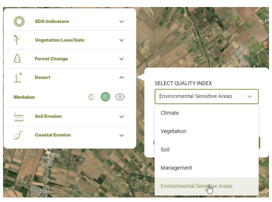
The resultant layer and statistics will be computed and visualized as shown



Example of results for Management Quality Index computation

Calculate the Environmental Sensitivity Areas Index(ESAI)

To coumpute the Environmental Sensitivity Index select MEDALUS option from the service menu. On the layers selection option dropdown, selsect the ESAI option as shown below



Selecting the ESAI option from the layer selection dropdown

Exporting Outputs

Exporting outputs on the service is as simple and intuitive. Users can download the maps, charts and data following the steps highligted in this section of the document.

Export Map

Map outputs can be exported in .png format. To export the map, users can click on the export map tool that is found on the map navigation tools as shown below.

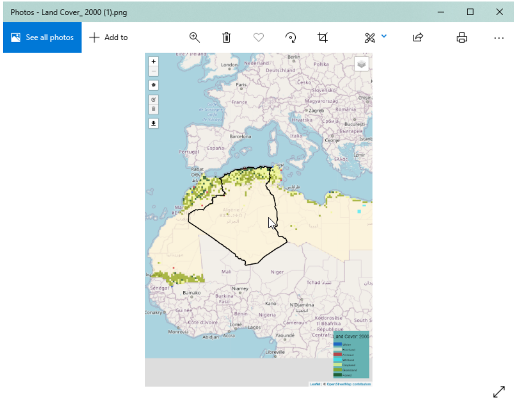
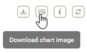


Image file of exported map

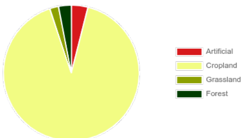
Export Chart

The chart image can be exported from the statistics tab by clicking on the export image icon on the list of icons at the top-right conner of the chart area.



Export chart as image

An example of an image file export is shown below.

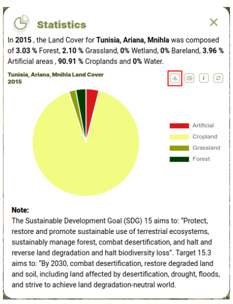


Export chart as image

Download data

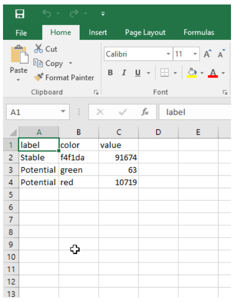
In addition to exporting charts as an option, users can also downlad the data and create custom charts or perform further analyses.

The download data icon icon can be found just below the summary text under the statistics panel as in the figure below.



Download CSV file option

The downloaded data is in .csv format and can be open in microsoft exel or similar software

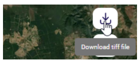


Exported data as CSV

Downloading Raster Data

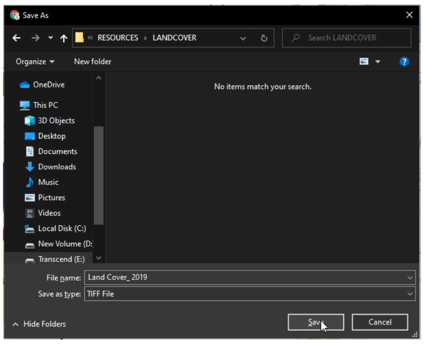
MISLAND Service users can also download the data in GeoTIF format for further analysis or visualization

To download the raster data, Click on the download tiff just below the service menu-bar as shown below



Download tiff file option

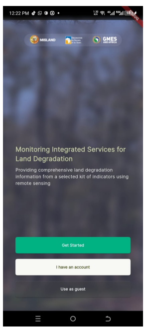
This will prompt you to save the file in your desired location. The downloaded raster can be visualized and analysed with your desired software or tools.



Saving the downloaded tiff

User Management

Like the plugin, the mobile app is free to use, but you should register an email address to facilitate computation of large areas as the results may have to be sent to the email address. However, a `guest` mode is provided for those who wish to explore the app without registering or logging in.



Splash Screen

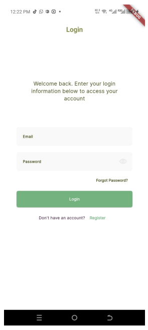
Guest mode

To proceed with guest mode click `Use as guest` to open the dahboard without logging in or registering.

> **Note**
>
> For large-area calculation, you will be required to login so that results can be sent to your email.

Login

To login, click `I have an account` on the splash screen to proceed to the login page. Provide your email and password to proceed to the dashboard. If you have previously visited the Misland Geoportal, or the QGIS plugin, use the same credentials to login.



Login

Registration

To register an account, click `Get started` to open the registration page. Provide all the required details and click `Next` to proceed to the password page. Fill in your passwword and click `Create account`. A verification email will be sent to your email from where you can login and proceed to the dashboard.

> **Note**
>
> The account created here can be used both on the QGIS Plugin and the Misland Geoportal.

Password Retrieval

To retrieve your account, follow the following procedure.

1. On the login page, click the `Forgot Password` text button to open the password reset page.
2. Provide your email and click `Reset Password`. A verification email with a guide on how to reset your account will be sent to your email.

Dashboard

Tutorial

To see what each button on the dashboard does, click the `Tutorials` button. This will change the dashboard's mode to tutorials mode labelling all buttons with what they do.

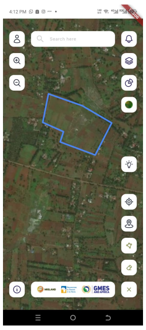
Selecting an Area of Interest

To select an area of interest, click the `Select Location` button. This will open a dialog from where you can select a country, region and subregion.

Drawing a Custom Area of Interest

To draw a custom area of interest, follow the procedure below.

1. Click the `Custom Draw` button.
2. Click the `Draw Polygon` button to activate drawing mode.
3. Tap on the dashboard and a polygon will be drawn automatically with the vertices being the points you tapped on the screen.

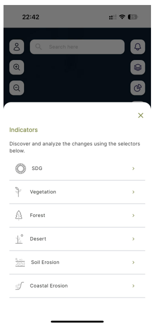


Dashboard with custom AOI

> **Note**
>
> To erase the polygon, click the `Erase` button and the polygon will be erased automatically. A minimum of three points is required to create a polygon.

Selecting an indicator

To select a layer, click the `Indicators` button to open the indicators dialog.

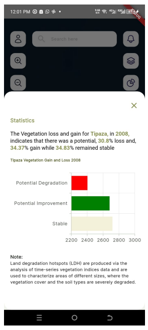


Indicators Dialog

> **Note**
>
> An area of interest must be selected before selecting an indicator.

Visulaizing statistics

To visualize statistics, click the `Statistics` button to open the statistics dialog.



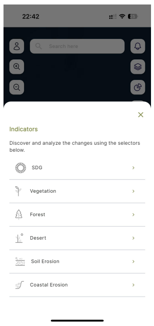
Statistics dialog

> **Note**
>
> An indicator must have been selected before visualizing the statistics.

SDG 15.3.1

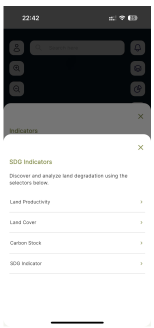
Land Productivity

1. To start the Land Productivity analysis, click the `Indicators` button to open the indicators dialog.



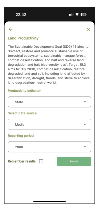
Indicators dialog

2. Click the `SDG` button to open the SDG Indicators dialog.



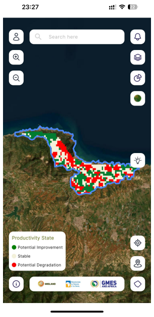
SDG Indicators dialog

3. Click the `Land Productivity` button to open the Land Productivity dialog.



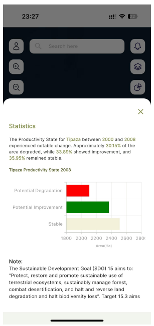
Land Productivity dialog

4. Provide all the required details on the dialog and click `submit`.



Sample Land Productivity Result

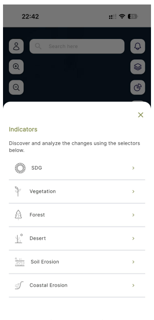
5. Visualize statistics on the dashboard by clicking the `Statistics` button.



Sample Land Productivity Statistics

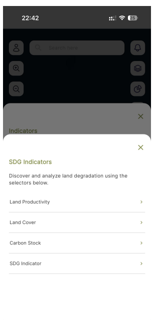
Land Cover

1. To start the Land Cover analysis, click the `Indicators` button to open the indicators dialog.



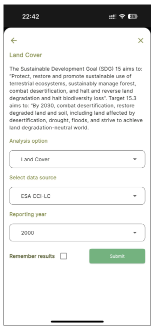
Indicators dialog

2. Click the `SDG` button to open the SDG Indicators dialog.



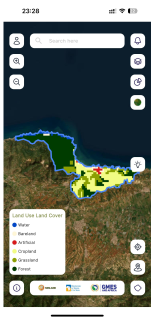
SDG Indicators dialog

3. Click the `Land Cover` button to open the Land Cover dialog.



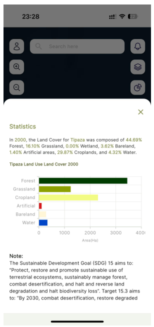
Land Cover dialog

4. Provide all the required details on the dialog and click `submit`.



Sample Land Cover Result

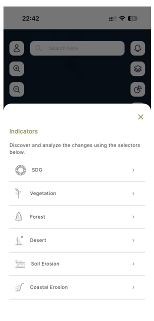
5. Visualize statistics on the dashboard by clicking the `Statistics` button.



Sample Land Cover Statistics

Carbon Stock

1. To start the Carbon Stock analysis, click the `Indicators` button to open the indicators dialog.

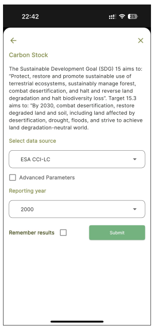


Indicators dialog

2. Click the `SDG` button to open the SDG Indicators dialog.

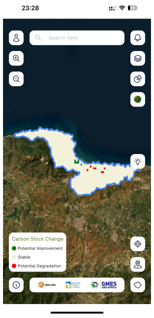
SDG Indicators dialog

3. Click the `Carbon Stock` button to open the Carbon Stock dialog.



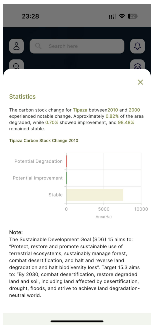
Carbon Stock dialog

4. Provide all the required details on the dialog and click `submit`.



Sample Carbon Stock Result

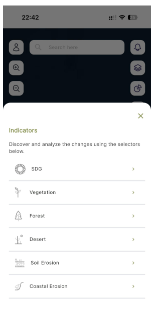
5. Visualize statistics on the dashboard by clicking the `Statistics` button .



Sample Carbon stock statistics

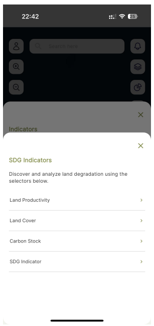
SDG 15.3.1

1. To start the SDG 15.3.1 analysis, click the `Indicators` button to open the indicators dialog.



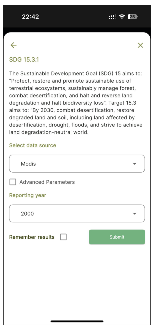
Indicators dialog

2. Click the `SDG` button to open the SDG Indicators dialog.



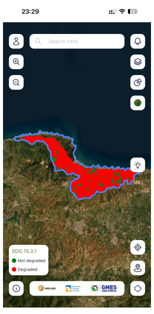
SDG Indicators dialog

3. Click the `SDG Indicator` button to open the SDG 15.3.1 dialog.



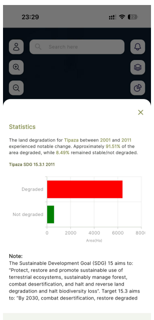
SDG 15.3.1 dialog

4. Provide all the required details on the dialog and click `submit`.



Sample SDG 15.3.1 Result

5. Visualize statistics on the dashboard by clicking the `Statistics` button.

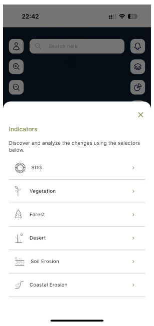


Sample SDG 15.3.1 Statistics

Vegetation

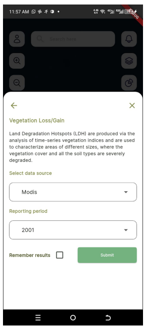
Vegetation Loss/Gain

1. To start the vegetation loss/gain analysis, click the `Indicators` button to open the indicators dialog.



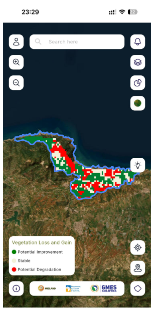
Indicators dialog

2. On the indicators modal click the `Vegetation` button to open the vegetation loss/gain dialog



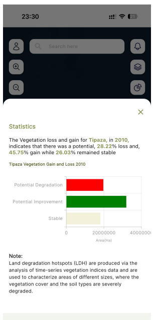
Vegetation Loss/Gain dialog

3. Provide all the required details on the dialog and click `submit`.



Sample Vegetation Loss and Gain Result

4. Visualize statistics on the dashboard by clicking the `Statistics` button.

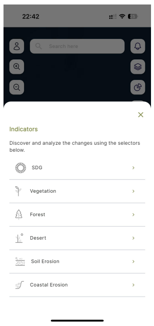


Sample Vegetation Loss and Gain Statistics

Forest

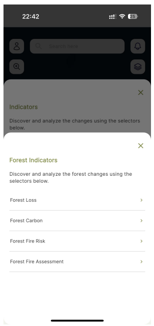
Forest Loss

1. To start the forest loss analysis, click the `Indicators` button to open the indicators dialog.



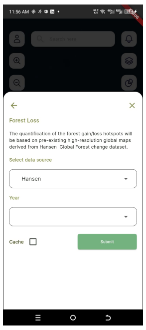
Indicators dialog

2. On the indicators modal click the `Forest` button to open the forest indicators dialog



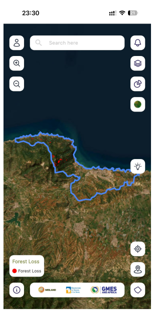
Forest Indicators dialog

3. On the indicators modal click the `Forest Loss` button to open the forest loss dialog



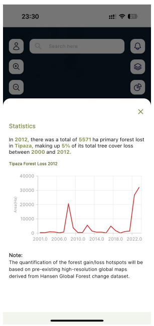
Forest Loss dialog

4. Provide all the required details on the dialog and click `submit`.



Sample Forest Loss Result

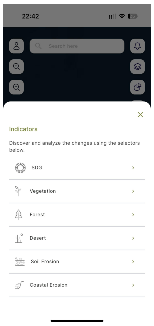
5. Visualize statistics on the dashboard by clicking the `Statistics` button.



Sample Forest Loss statistics

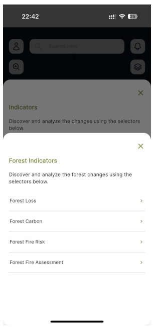
Forest Carbon

1. To start the forest carbon emission analysis, click the `Indicators` button to open the indicators dialog.



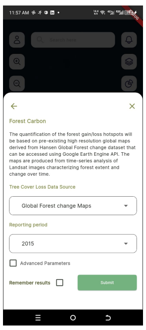
Indicators dialog

2. On the indicators modal click the `Forest` button to open the forest indicators dialog



Forest Indicators dialog

3. On the indicators modal click the `Forest Carbon` button to open the forest carbon dialog

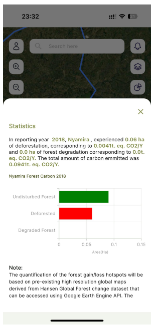


Forest carbon dialog

4. Provide all the required details on the dialog and click `submit`.

Sample Forest Carbon Result

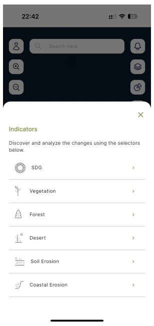
5. Visualize statistics on the dashboard by clicking the `Statistics` button.



Sample Forest Carbon statistics

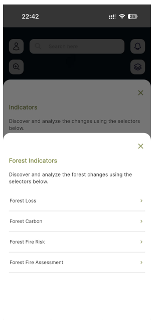
Forest Fire Risk

1. To start the forest fire risk analysis, click the `Indicators` button to open the indicators dialog.



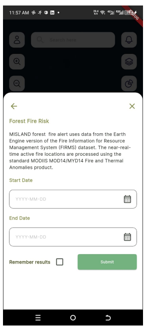
Indicators dialog

2. On the indicators modal click the `Forest` button to open the forest indicators dialog



Forest Indicators dialog

2. On the indicators modal click the `Forest Fire Risk` button to open the forest fire risk dialog

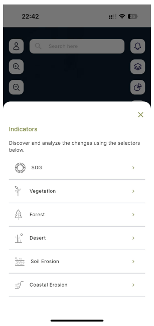


Forest Fire Risk dialog

3. Provide all the required details on the dialog and click `submit`.
4. Visualize statistics on the dashboard by clicking the `Statistics` button.

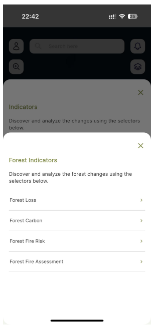
Forest Fire Assessment

1. To start the forest fire assessment analysis, click the `Indicators` button to open the indicators dialog.



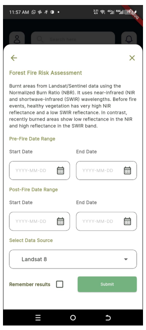
Indicators dialog

2. On the indicators modal click the `Forest` button to open the forest indicators dialog



Forest Indicators dialog

3. On the indicators modal click the `Forest Fire Assessment` button to open the forest fire assessment dialog



Forest Fire Assessment dialog

4. Provide all the required details on the dialog and click `submit`.
5. Visualize statistics on the dashboard by clicking the `Statistics` button.

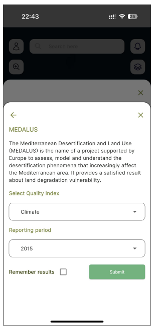
Desertification

MEDALUS

1. To start the MEDALUS desertification analysis, click the `Indicators` button to open the indicators dialog.

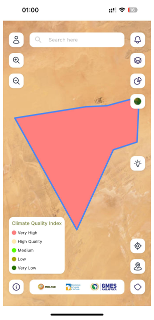
Indicators dialog

2. Click the `Desert` button to open the MEDALUS dialog.



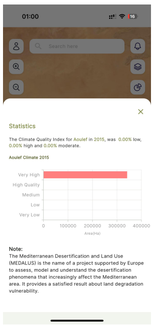
MEDALUS dialog

3. Provide all the required details on the dialog and click `submit`.



Sample Desertification Result

4. Visualize statistics on the dashboard by clicking the `Statistics` button.

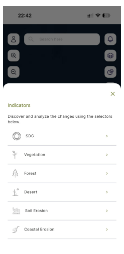


Sample Desertification Statistics

Soil Erosion

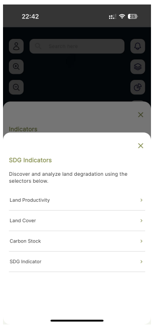
Water Erosion

1. To start the Water Erosion analysis, click the `Indicators` button to open the indicators dialog.



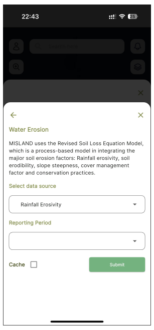
Indicators dialog

2. Click the `Soil Erosion` button to open the Soil Erosion dialog.



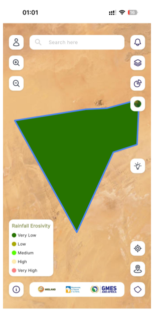
Soil Erosion dialog

3. Click the `Water Erosion` button to open the Water Erosion dialog.



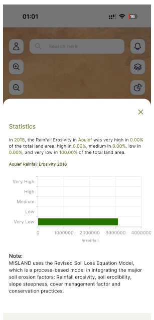
Water Erosion dialog

4. Provide all the required details on the dialog and click `submit`.



Sample Water Erosion Result

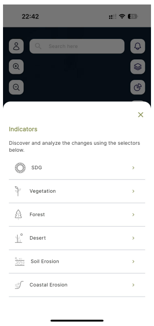
5. Visualize statistics on the dashboard by clicking the `Statistics` button .



Sample Water Erosion statistics

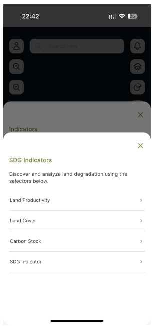
Wind Erosion

1. To start the Wind Erosion analysis, click the `Indicators` button to open the indicators dialog.



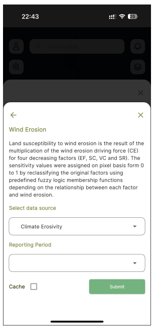
Indicators dialog

2. Click the `Soil Erosion` button to open the Soil Erosion dialog.



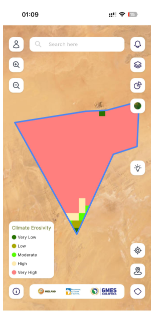
Soil Erosion dialog

3. Click the `Wind Erosion` button to open the Wind Erosion dialog.



Wind Erosion dialog

4. Provide all the required details on the dialog and click `submit`.



Sample Wind Erosion Result

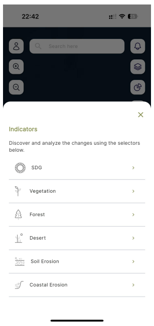
5. Visualize statistics on the dashboard by clicking the `Statistics` button .

Sample wind Erosion statistics

Coastal Erosion

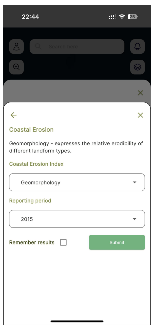
Coastal Vulnerability Index

1. To start the Coastal Erosion analysis, click the `Indicators` button to open the indicators dialog.



Indicators dialog

2. Click the `Coastal Erosion` button to open the Coastal Vulnerability Index dialog.

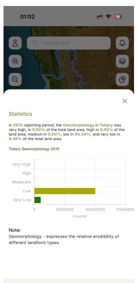


Coastal Erosion dialog

3. Provide all the required details on the dialog and click `submit`.

Sample Coastal Erosion Result

4. Visualize statistics on the dashboard by clicking the `Statistics` button .



Sample Coastal Erosion Statistics

Registration and Settings

Registration

The toolbox is free to use, but you should register an email address to facilitate computation of large areas as the results may have to be sent to the email address.

To register your email address and obtain a free account, select the **settings** icon highlighted . This will open the **settings** dialog.

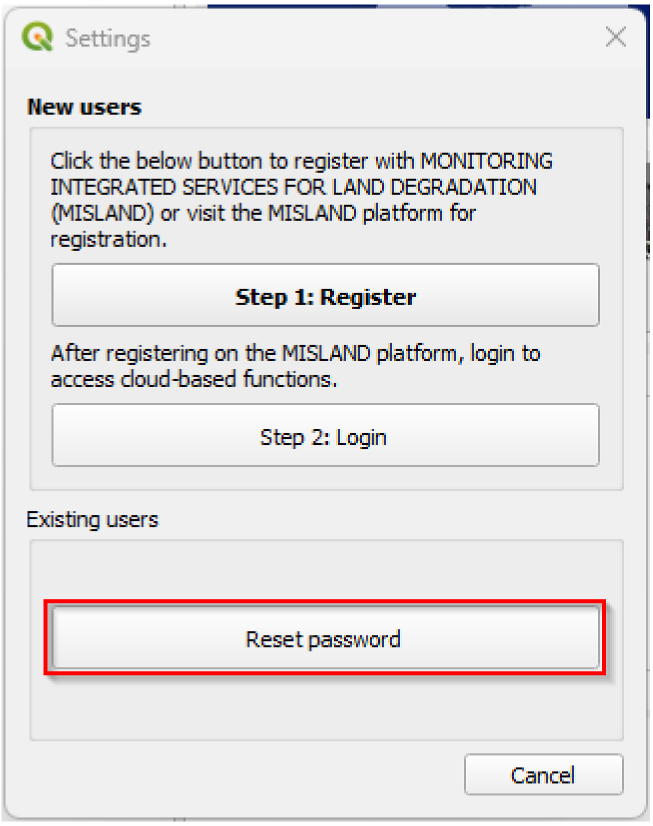


Figure 1: Settings dialog

To register, click the `Step 1:Register` button. This will lead you to the MISLAND-Africa registration page. Provide all the details required on the platform and signup.

> **Note**
>
> If you have already registered on the platform, you can proceed to login on QGIS.

Login

To login, click on the `Step 2: Login` button. This will open the `Login` dialog.

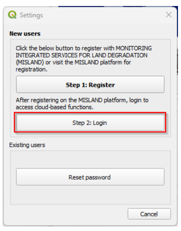


Figure 2: Settings with login button highlighted

Provide your email and password to login. Upon successful registration, your details will be saved by QGIS.

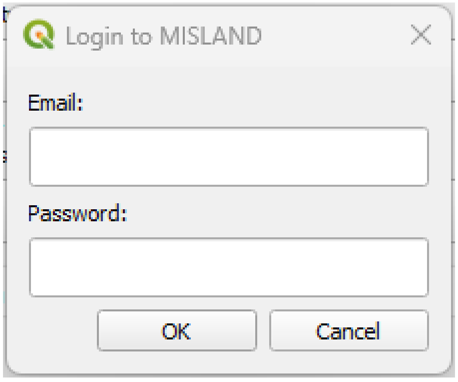


Figure 3: Login Dialog

Reset Password

If you wish to reset your password, click the `Reset Password` button. This will open MISLAND-Africa reset password.

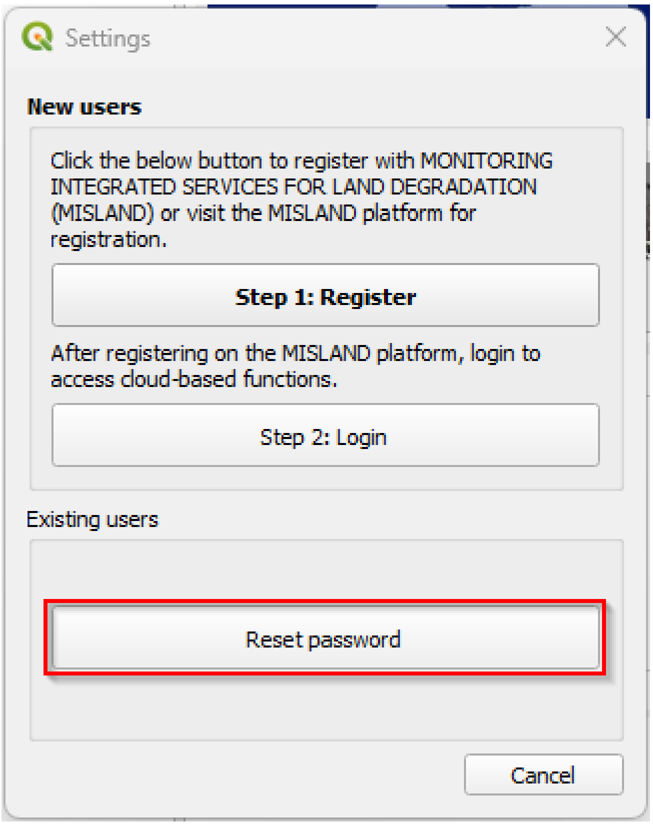


Figure 4: Settings dialog with reset password button highlighted

Proceed as guided on the platform to recover your account.

Calculate SDG 15.3.1

Sustainable Development Goal 15.3 intends to combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world by 2030. In order to assess the progress to this goal, the agreed-upon indicator for SDG 15.3 (proportion of land area degraded) is a combination of three sub-indicators: change in `land productivity`, change in `land cover` and change in `soil organic carbon`.

Land Productivity

Land productivity is computed from vegetation indices using three measures of change i.e trajectory, state and performace. Any of the three sub-indicators measures of change as well as the productivity can be combuted as illustrated below.

1. To start the land productivity analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

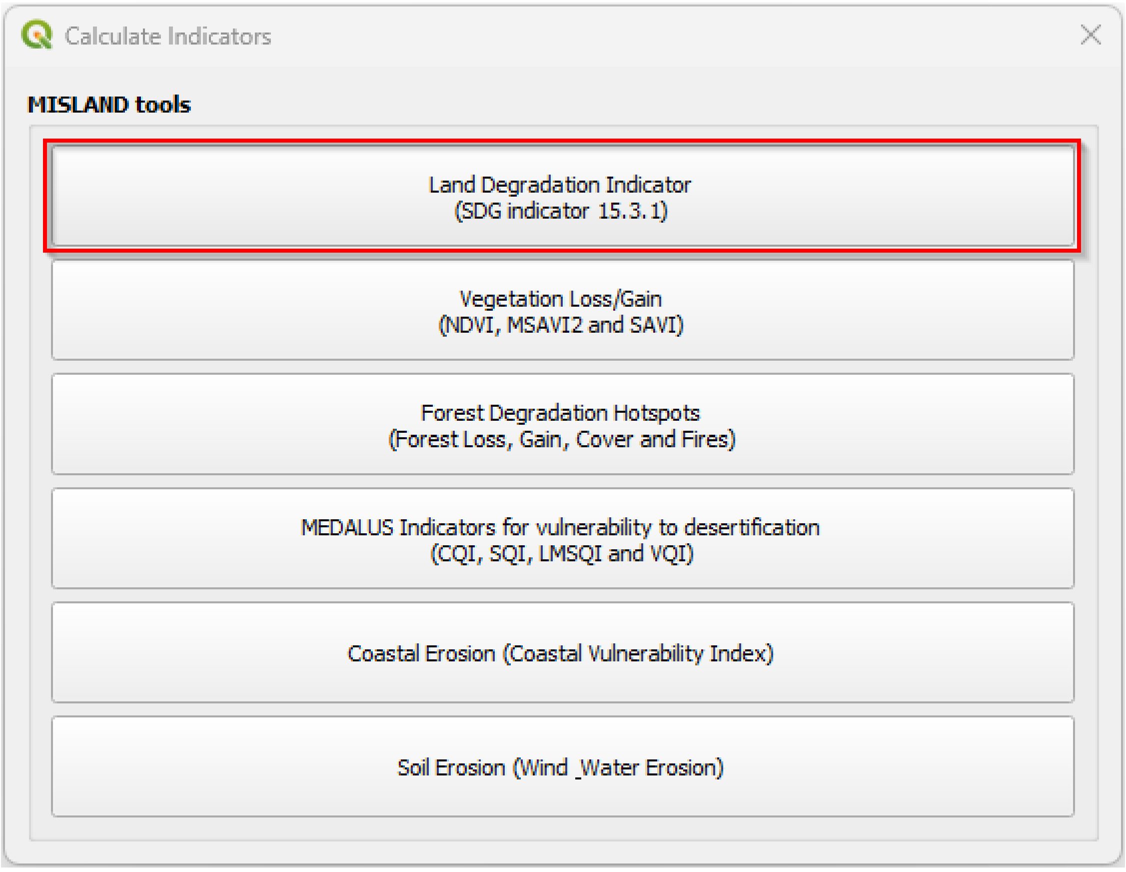


Figure 5: Calculate Dialog

2. From here, click on the `Land Degradation Indicator` button highlighted in red. This will open the `SDG Dialog`.

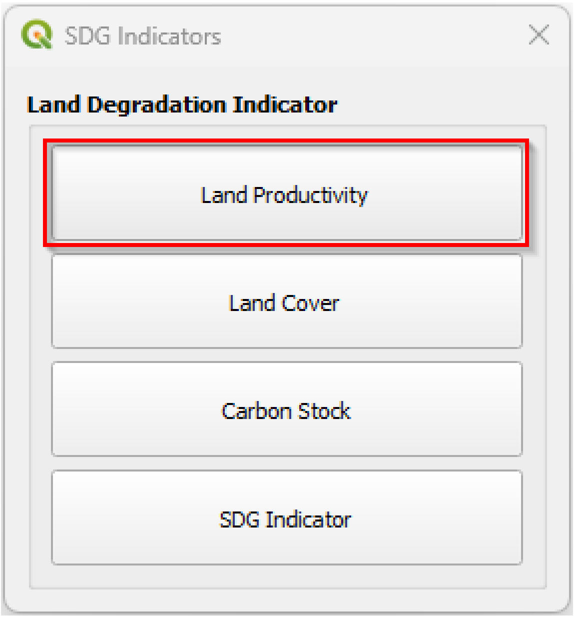


Figure 6: Land Degradation dialog

3. On the dialog click the `Land Productivity` button highlighted in red to open the `Land Productivity Dialog`.

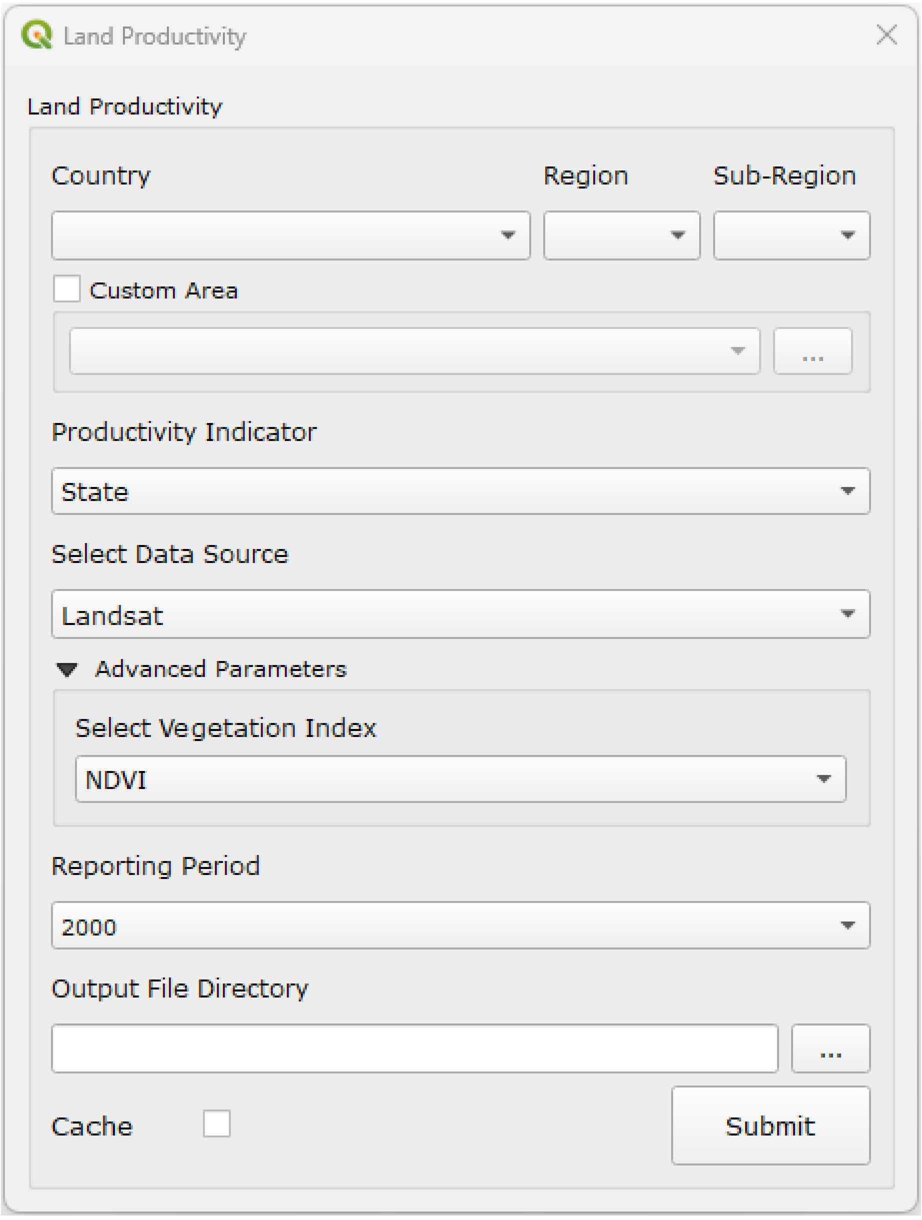


Figure 7: Land Productivity dialog

4. Under the `Productivity Indicator` option on the pop-up menu, users can select either of the three land productivity sub-indicators i.e. State, performance, and trajectory or the final aggregated land productivity for their selected area of interest.

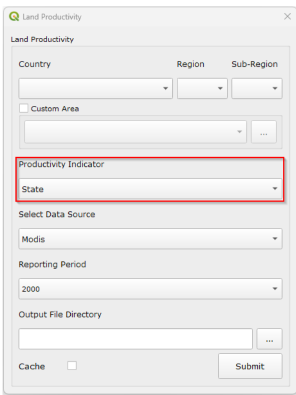


Figure 8: Land Productivity Indicator

Note

MISLAND allows users to assess vegetation using high resolution Landsat derived vegetation indices. If the selection of the data is landsat the option to specify the vegetation index .i.e NDVI, MSAVI or SAVI will appear under the `Advanced Parameters` option.

Important

Land Productivity Parameters :width: 100%

Parameters	Definition
Productivity Indicator	The Productivity Indicator of choice
Data Source	The data source of choice.
Vegetation Index	Vegetation Index of choice
Reporting year	Year of analysis

4. Once the selection of datasets and reporting period is complete click on the `Submit` button at the bottom of the dialog. The results should be displayed as shown below.

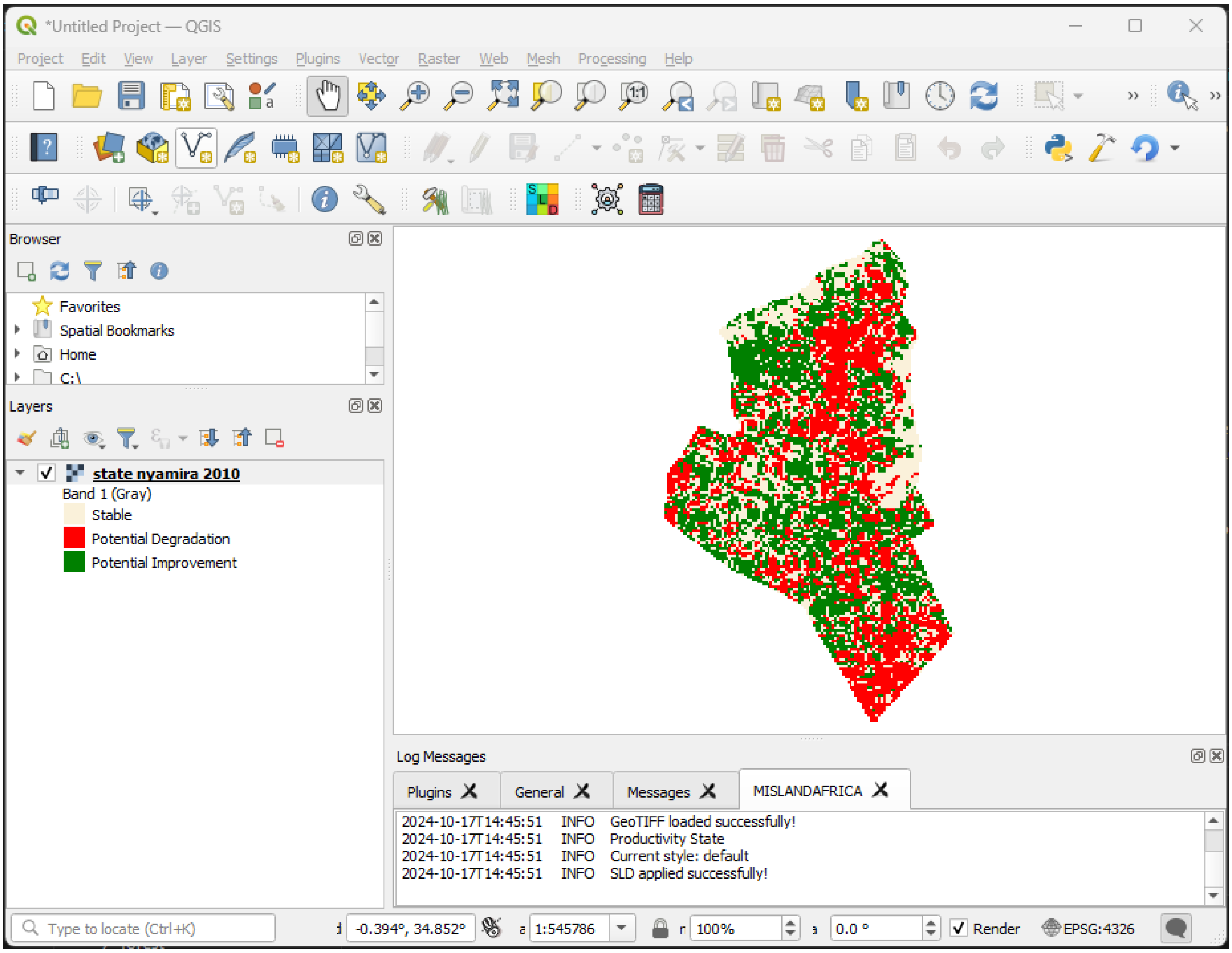


Figure 9: Land Productivity Result

Land Cover and Land Cover Change

Land Cover

1. To start the land cover analysis, click the **calculate** icon highlighted . This will open the **calculate** dialog.

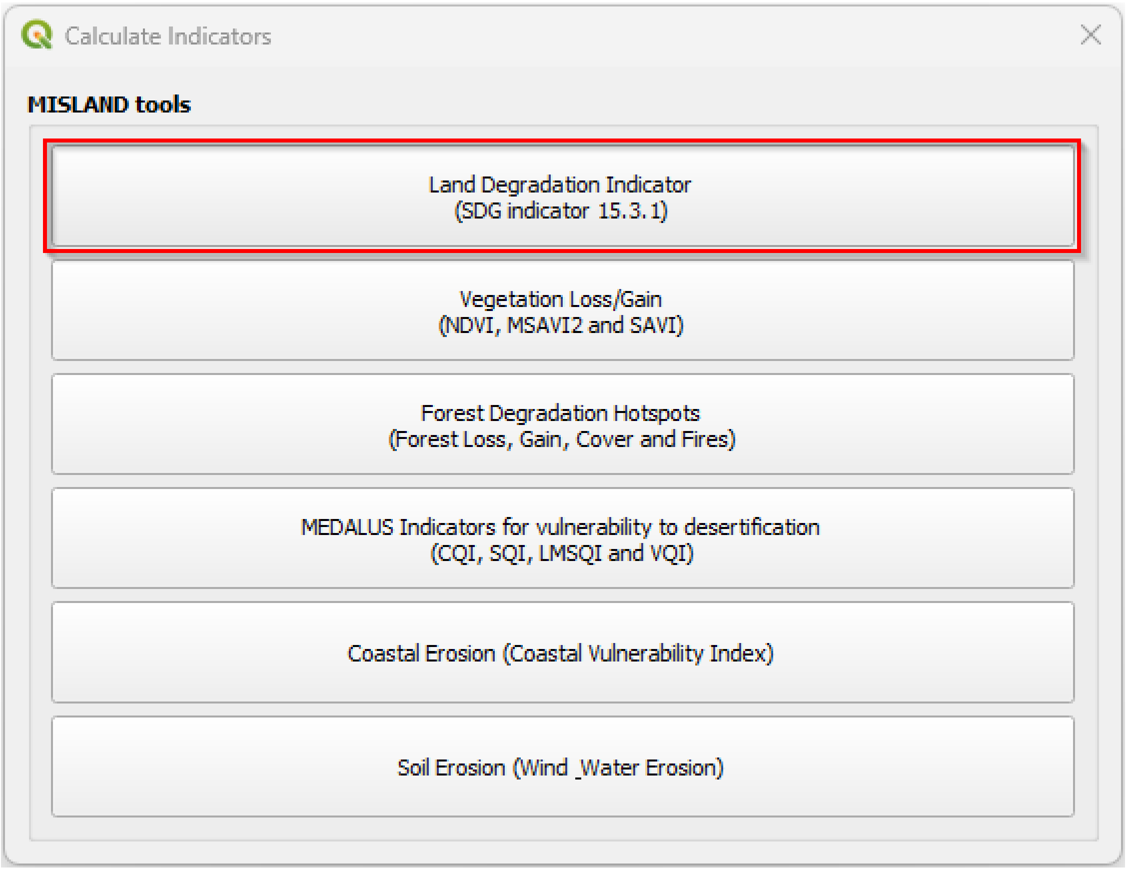


Figure 10: Calculate Dialog

2. From here, click on the `Land Cover Indicator` button highlighted in red. This will open the `SDG Dialog`.

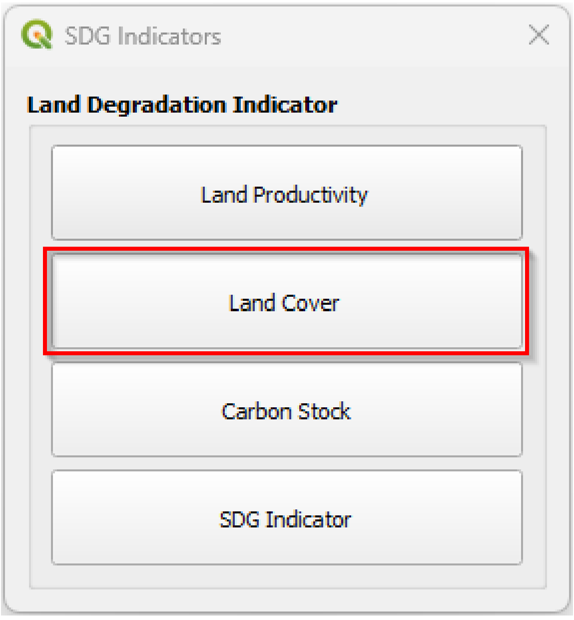


Figure 11: Land Degradation dialog

3. On the dialog, click the `Land Cover` button highlighted in red. This will open the `Land Cover` dialog.

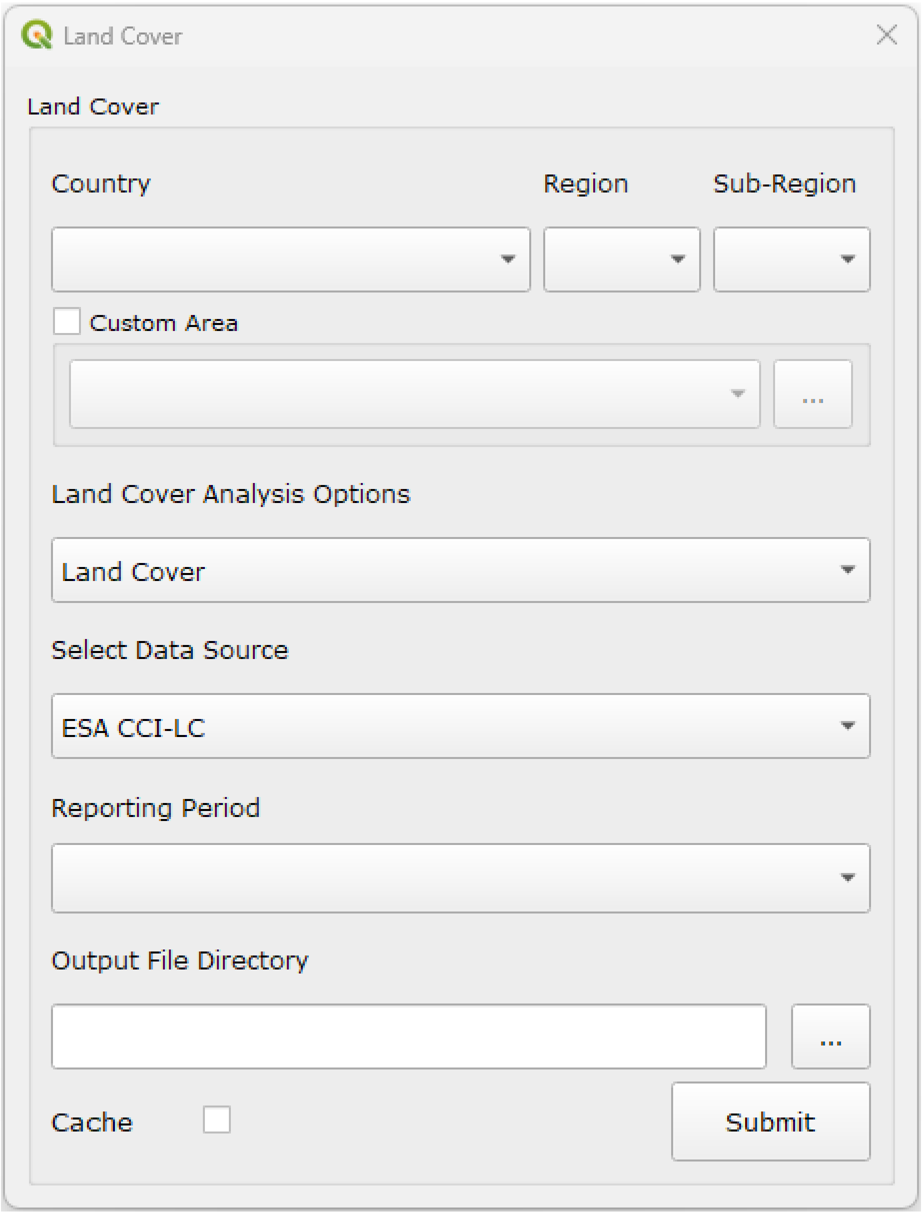


Figure 12: Land Cover Dialog

4. On the `Land Cover Analysis Options` select **Land Cover**.

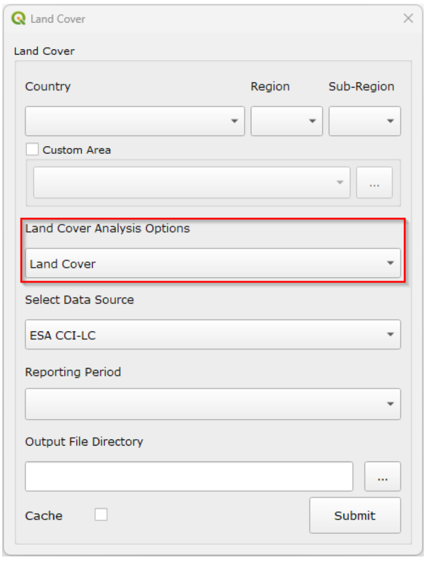


Figure 13: Land Cover Analysis Option

Important

Land Cover Parameters

Parameters	Definition
Land Cover Analysis Options	The Land cover analysis option of choice
Data Source	The data source of choice
Reporting period	Year of analysis

5. Provide all other parameters required in the dialog and click `Submit`. The results should be displayed as shown below.

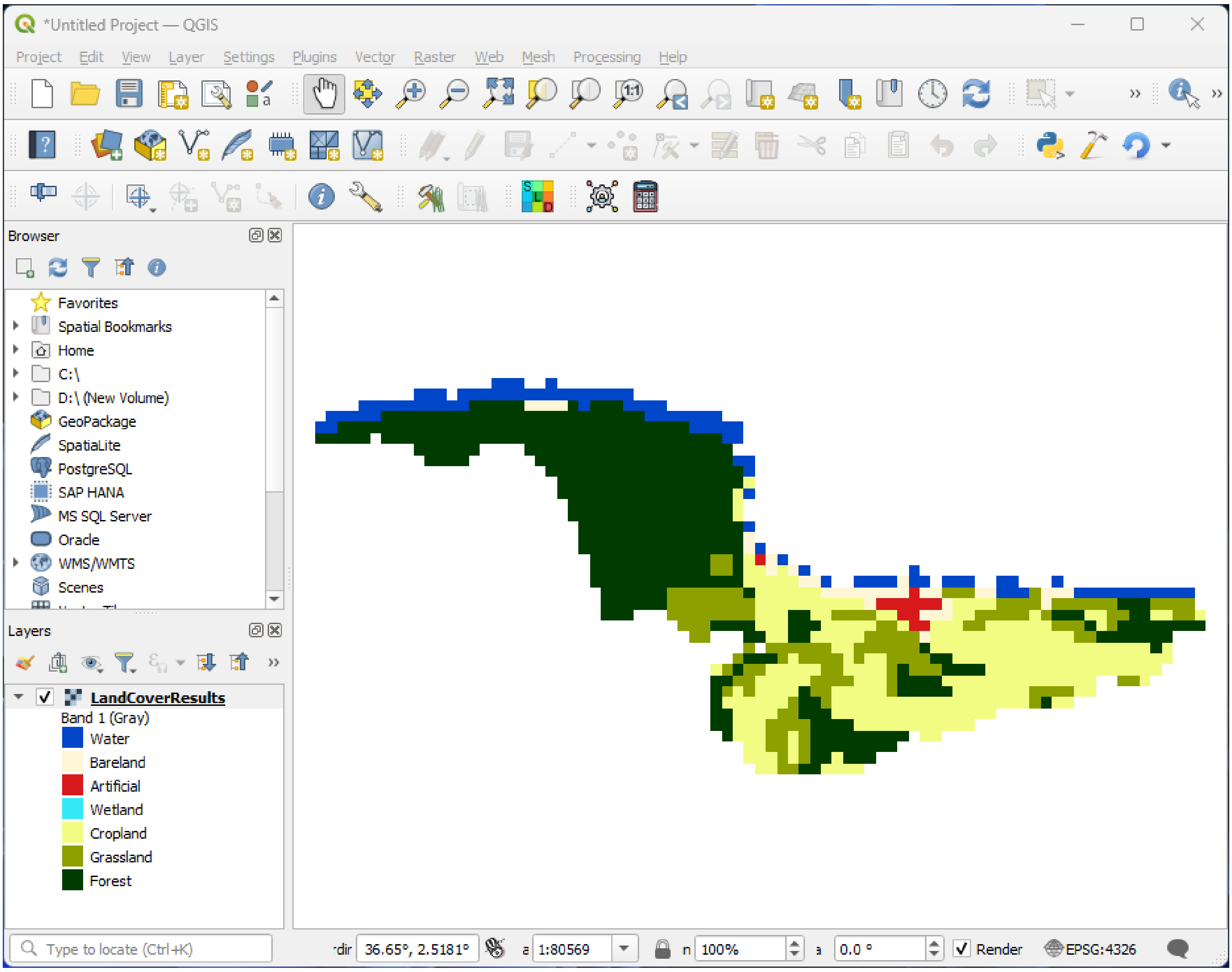


Figure 14: Land Cover Results

Land Cover Change

1. On the `Land Cover` dialog, select `Land Cover Change` as the `Land Cover Analysis Option`. In this section you will have to provide a `Start year` and an `end year`.

Figure 15: Land Cover Change Analysis Option

Important

Land Cover Change Parameters

Parameters	Definition
Land Cover Analysis Options	The Land cover analysis option of choice
Data Source	The data source of choice
Start year	Base year/Start year
End year	Comparison year/end year

2. Provide all other parameters required in the dialog and click `Submit`. The results should be displayed as shown below.

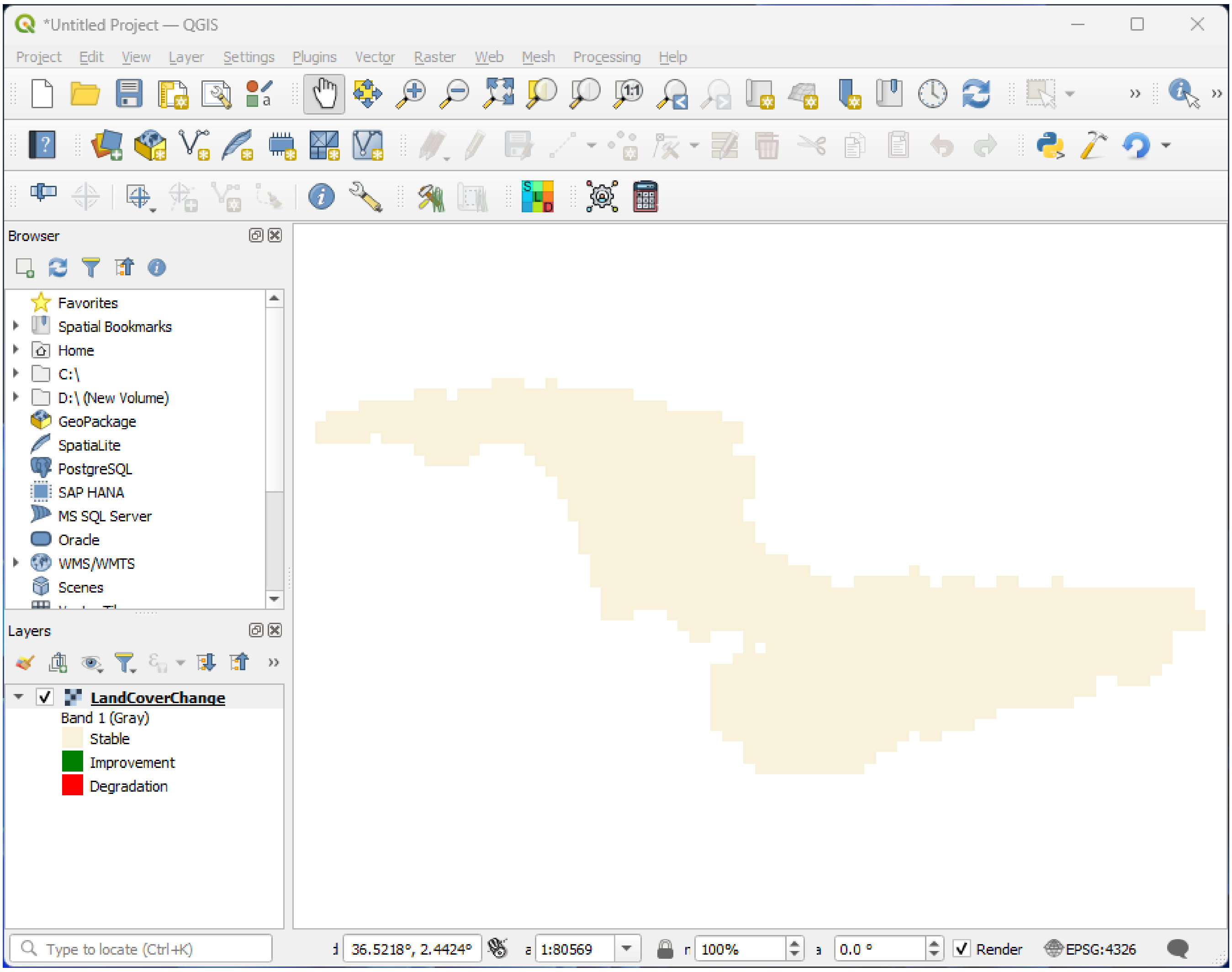


Figure 16: Land Cover Change Results

Carbon Stock

1. To start the carbon stock analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

Figure 17: Calculate Dialog

2. From here, click on the `Carbon Stock` button highlighted in red. This will open the `Carbon Stock Dialog`.

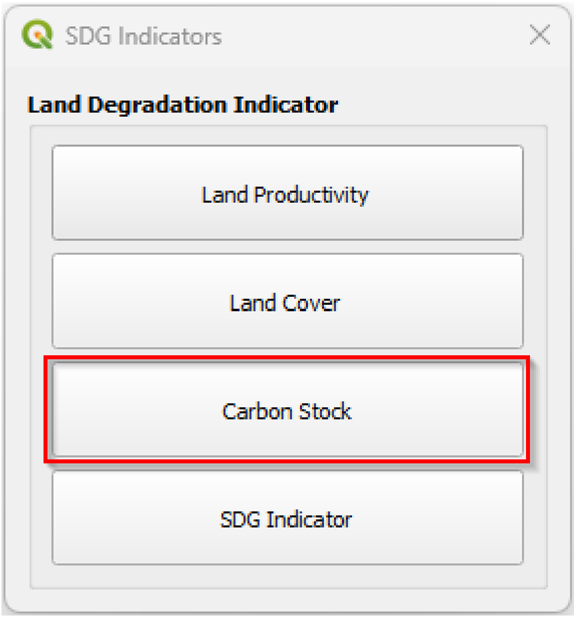


Figure 18: Land Degradation dialog

3. Proceed to provide all the required parameters and click `Submit` to compute Carbon Stock.

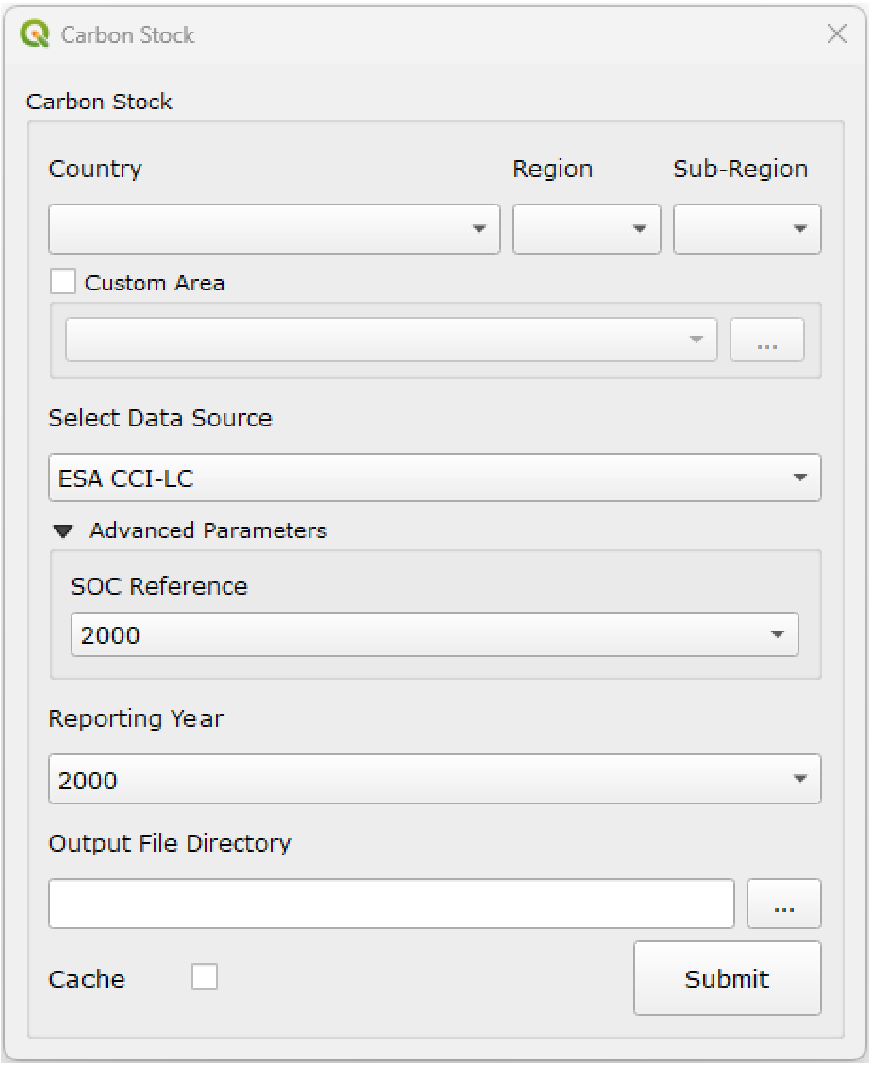


Figure 19: Carbon stock dialog

Important

Land Cover Parameters

Parameters	Definition
Data Source	The data source of choice
SOC reference	Soil Organic Carbon Reference Raster
Reporting period	Year of analysis

4. The result will be as shown below.

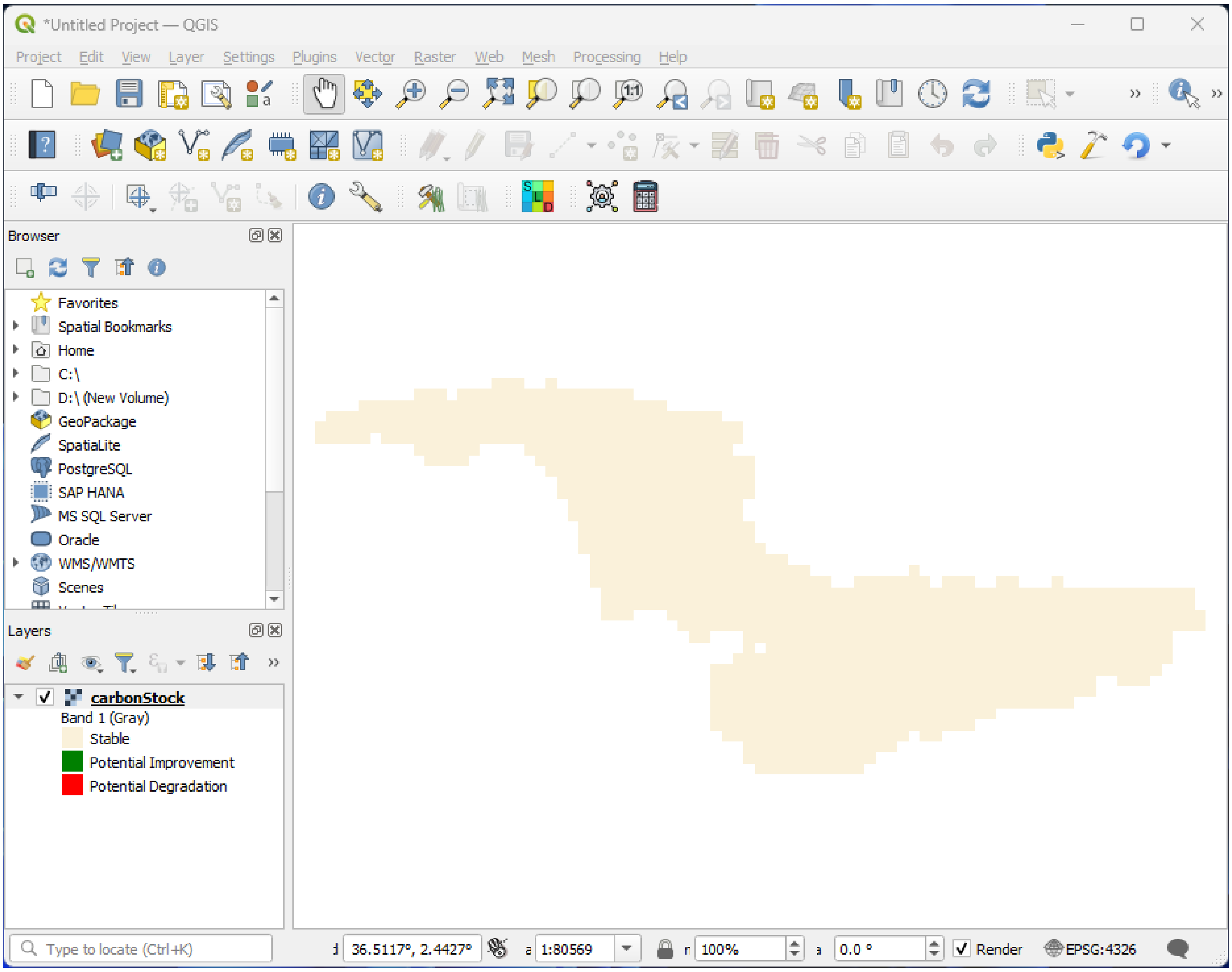


Figure 20: Carbon Stock Results

SDG 15.3.1

1. To start the SDG Indicator analysis, click the **calculate** icon highlighted. This will open the `calculate` dialog.

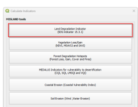


Figure 21: Calculate Dialog

2. From here, click on the `SDG Indicator` button highlighted in red. This will open the `SDG Indicator Dialog`.

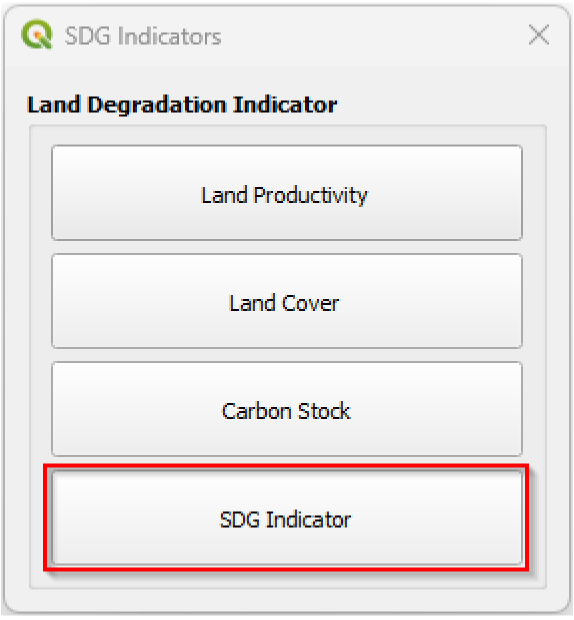


Figure 22: Land Degradation dialog

3. Proceed to provide all the parameters as required on the dialog and click `Submit`.

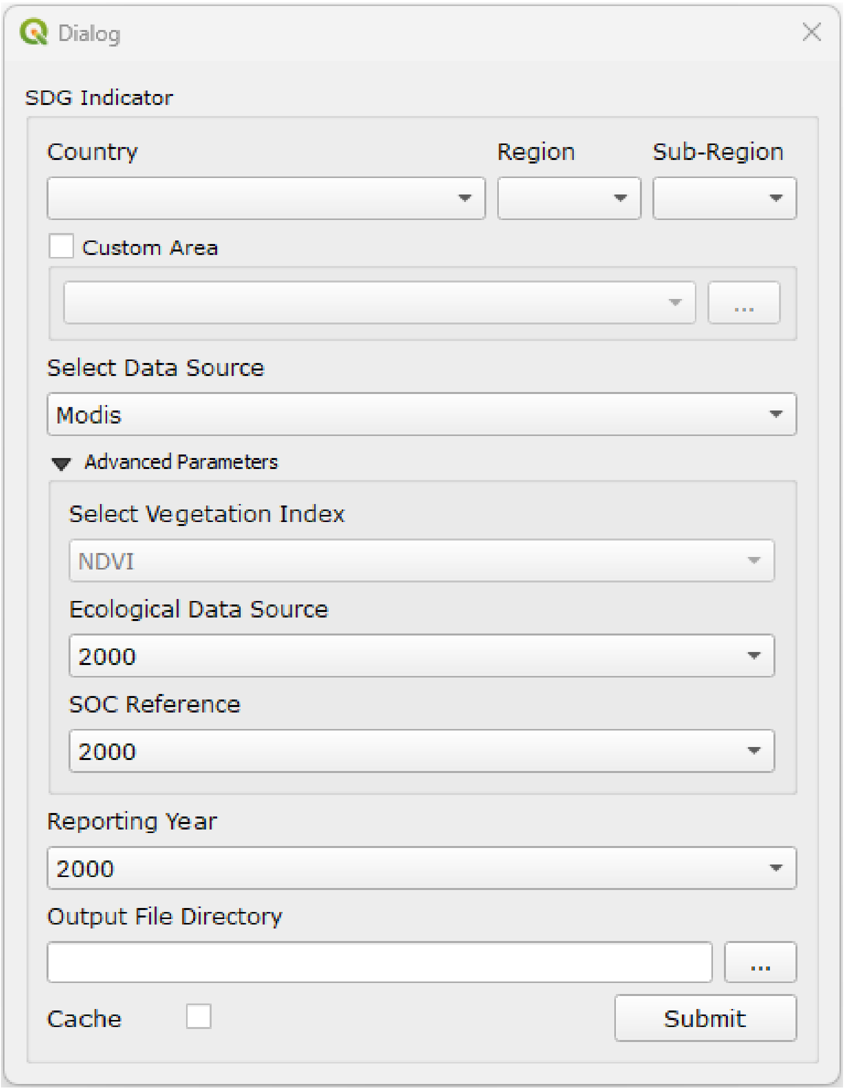


Figure 23: SDG 15.3.1 dialog

Note

The **Advanced Parameters** section provides more options to select the vegetation index of choice, the ecological unit dataset and the soil organic carbon reference raster.

Important

SDG 15.3.1 Parameters

Parameters	Definition
Data Source	The data source to users
Vegetation index	Vegetation Index of choice
Ecological Data Source	The Ecological Unit dataset
SOC reference	Soil Organic Carbon reference raster
Reporting year	Year of analysis

4. The result will be as shown below.

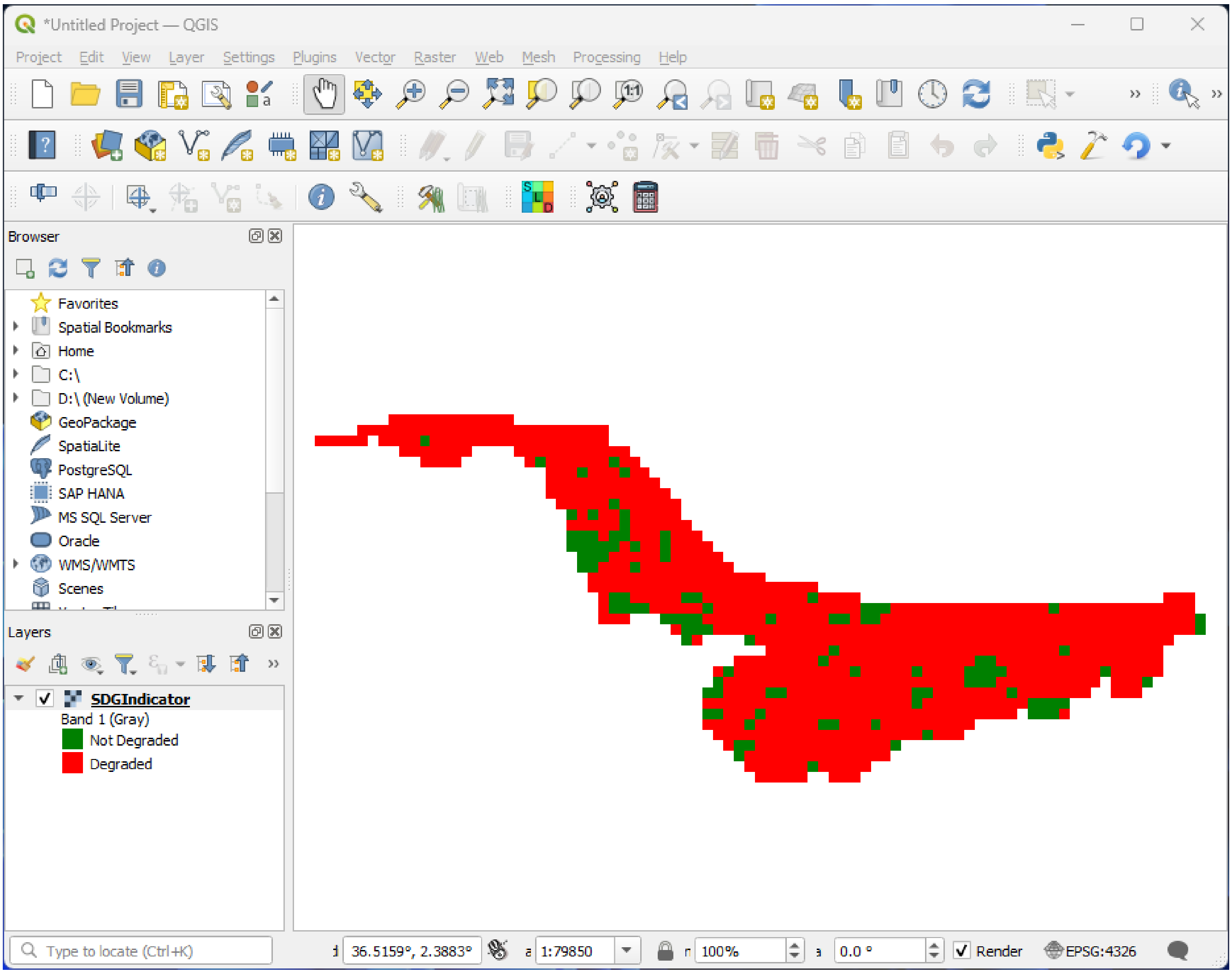


Figure 24: SDG 15.3.1 Results

Vegetation Loss/Gain

1. To start the vegetation degradation analysis, click the **calculate** icon highlighted . This will open the **calculate** dialog.

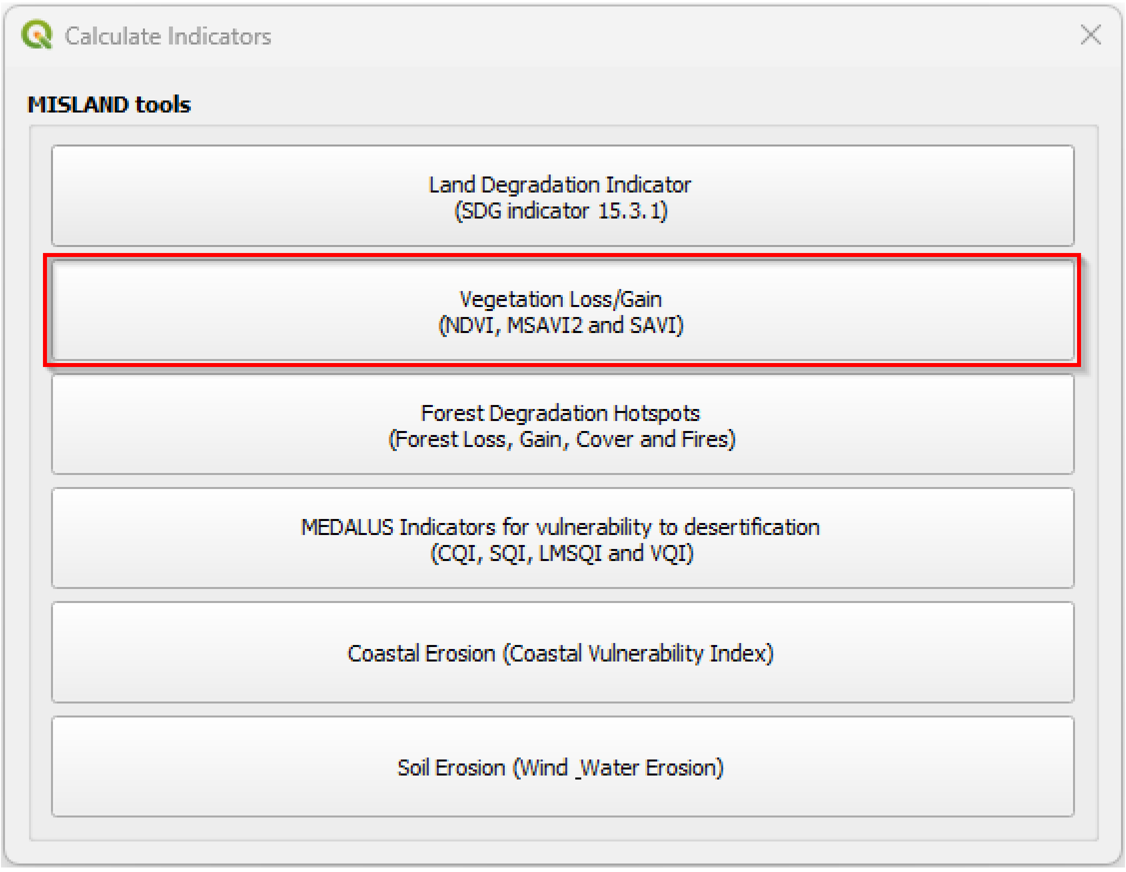


Figure 25: Calculate Dialog

2. From here, click on the `Vegetation Loss/Gain` button highlighted in red. This will open the `Vegetation Loss/Gain Dialog`. Provide all parameters as required in the dialog and click `Submit`.

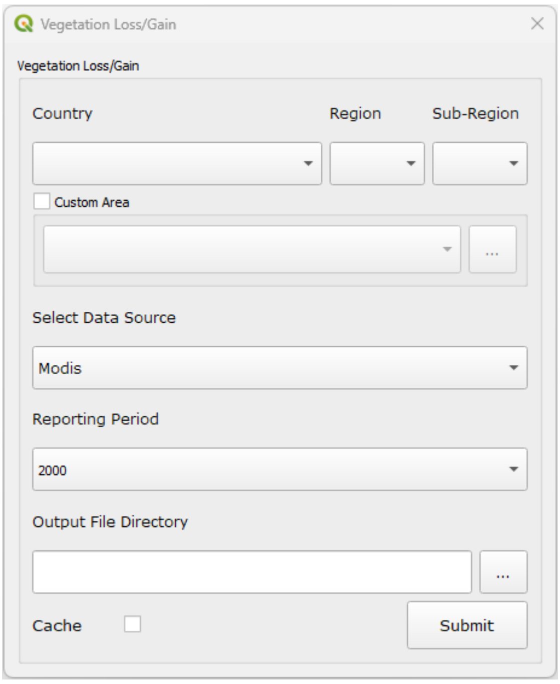
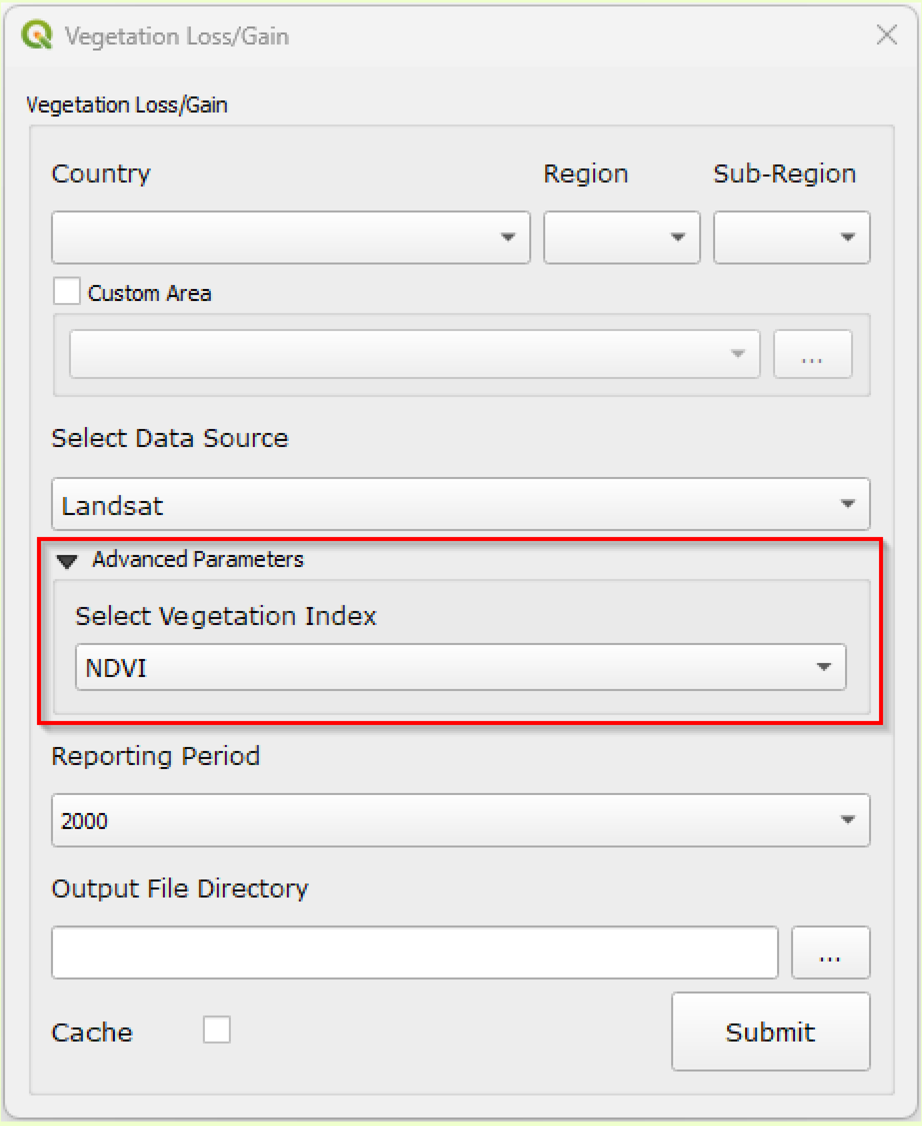


Figure 26: Vegetation Loss/Gain Dialog

Note

MISLAND allows users to assess vegetation using high resolution Landsat derived vegetation indices. If the selection of the data is **Landsat** the option to specify the vegetation index .i.e NDVI, MSAVI or SAVI will appear under the `Advanced Parameters` option.



Important

Vegetation Loss/Gain Parameters

Parameters	Definition
Data Source	The data source to users
Vegetation index	Vegetation Index of choice
Reporting year	Year of analysis

4. The result will be as shown below.

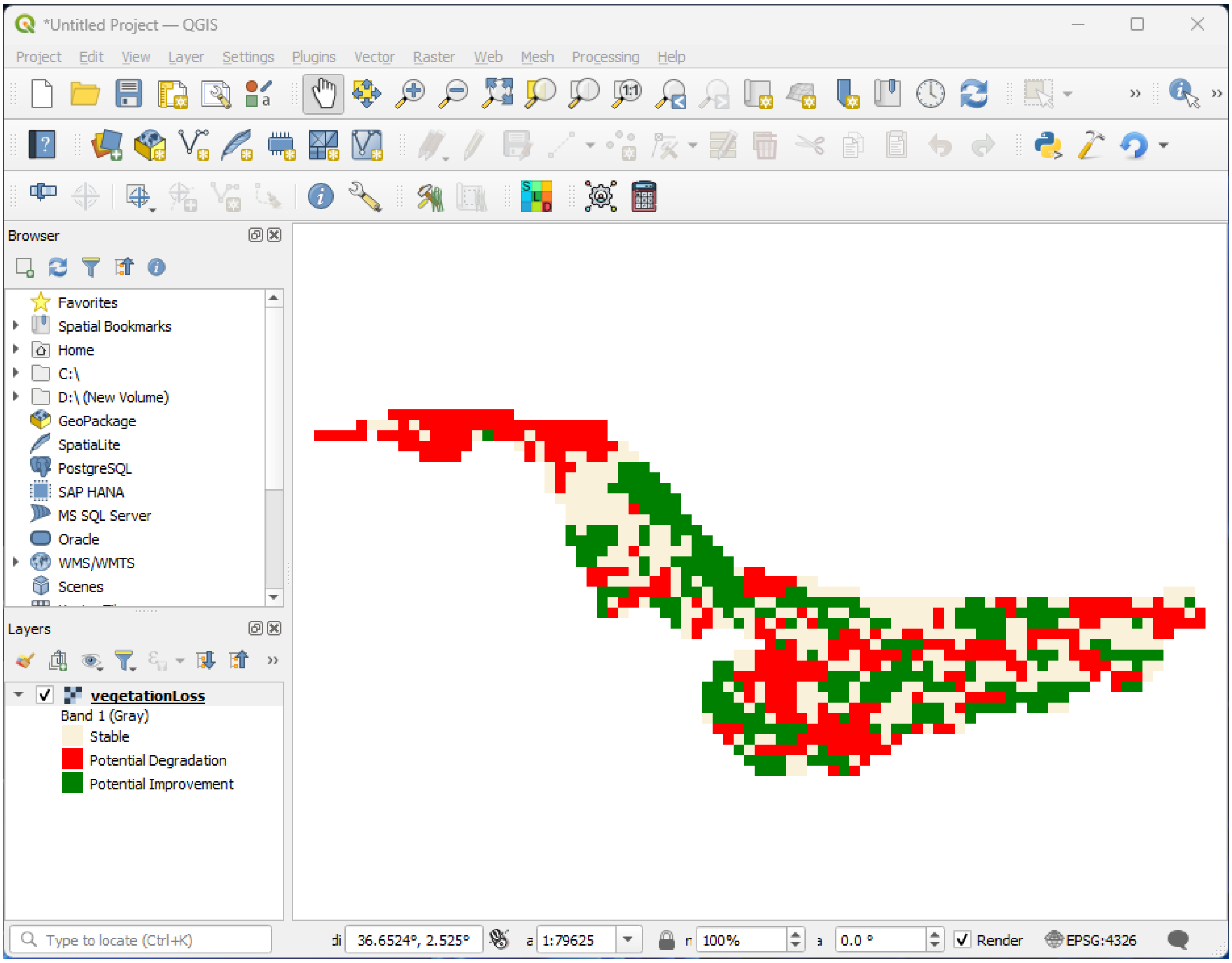


Figure 27: Vegetation Loss/Gain Results

Forest Degradation Monitoring

Forest Loss

1. To start the forest loss analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

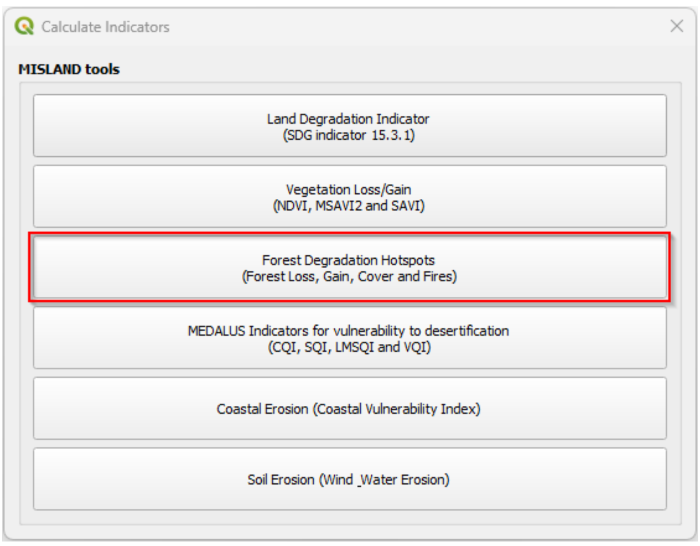


Figure 28: Calculate Dialog

2. Click on the `Forest Degradation Hotspots` button highlighted in red to open the `Forest Degradation Dialog`.

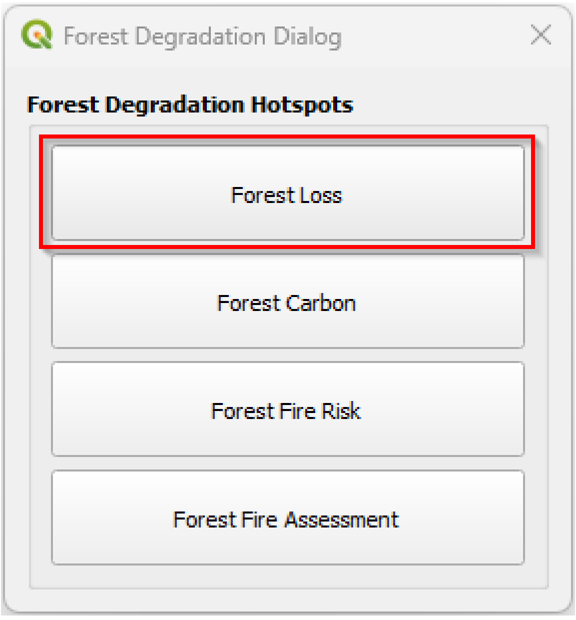


Figure 29: Forest Degradation dialog

3. Click on the `Forest Loss` button to open the `Forest Loss Dialog`. Provide all the parameters as required in the dialog and click `Submit`.

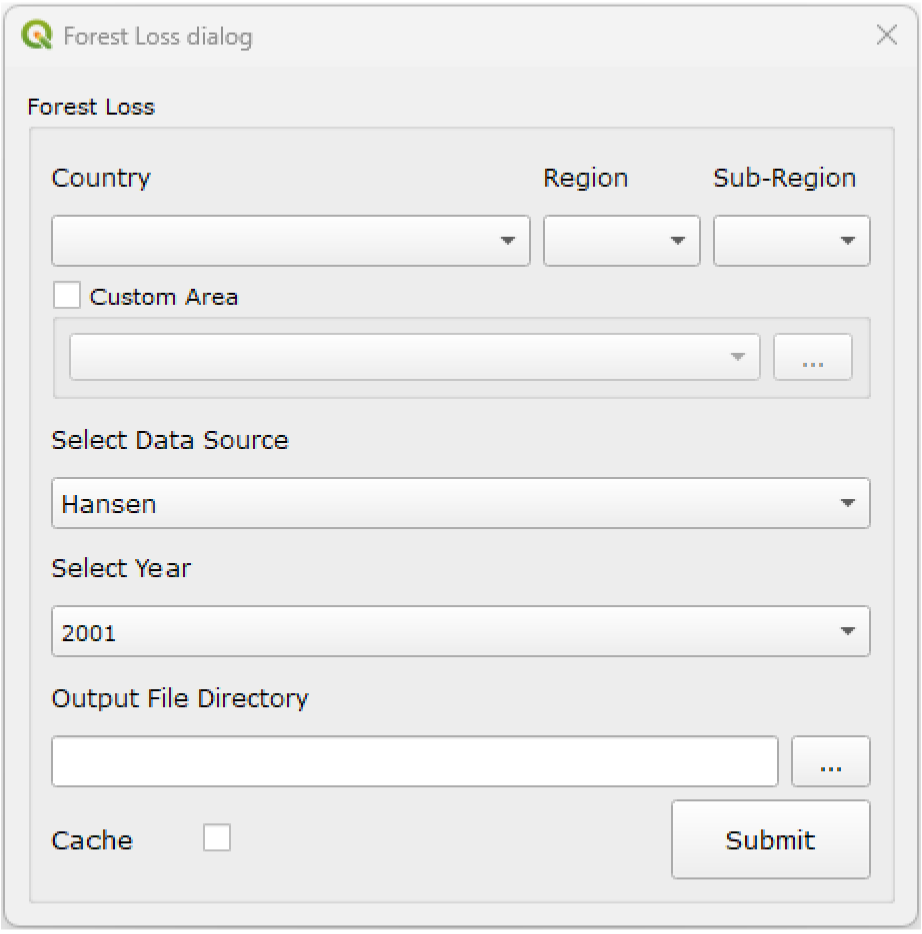


Figure 30: Forest Loss Dialog

Important

Forest Loss Parameters	
Parameters	**Definition**
Data Source	The data source of choice
Reporting period	Year of analysis

4. The result should be as shown below.

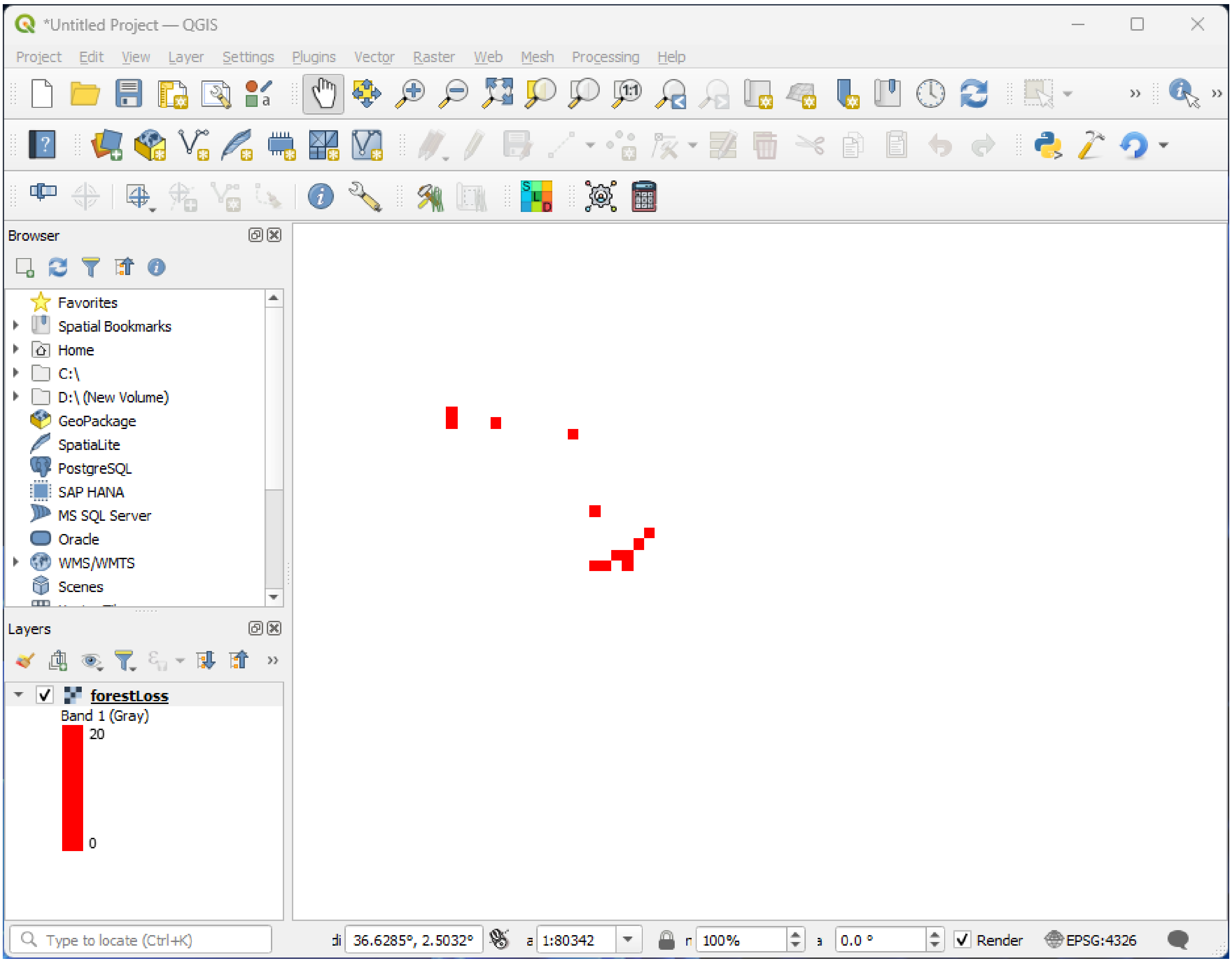


Figure 31: Forest Loss Results

Forest Carbon Emission

1. To start the forest carbon emission analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

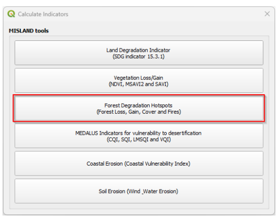


Figure 32: Calculate Dialog

2. Click on the `Forest Degradation Hotspots` button highlighted in red to open the `Forest Degradation Dialog`.

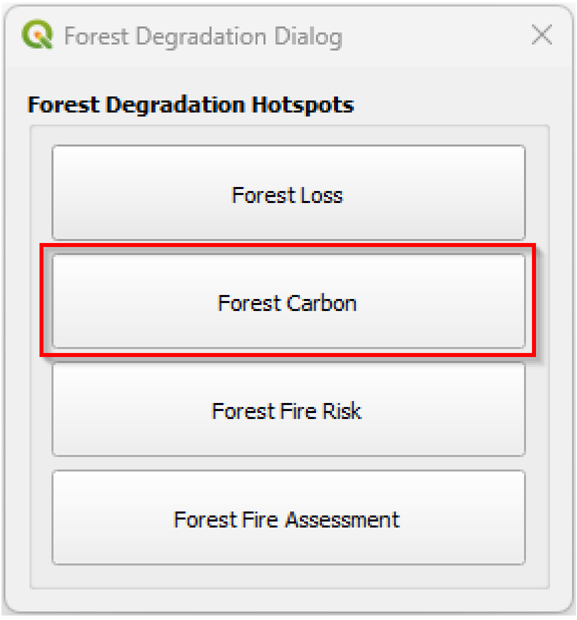


Figure 33: Forest Degradation dialog

3. Click on the `Forest Carbon` button to open the `Forest Carbon Emission Dialog`. Provide all the parameters as required in the dialog and click `Submit`.

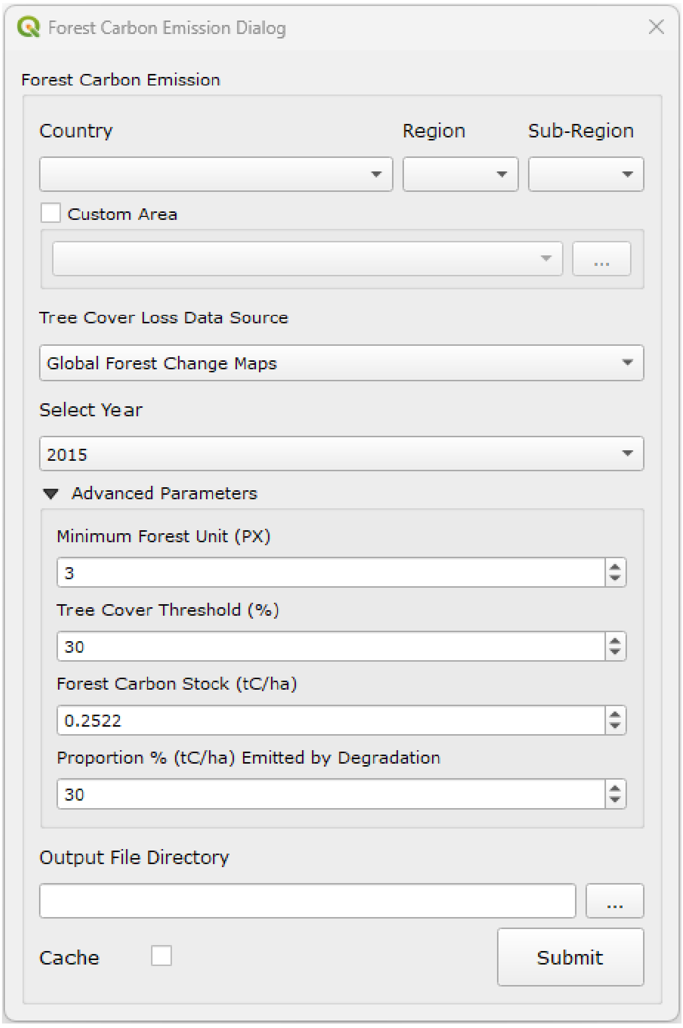


Figure 34: Forest Carbon Emission Dialog

Important

Forest Carbon Emmission Parameters

Parameters	Definition
Tree Cover Loss Data Source	Tree cover loss data source
Select year	Year of analysis
Minimum Forest Unit	Minimum Forest Unit
Tree Cover Threshold	Tree Cover Threshold
Forest Carbon Stock	Forest Carbon Stock
Proportion Emitted by Degradation	Proportion Emitted by Degradation in percentage(%)

4. The result should be as shown below.

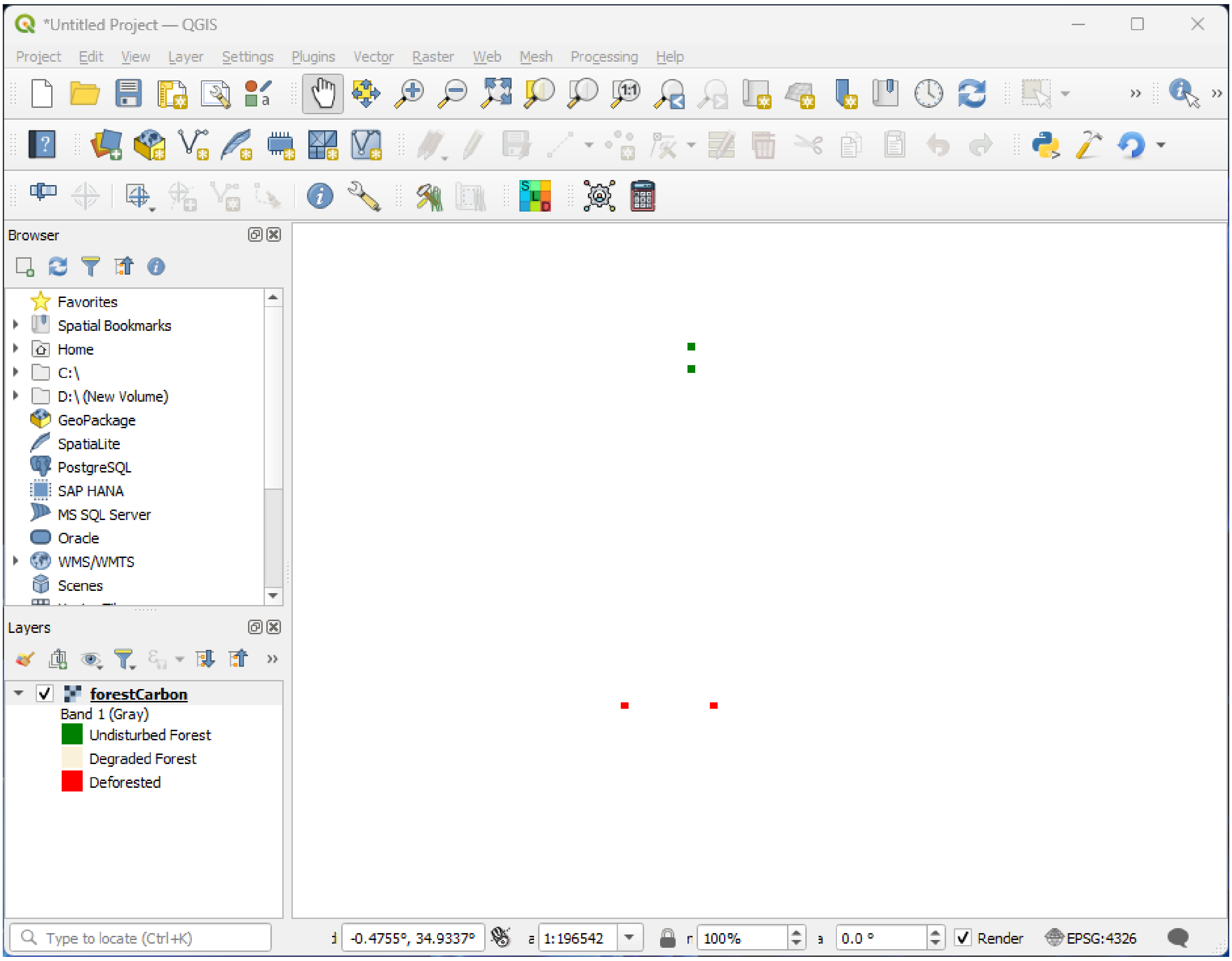


Figure 35: Forest Carbon Emission Results

Forest Fire Risk

1. To start the forest fire risk analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

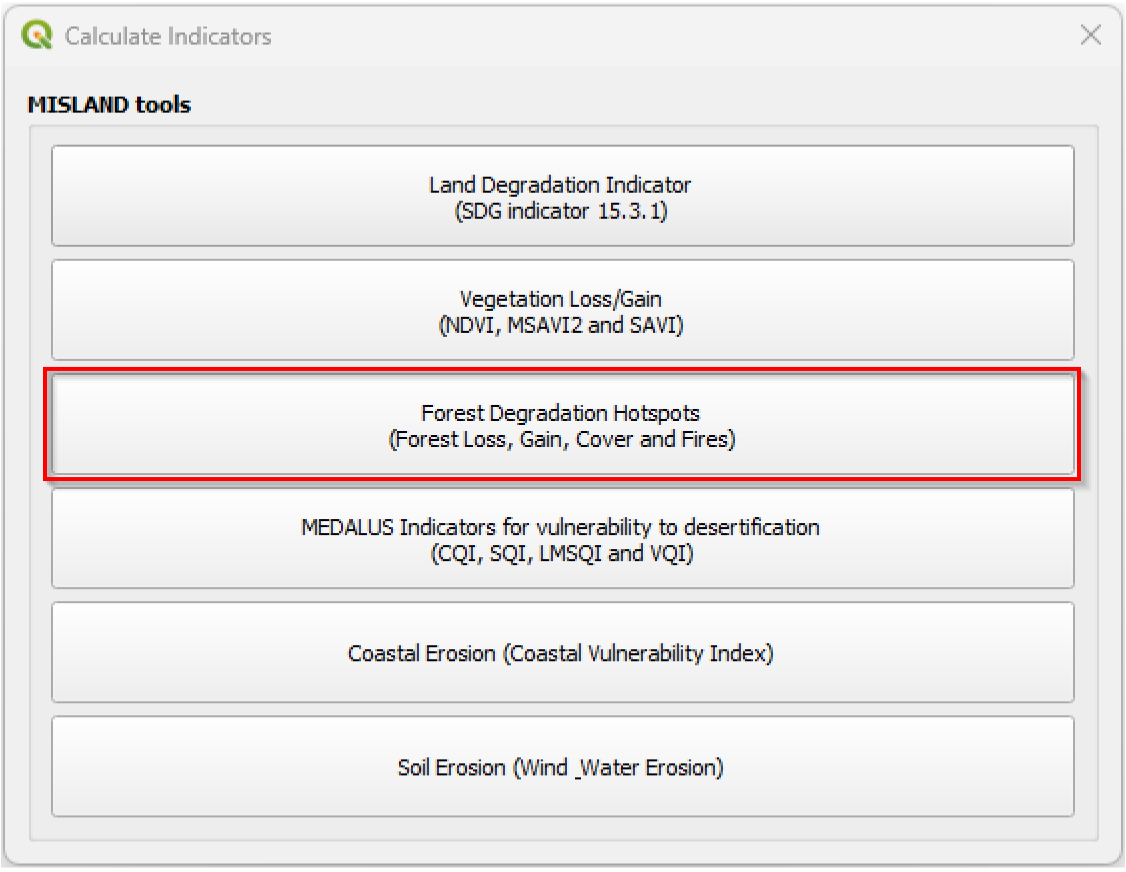


Figure 36: Calculate Dialog

2. Click on the `Forest Degradation Hotspots` button highlighted in red to open the `Forest Degradation Dialog`.

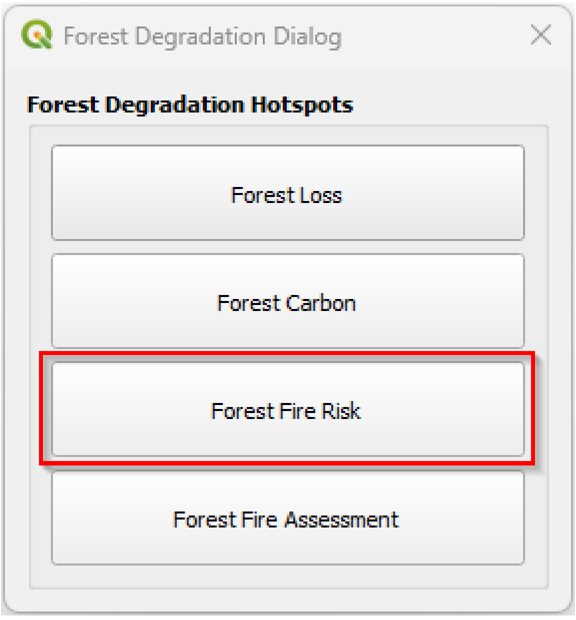


Figure 37: Forest Degradation dialog

3. Click on the `Forest Fire Risk` button to open the `Forest Fire Risk Dialog`. Provide all the parameters as required in the dialog and click `Submit`.

Figure 38: Forest Fire Risk Dialog

Important

Forest Carbon Emmission Parameters

Parameters	Definition
Start Date	Start Date
End Date	End Date

4. The result should be as shown below.

Forest Fire Assessment

1. To start the forest fire assessment analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

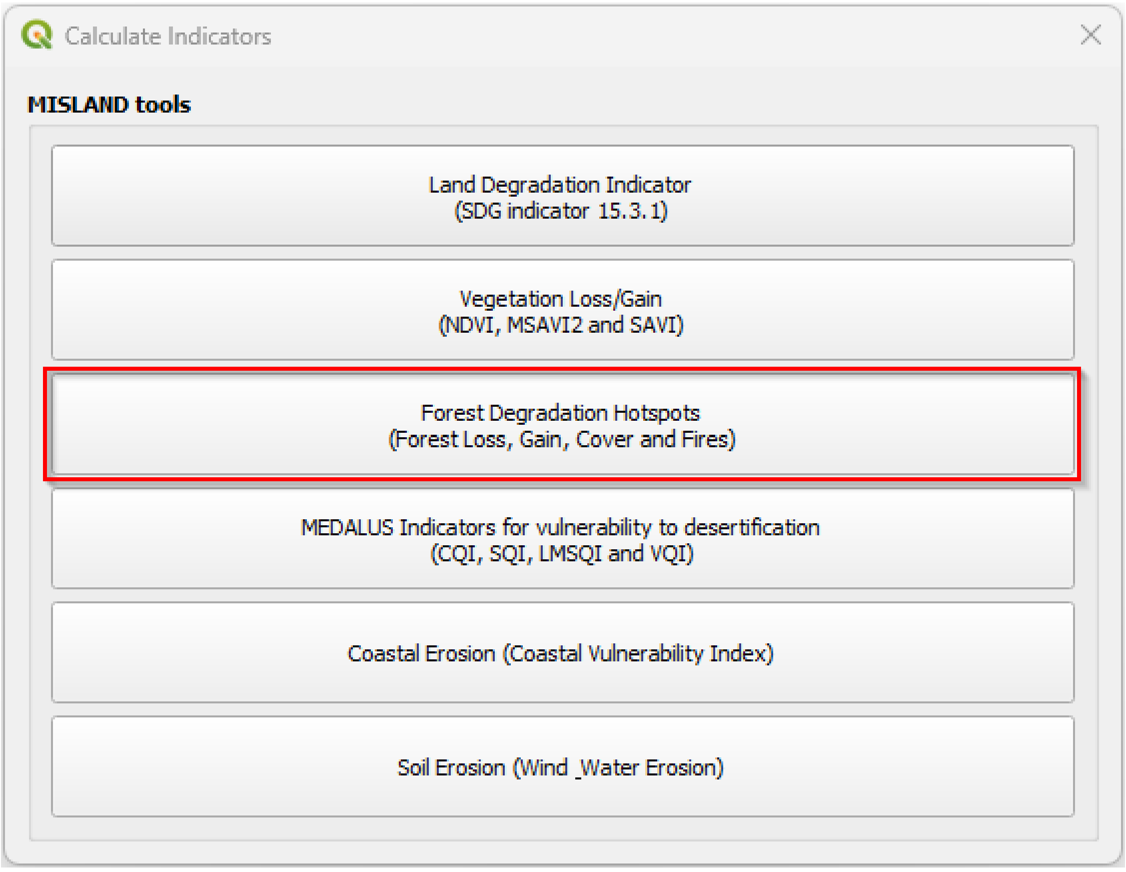


Figure 40: Calculate Dialog

2. Click on the `Forest Degradation Hotspots` button highlighted in red to open the `Forest Degradation Dialog`.

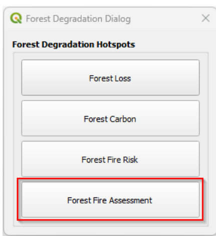


Figure 41: Forest Degradation dialog

3. Click on the `Forest Fire Assessment` button to open the `Forest Fire Assessment Dialog`. Provide all the parameters as required in the dialog and click `Submit`.

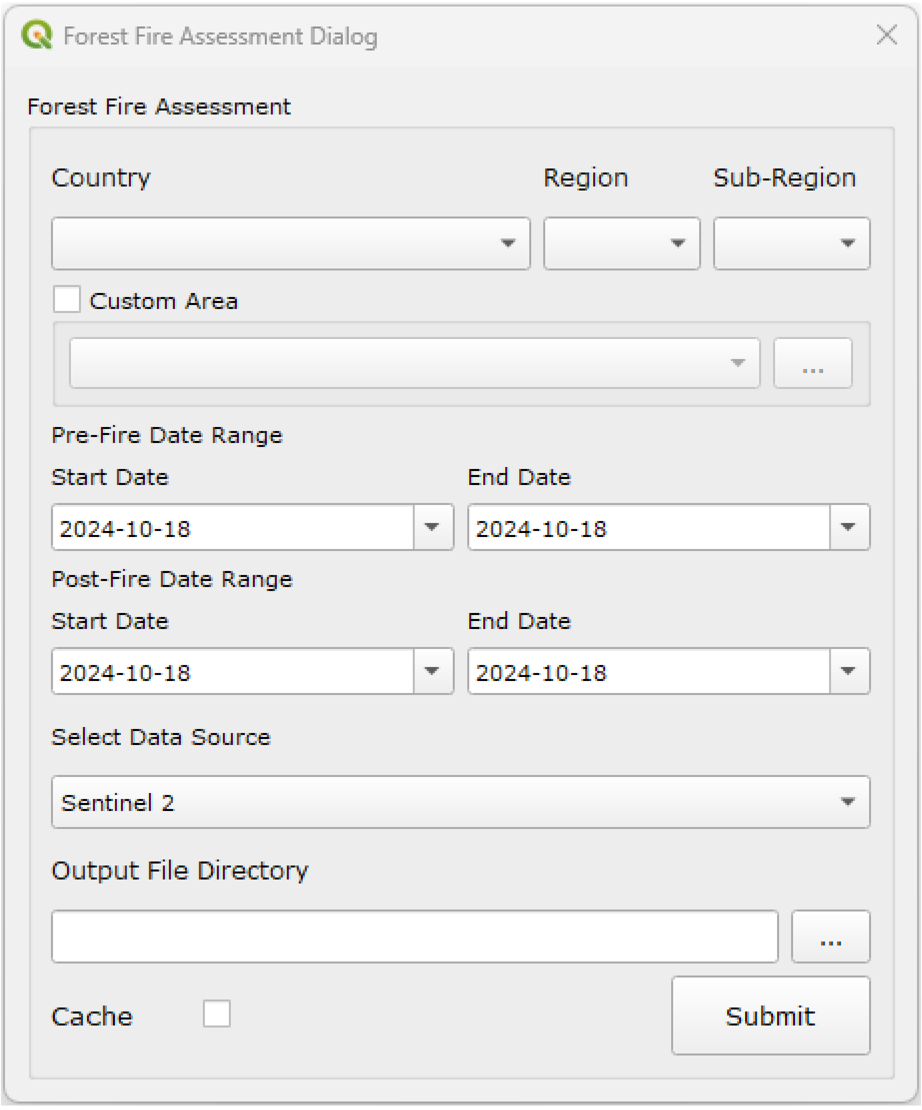


Figure 42: Forest Fire Assessment Dialog

Important

Forest Carbon Emmission Parameters

Parameters	Definition
Pre-Fire Date Range	The date range before the fire happened
Post-Fire Date Range	The date range after the fire happened

4. The result should be as shown below.

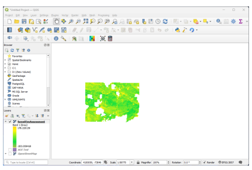


Figure 43: Forest Fire Assessment Results

Mediterranean Desertification and Land Use (MEDALUS)

1. To start the MEDALUS Desetification analysis, click the **calculate** icon highlighted . This will open the **calculate** dialog.

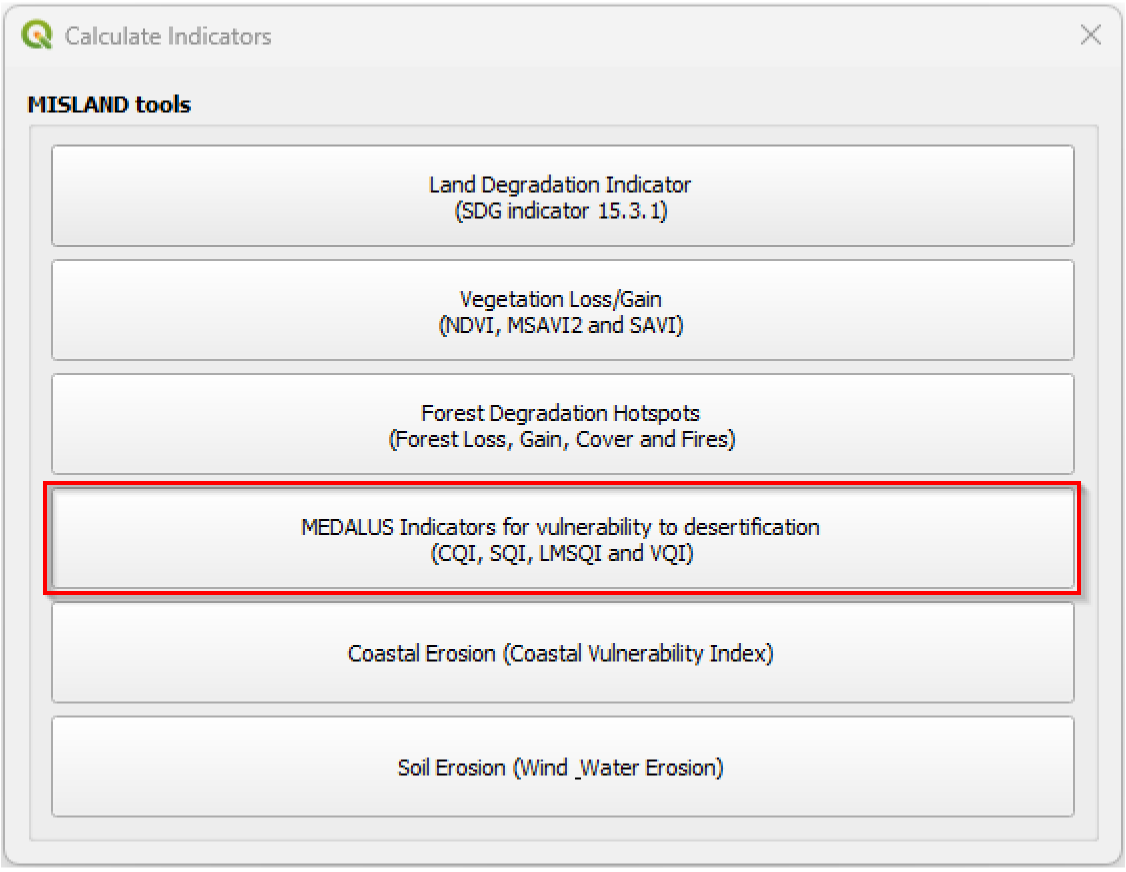


Figure 44: Calculate Dialog

2. From here, click on the `MEDALUS` button highlighted in red. This will open the `MEDALUS Desertification Dialog`. Provide all parameters as required in the dialog and click `Submit`.

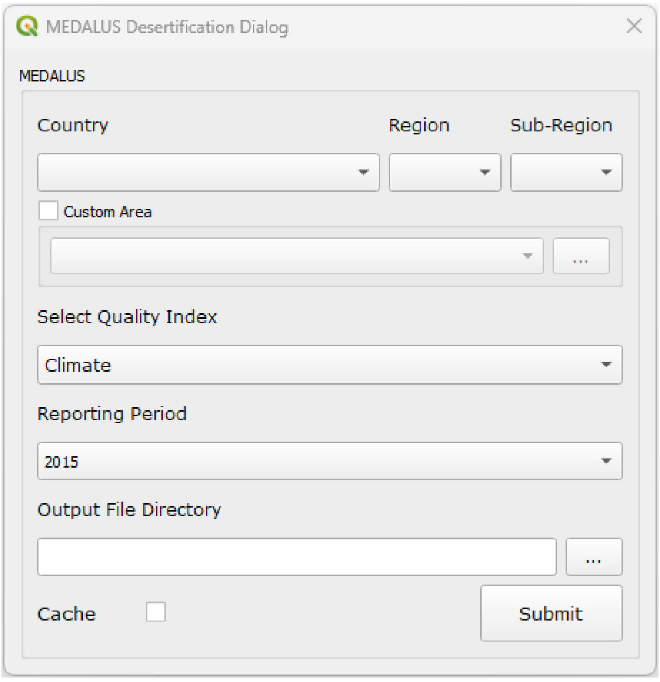


Figure 45: MEDALUS Desertification Dialog

Important

MEDALUS Desertification Parameters

Parameters	Definition
Quality Index	The Desertification Quality Index
Reporting period	Year of analysis

4. The result will be as shown below.

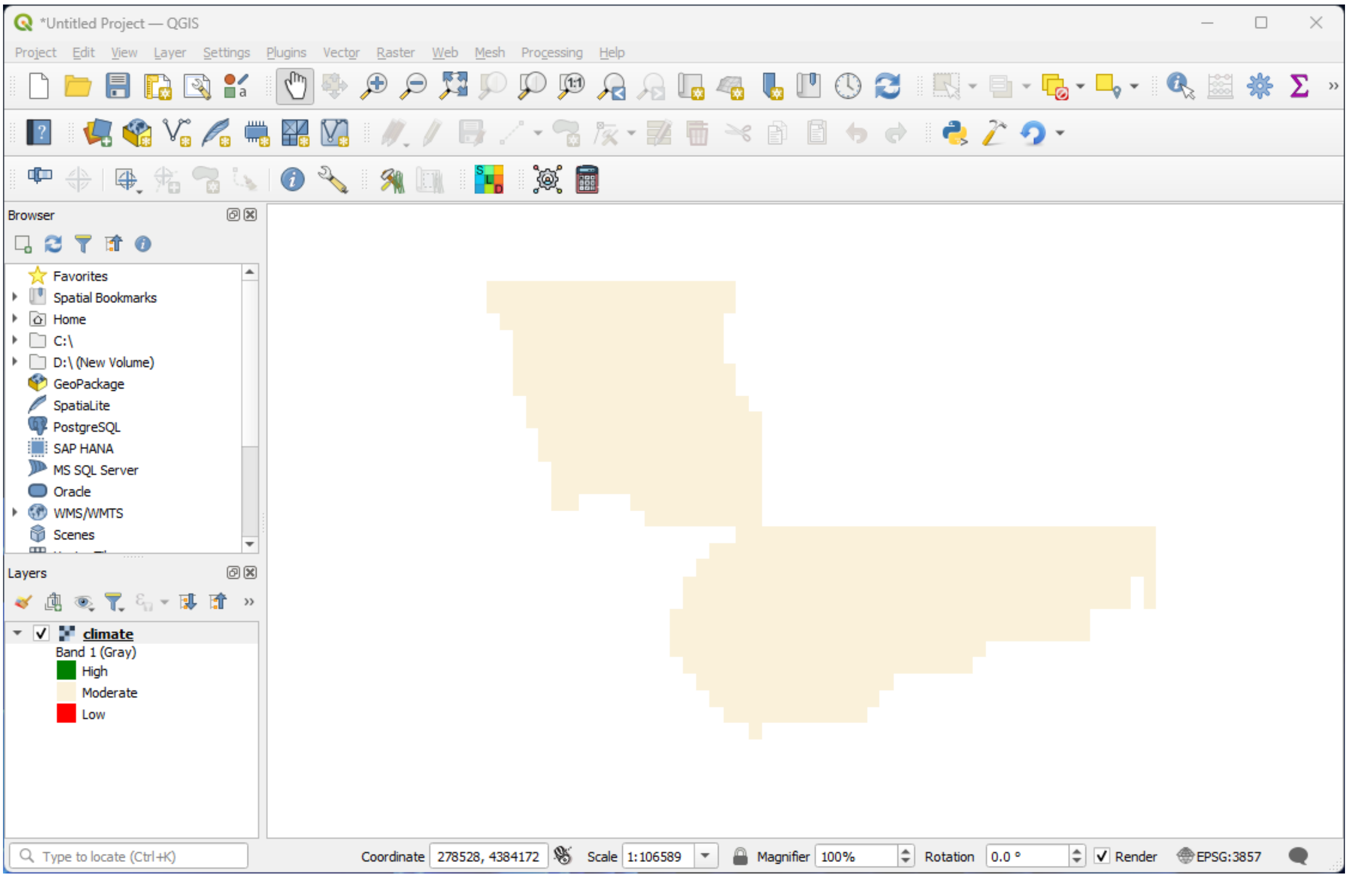


Figure 46: MEDALUS Results

Soil Erosion

Water Erosion (RUSLE Model)

1. To start the water erosion analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

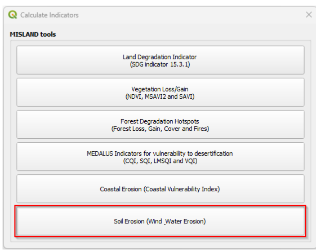


Figure 47: Calculate Dialog

2. Click on the `Soil Erosion` button highlighted in red to open the `Soil Erosion Dialog`.

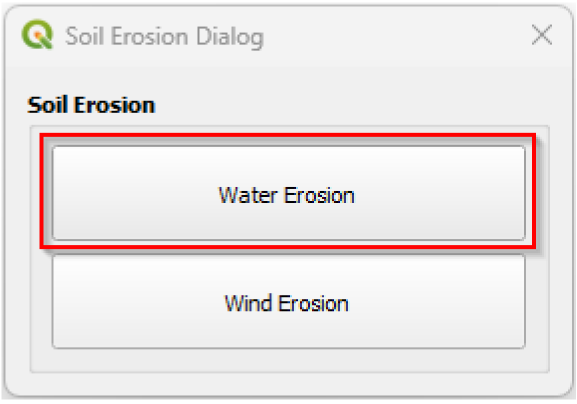


Figure 48: Soil Erosion Dialog

3. Click on the `Water Erosion` button to open the `Water Erosion Dialog`. Provide all the parameters as required in the dialog and click `Submit`.

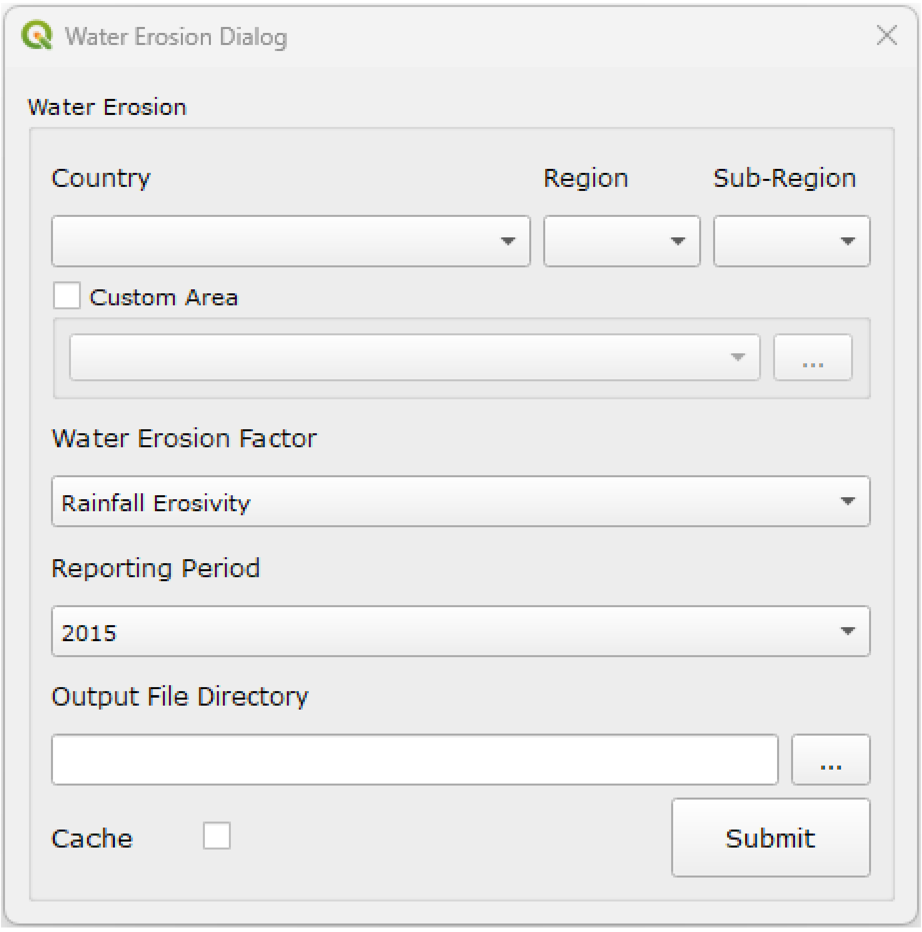


Figure 49: Water Erosion Dialog

Important

Water Erosion Parameters

Parameters	Definition

Water Erosion Factor	Water Erosion Factor
Reporting Period	Year of analysis

4. The result should be as shown below.

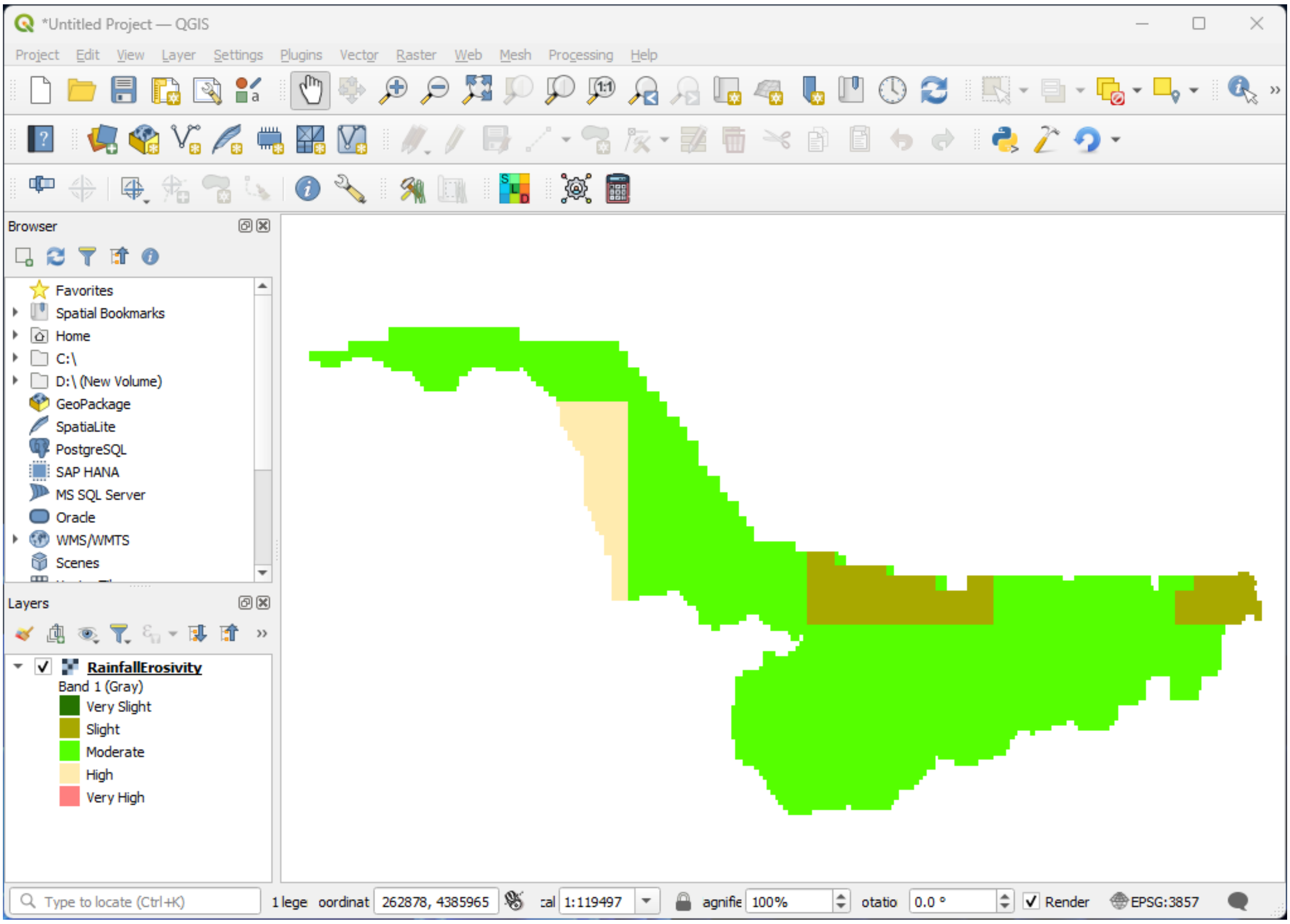


Figure 50: Water Erosion Results

Wind Erosion (ILSWE)

1. To start the wind erosion analysis, click the **calculate** icon highlighted . This will open the `calculate` dialog.

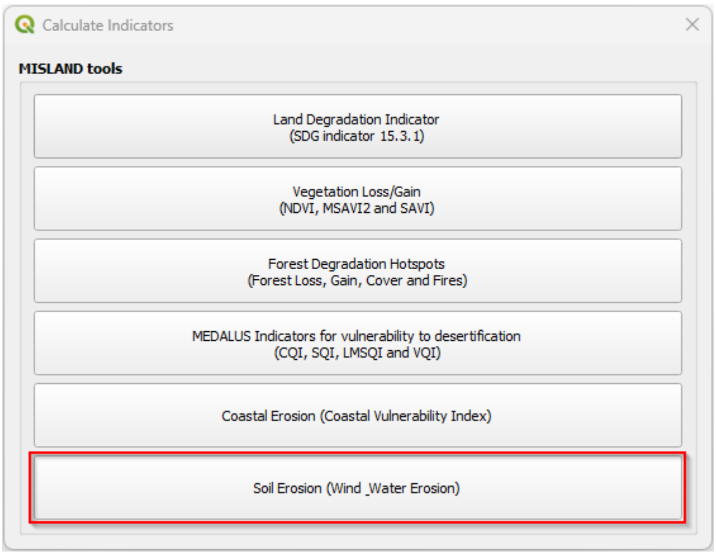


Figure 51: Calculate Dialog

2. Click on the `Soil Erosion` button highlighted in red to open the `Soil Erosion Dialog`.

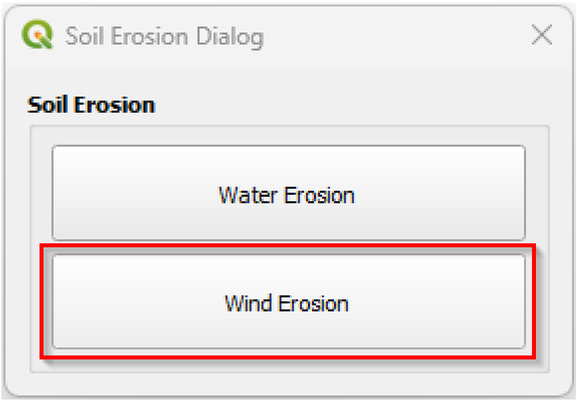


Figure 52: Soil Erosion Dialog

3. Click on the `Wind Erosion` button to open the `Wind Erosion Dialog`. Provide all the parameters as required in the dialog and click `Submit`.

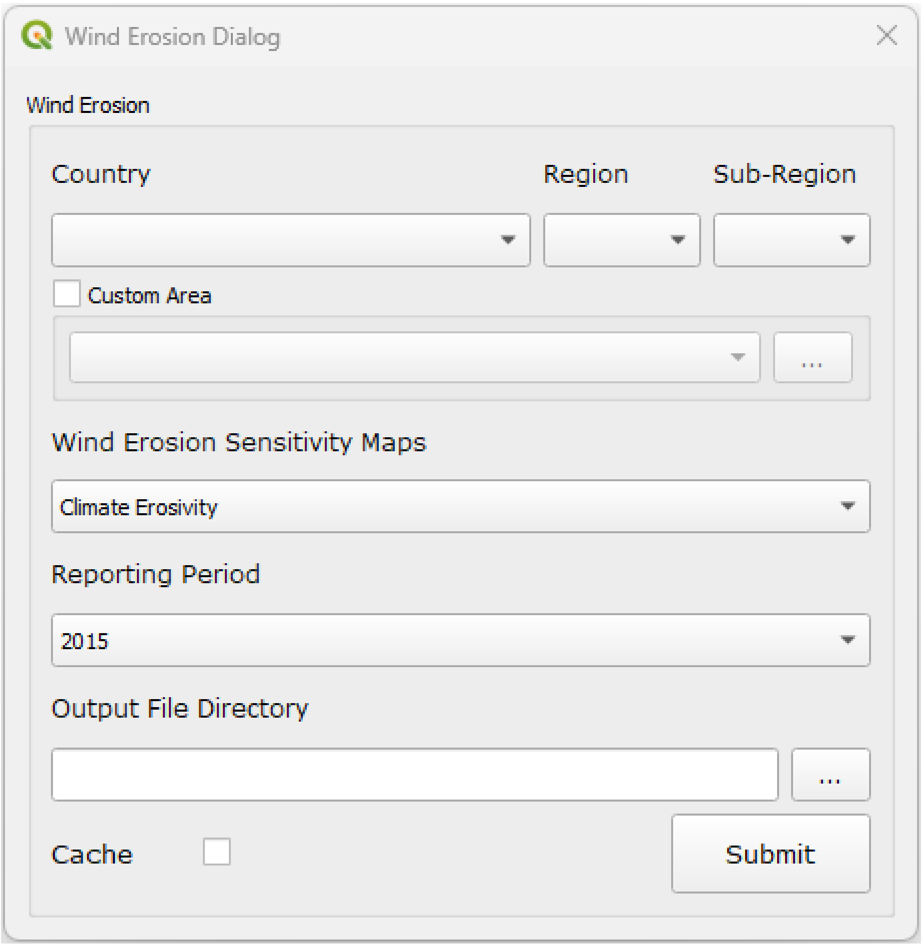


Figure 53: Wind Erosion Dialog

Important

Wind Erosion Parameters

Parameters	Definition

Water Erosion Sensitivity Maps	Water Erosion Sensitivity maps
Reporting Period	Year of analysis

4. The result should be as shown below.

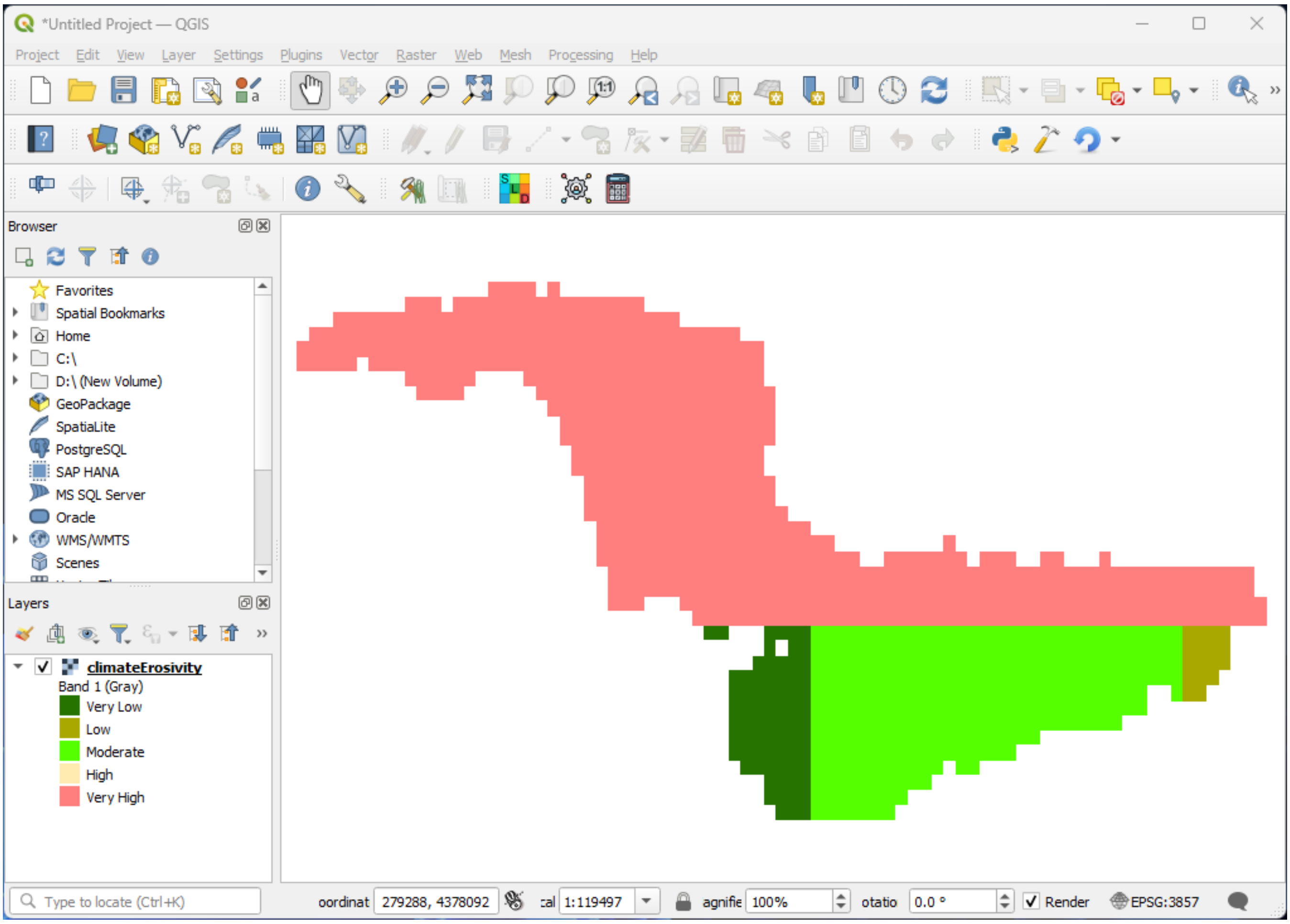


Figure 54: Wind Erosion Results

Coastal Vulnerability Index

1. To start the coastal erosion analysis, click the **calculate** icon highlighted . This will open the **calculate** dialog.

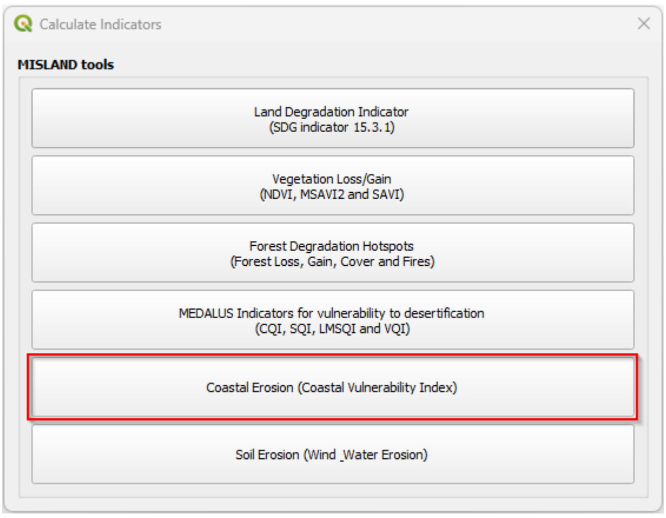


Figure 55: Calculate Dialog

2. From here, click on the `Coastal Erosion` button highlighted in red. This will open the `Coastal Erosion Dialog`. Provide all parameters as required in the dialog and click `Submit`.

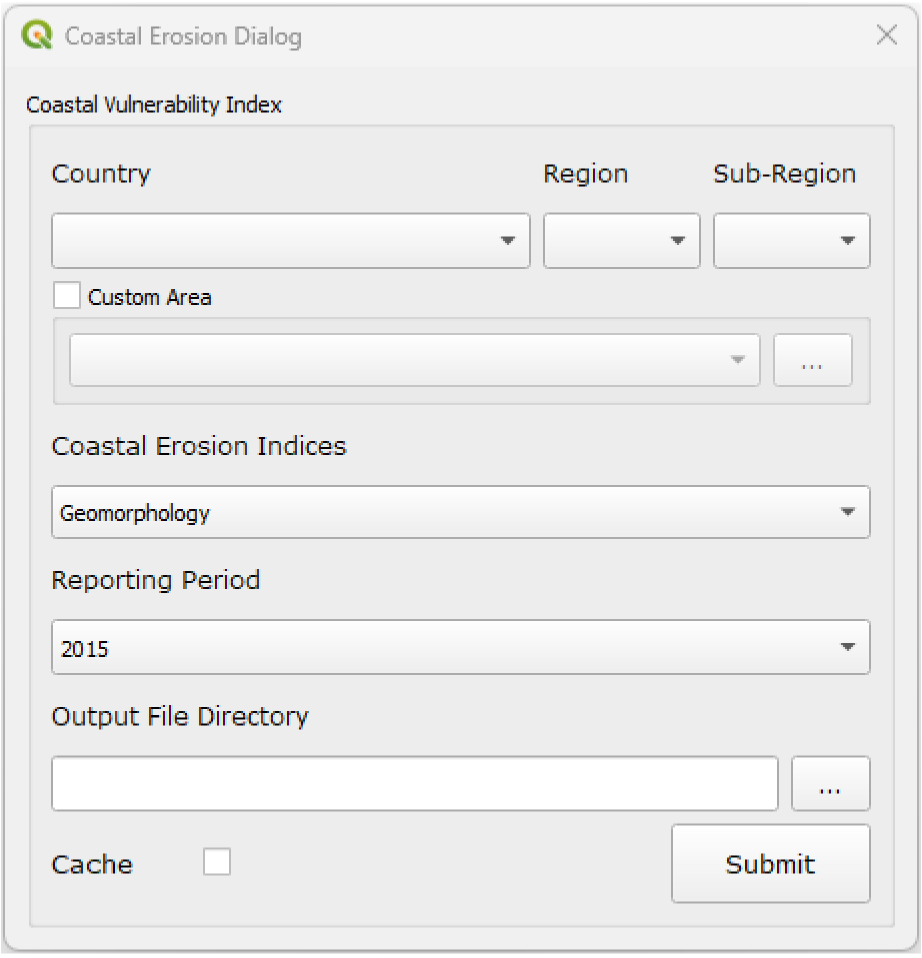


Figure 56: Coastal Erosion Dialog

Important

Coastal Erosion Parameters

Parameters	Definition
Coastal Erosion Indices	Coastal Erosion Indices
Reporting period	Year of analysis

4. The result will be as shown below.

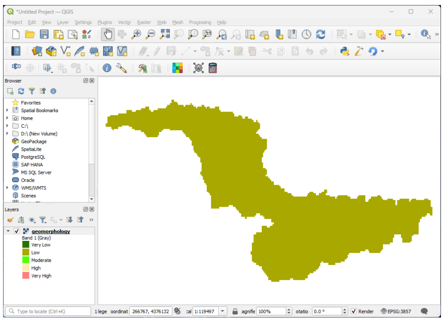


Figure 57: Coastal Erosion Results

Indices and tables

- **genindex**
- **modindex**
- **search**