Interreg Greece-Bulgaria
European Regional Development Fund
EUROPEAN UNION
BIO2CARE

INTERREG V-A COOPERATION PROGRAMME
GREECE – BULGARIA 2014 – 2020

Reinforcing Protected Areas Capacity through an Innovative Methodology for Sustainability

– BIO2CARE –

(Reg. No: 1890)

Deliverable 5.1
Training sessions regarding the use of BIO2CARE Software

The Project is co-funded by the European Regional Development Fund and by national funds of the countries participating in the Interreg V-A "Greece-Bulgaria 2014-2020" Cooperation Programme

Contents of the training session

- Theoretical background of BIO2CARE software/tools
- BIO2CARE Decision Making Software
- BIO2CARE Calc Tool
- BIO2CARE Symbiosis Tool
- Benefits from BIO2CARE implementation

- **Theoretical background of BIO2CARE software/tools**
- BIO2CARE Decision Making Software
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Sustainability = Carrying Capacity

(a) the idea of sustainability reflects a limit, similarly with the concept of Carrying Capacity, and
(b) both concepts share the same challenges in formulating the objectives, practices, and actions of improvement (Saarinen, 2006).

From the early 1960s, due to the fact that **public visits** were the major threat for protected areas (Lawson et al., 2003; Needham et al., 2011; Prato, 2001;2009), research on outdoor recreation has utilized the concept of **Carrying Capacity** to address the **resource and social impacts of visitors (**Lawson et al., 2003; Wagar, 1964; Manning, 1999)

Carrying Capacity: "*the maximum number of visitors an area can sustain without unacceptable deterioration of the physical environment and without considerably diminishing user satisfaction*" (Prato, 2001; National Park Service, 1997; Satta, 2003).

Available methods for assessing Carrying Capacity

Our literature review:

✓13 methods selected from a pool of 61 methods.
✓ The methods (13) analyzed, categorized, and were finally evaluated based on specific criteria (Aktsoglou and Gaidajis, 2020; Angelakoglou and Gaidajis, 2020).
✓Key conclusions related to the efficiency and the applicability of environmental sustainability assessment methods of protected areas:

➢the "**Resource Availability Assessment**" category of methods and especially the "**Ecological Footprint**" method have been indicated as the most appropriate method for the evaluation of environmental sustainability of protected areas (Aktsoglou and Gaidajis, 2020).

Ecological Footprint

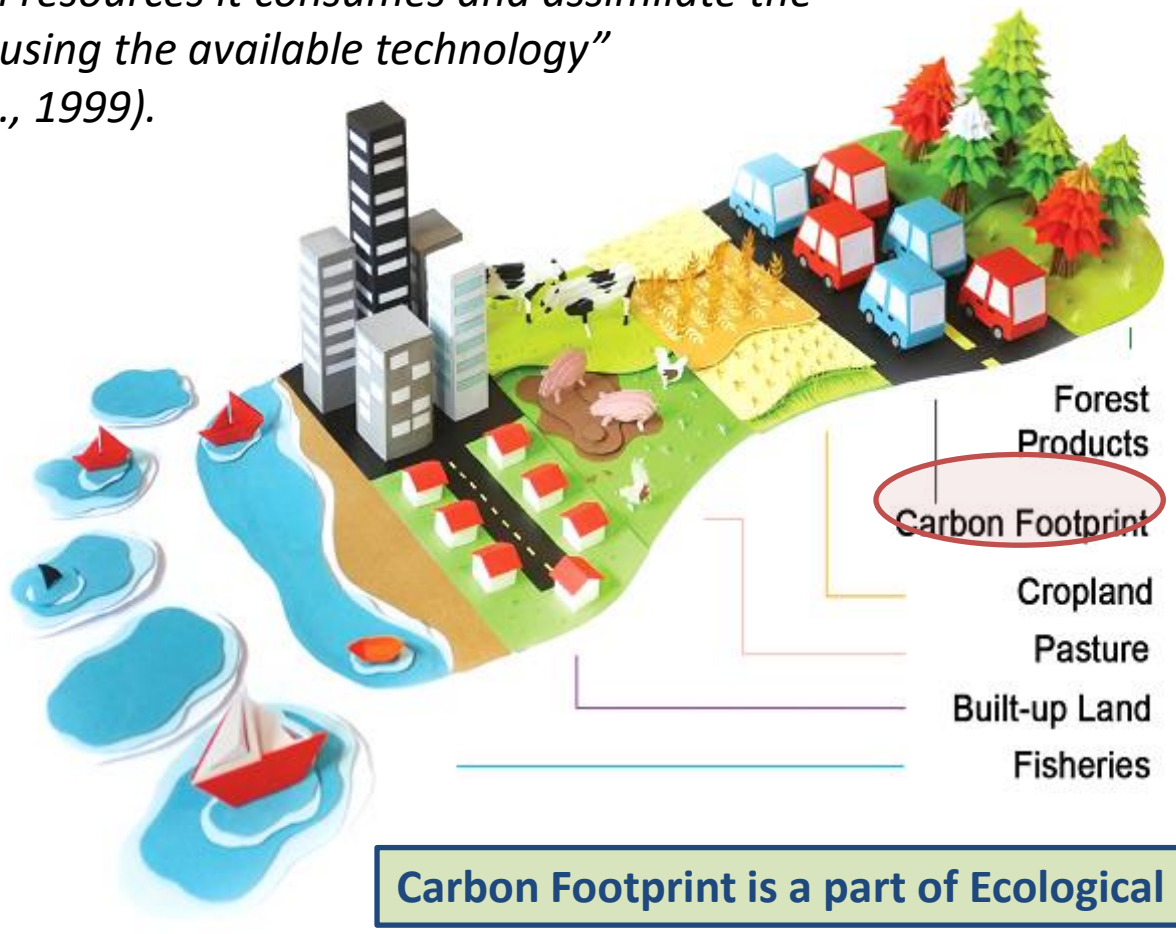
M. Wackernagel: 11.2 billion hectares of bioproductive land and / or water cover about ¼ of the planet and include:

- 2,3 billion hectares of fisheries
- 1,5 billion hectares of cropland
- 3,5 billion hectares of pasture
- 3,6 billion hectares of forests
- 0,3 billion hectares of built-up areas

✓The average bioproductive hectare, characterized by an average productivity of 11.2 billion hectares, is called the **Global hectare(Gha).**
✓The productivity of different categories of global bioproducts differs!
✓Production areas of the same category do not have the same productivity worldwide!

Ecological Footprint

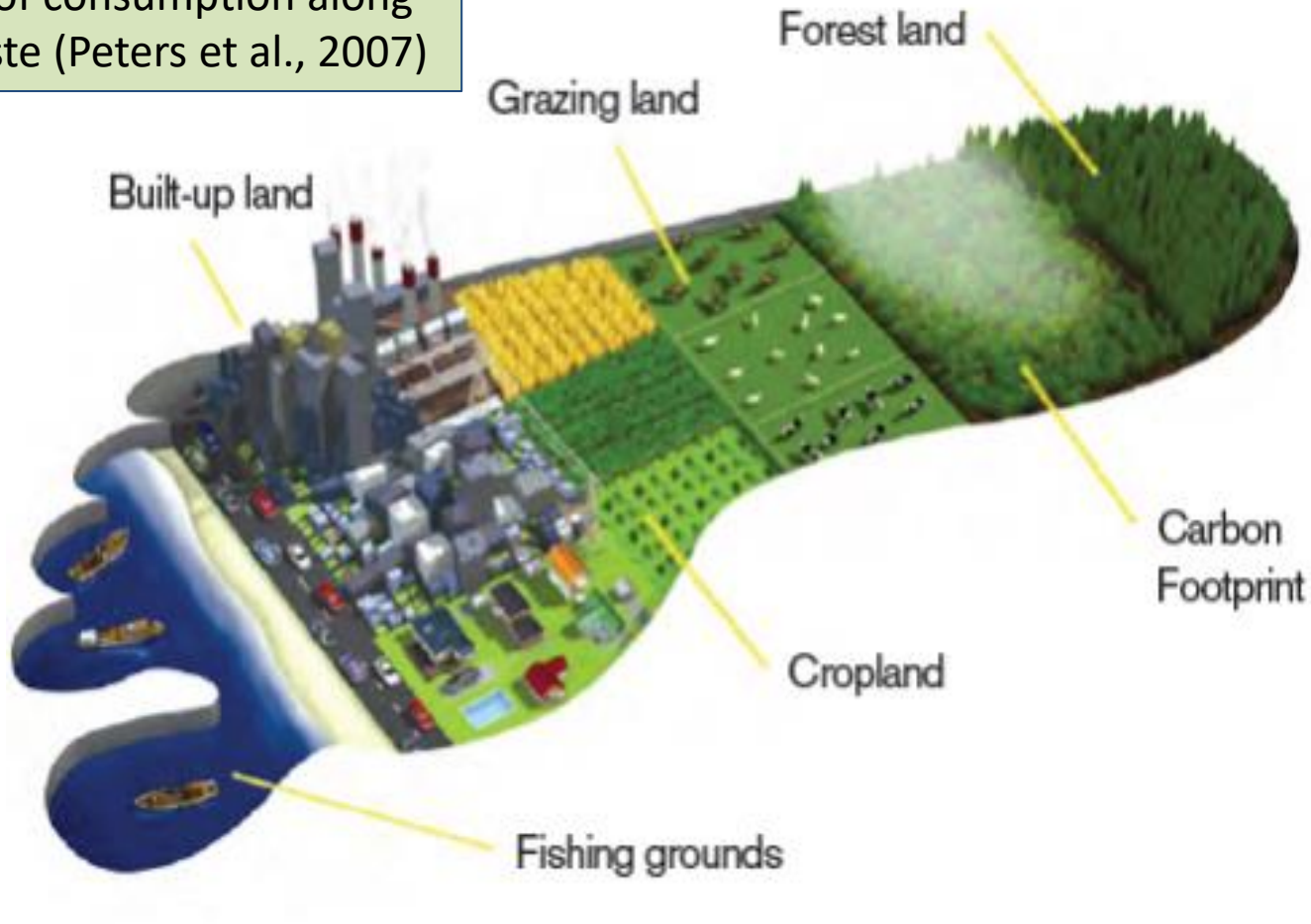
"the amount of land and/or water that is necessary to a population or activity, in order to produce, in a sustainable way, all the natural resources it consumes and assimilate the waste it produces, using the available technology" (Wackernagel et al., 1999).



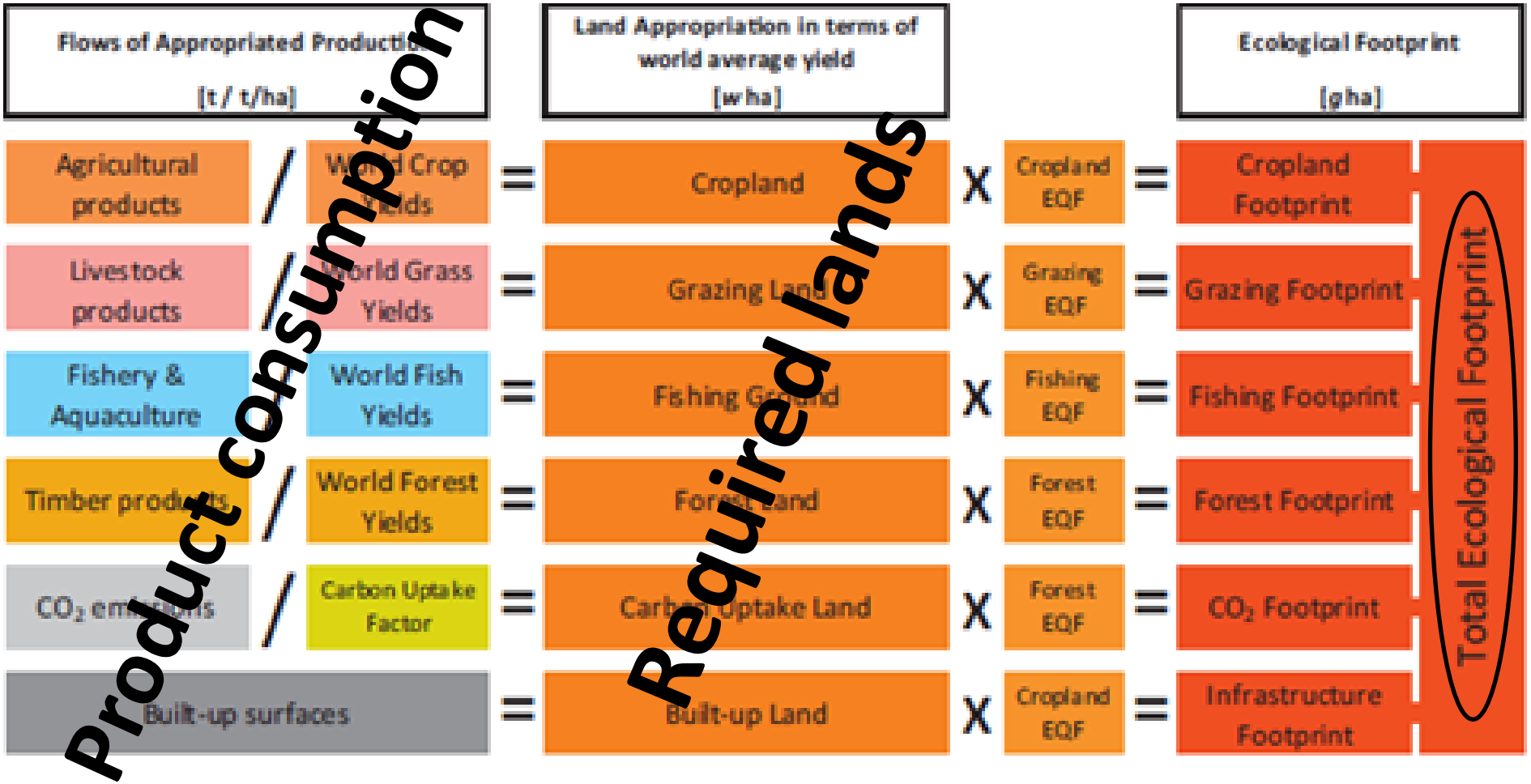
Carbon Footprint is a part of Ecological Footprint

Biocapacity

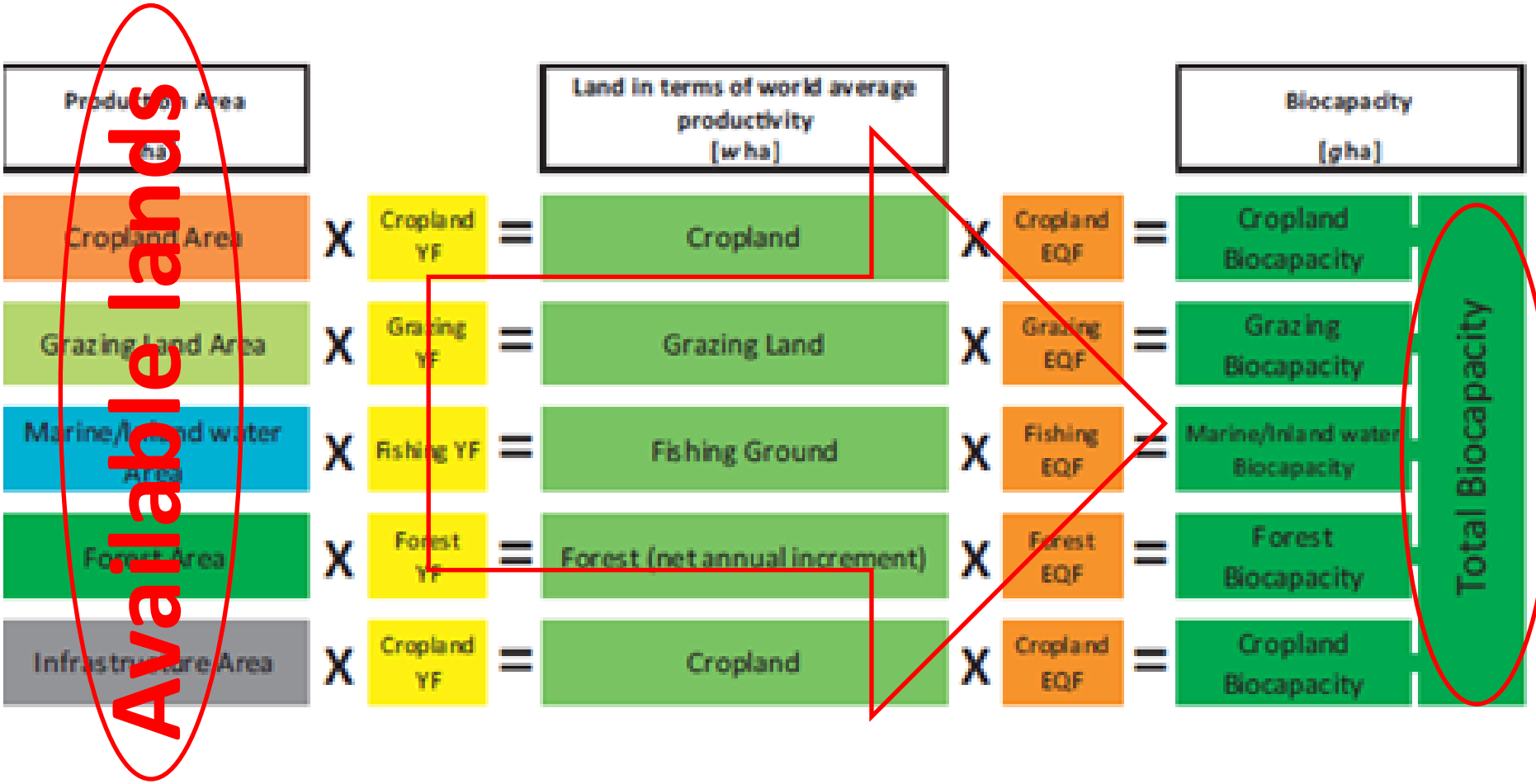
Biocapacity: a term that represents the available biologically productive land that absorbs the impact of consumption along with subsequent waste (Peters et al., 2007)



Ecological Footprint

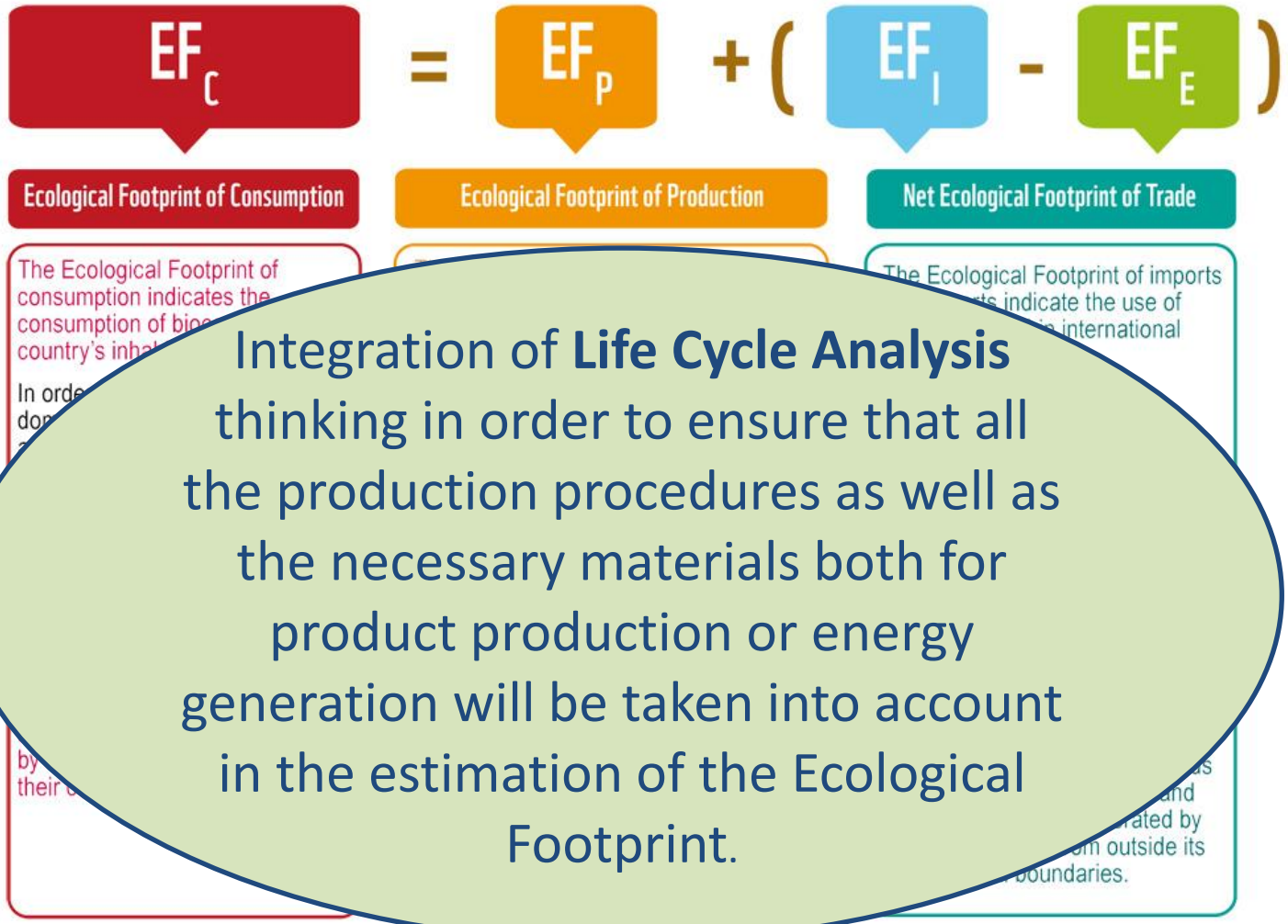


Biocapacity



- The Yield Factors are renewed every year.
- The Global Equivalence Factors are the same worldwide.

Ecological Footprint calculation method



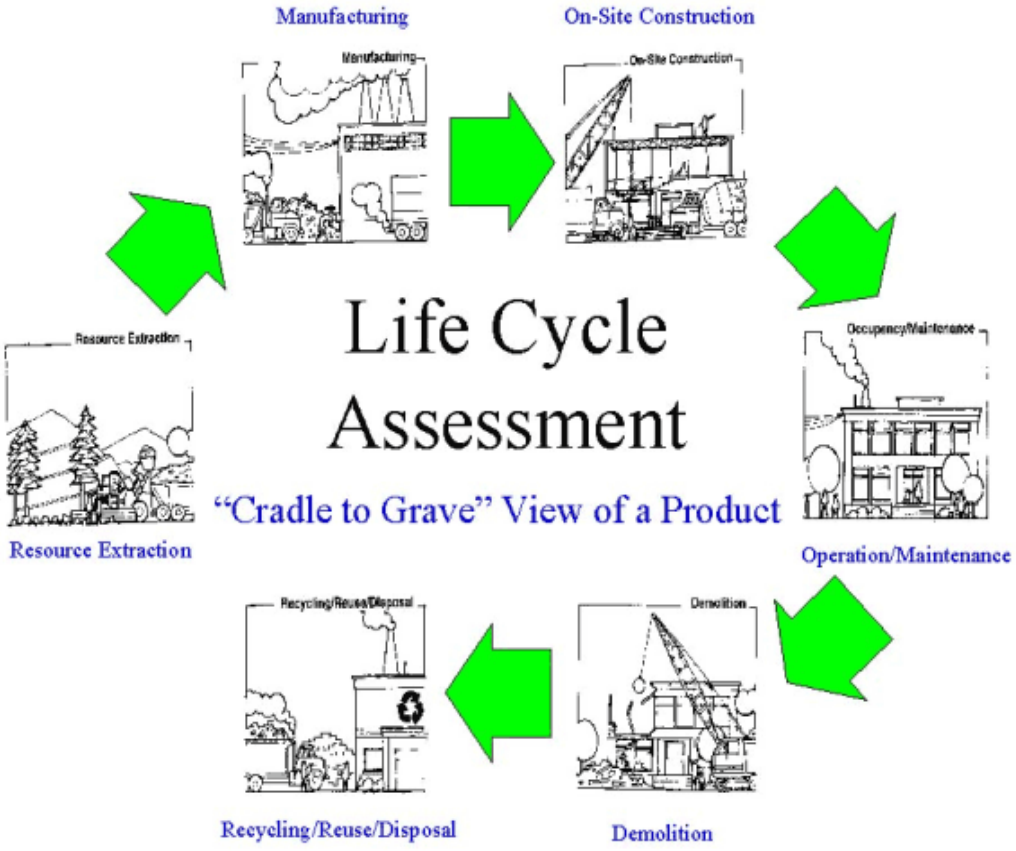
Integration of **Life Cycle Analysis** thinking in order to ensure that all the production procedures as well as the necessary materials both for product production or energy generation will be taken into account in the estimation of the Ecological Footprint.

Life Cycle Assessment

➢**Basic principle of sustainable development** :
Life Cycle Analysis (LCA).

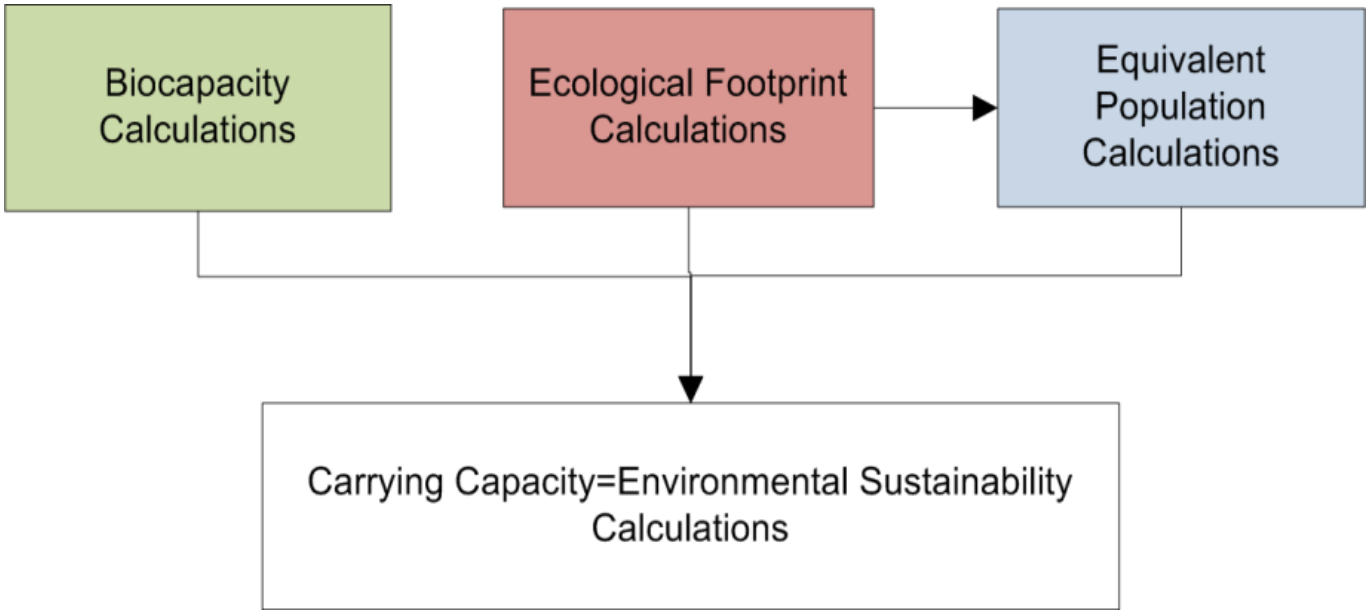
Life cycle analysis is a tool that examines the overall environmental impact of a system taking into account every step of its life.

- Extraction of raw materials
- Production
- Transfer
- Use-Maintenance
- Disposal-Deposition



The footprints (ecological, carbon and water) integrate the LCA principles.

Methodological Framework



$$\text{Carrying Capacity (max equivalent population)} = \frac{\text{Biocapacity (available land)}}{\text{Ecological Footprint (required land)}}$$

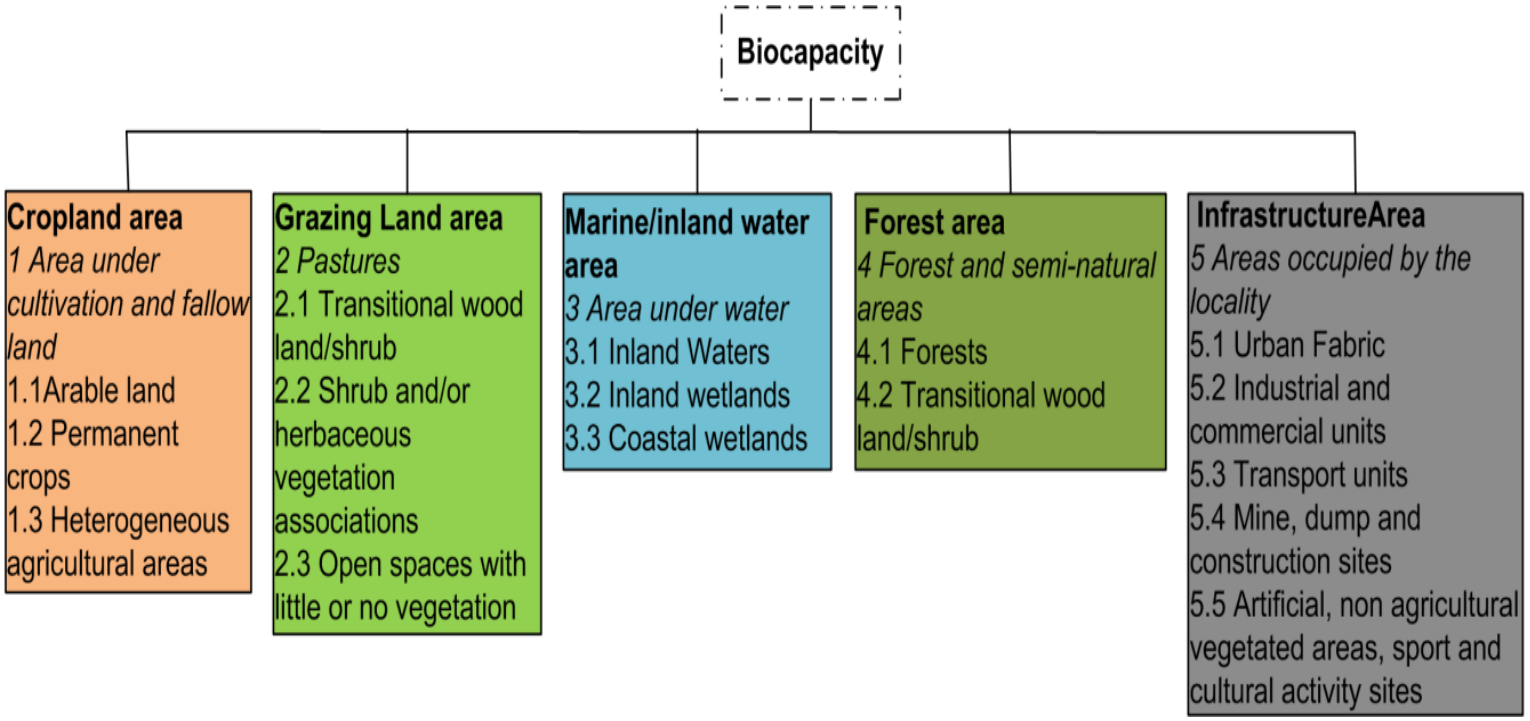
P (existing equivalent population)

Methodological Framework

Biocapacity's Accounts'

USE of:

- **CORINE** (Coordination of Information on the Environment) land cover methodology databases
- the application of a **GIS** (Geographic Information System) software compatible with the European databases for land uses



Methodological Framework

Biocapacity's Accounts'

➢*"The **Yield Factors** (YFs) account for countries' differing levels of productivity for particular land uses are country-specific and vary by land use type and year (Borucke et al., 2013).*

➢*"The **Equivalence Factors** (EQFs) convert the areas of different land uses, at their respective world average productivities, into their equivalent areas at global average bioproductivity across all land use and they vary by land use as well as by year" (Borucke et l., 2013).*

Land Uses	Area in ha	Yield Factor	Equivalence Factor	Biocapacity (Gha)
Cropland Area	52,011	1.5	2.2	171,472
Grazing Land Area	4528	2.0	0.5	4528
Marine/ Inland Water Area	12,284	0.8	0.4	3931
Forest Area	910	1.3	1.4	1657
Infrastructure Area	1800	1.5	2.2	5940
Total Biocapacity of the NPEMT		(Scotti et al., 2009)		187,528

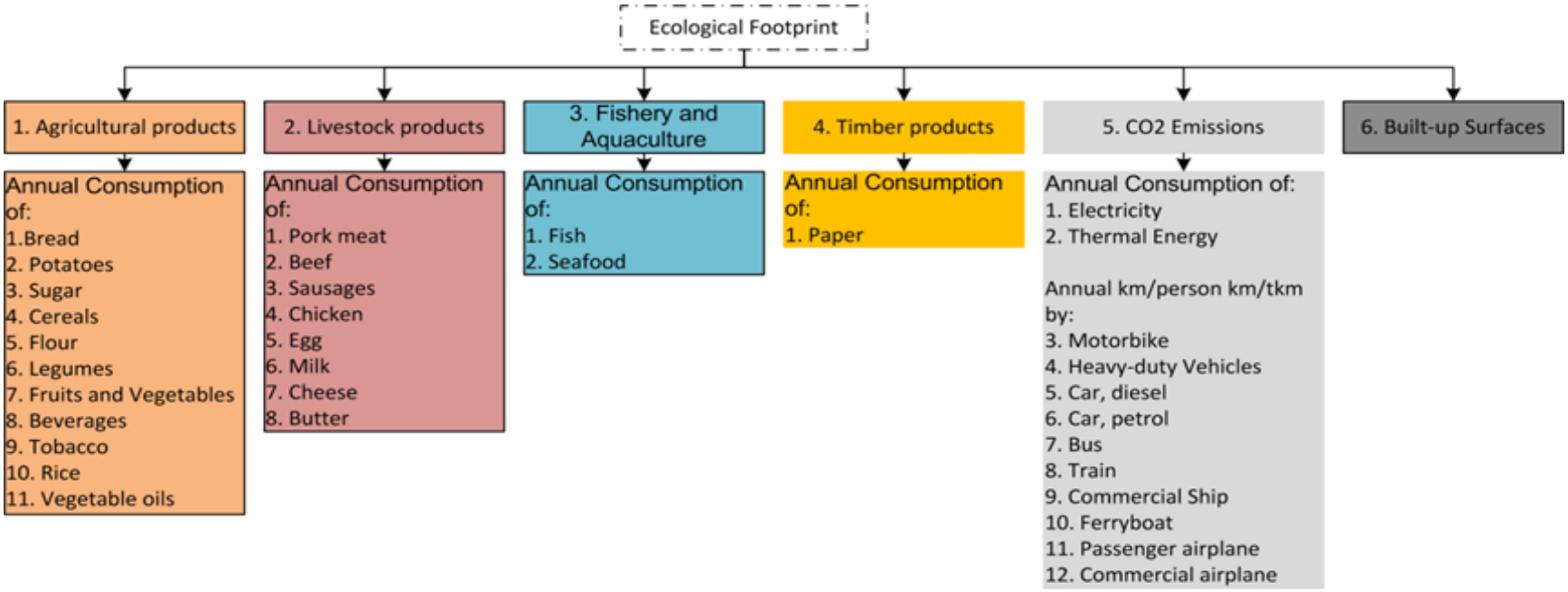
Methodological Framework

Ecological Footprint Accounts'

USE of:

✓**35 indicators** concerning consumption needs

✓**35 conversion factors** developed by the use of the application of **LCA software** (SimaPro 7.2) and the methodology Ecological Footprint V 1.02



Methodological Framework

Equivalent Population Accounts'

$$P_{eq} = \frac{P^*}{EF^*} EF$$

P* is the population of real residents
EF* is the Ecological Footprint of real residents
EF is the total Ecological Footprint of the area

- The framework takes into account the annual consumption of activities that do not depend directly on the resident population, such as the annual fuels consumption for private transportation, which depends on the annual travelled km by all types of vehicles (cars, motorbikes, trucks, etc.).
- An **equivalence between the consumption needs and the equivalent resident** was created, according to the **Ecological Footprint** that these needs require.
- The real residents' population and their needs is the basis of equivalence, the consumption needs of the remaining anthropogenic activities are matched to equivalent residents.
- Every real resident is matched to one equivalent resident, while all the other activities "produce" a corresponding number of equivalent residents.

- Theoretical background of BIO2CARE software/tools
- **BIO2CARE Decision Making Software**
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- Benefits from BIO2CARE implementation

- The **BIO2CARE Decision Making Software** is a cartographic online application that integrates all available data for the area of interest.

- Date are presented in a dynamic/interactive map, including:
  - Cartographic backgrounds
  - Dynamic/operational levels
  - Static cartographic data

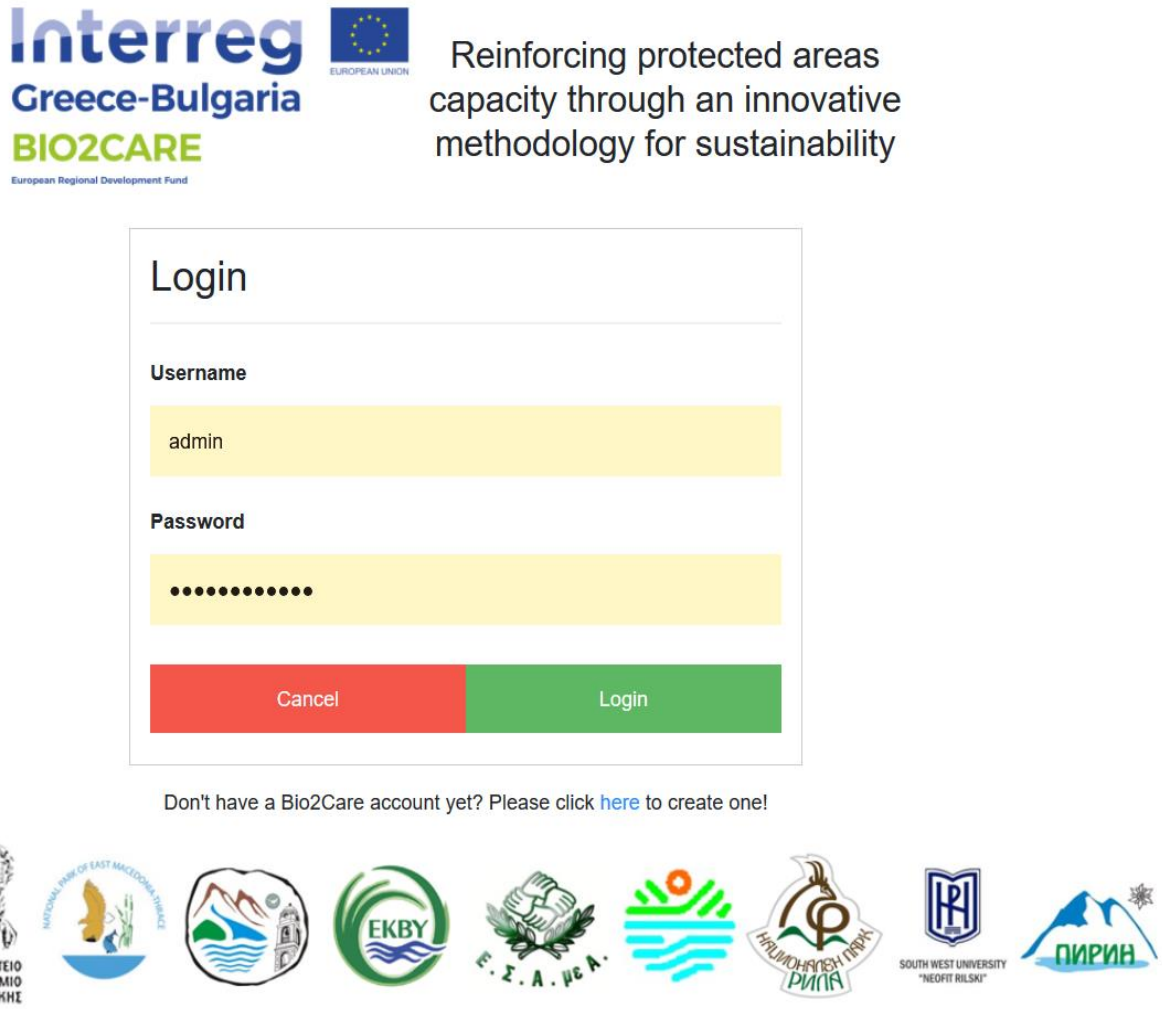
- The software allows its users (data administrators) to update the system with new data.

Type of Users

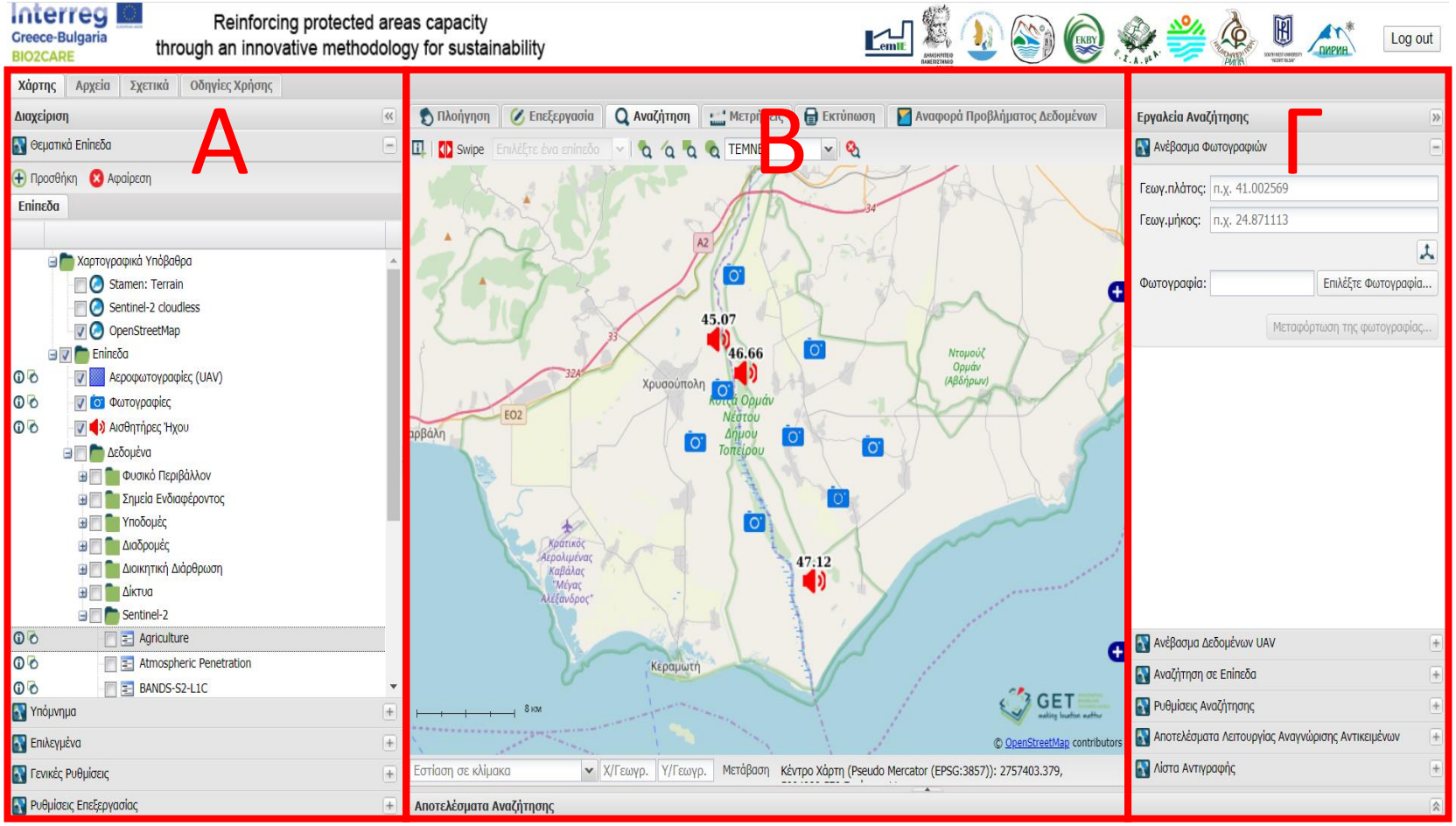
- **Simple Users**, with free access to application data and no certification upon entry

- **Data administrators**, with additional features to update application data – certification upon entry is needed

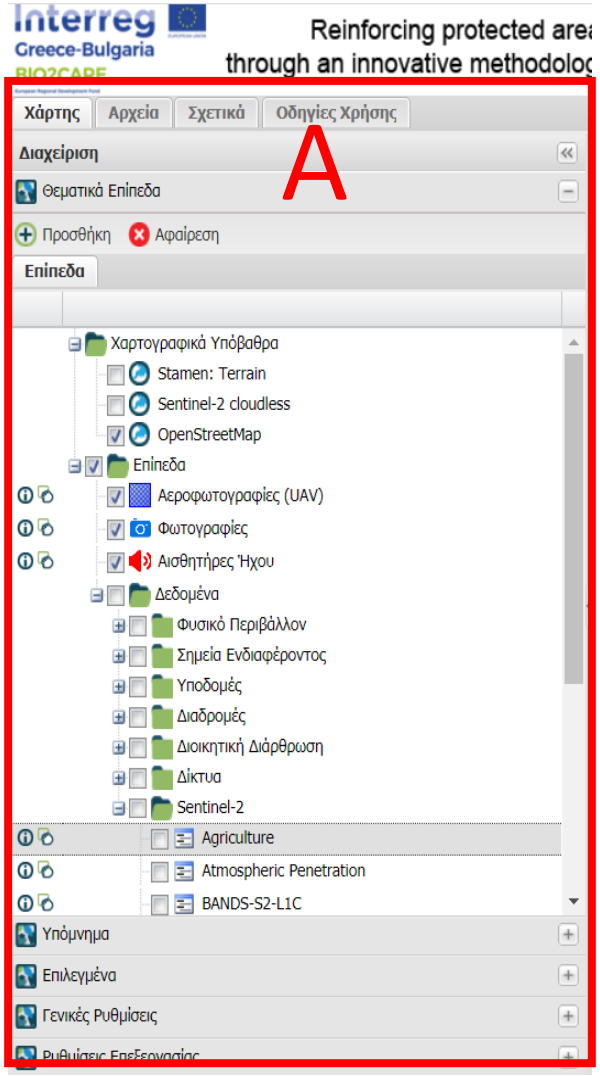
Sign-in


Interreg
Greece-Bulgaria
BIO2CARE
European Regional Development Fund
Reinforcing protected areas capacity through an innovative methodology for sustainability
Login
Username
admin
Password
Cancel
Login
Don't have a Bio2Care account yet? Please click here to create one!

Interface of the software

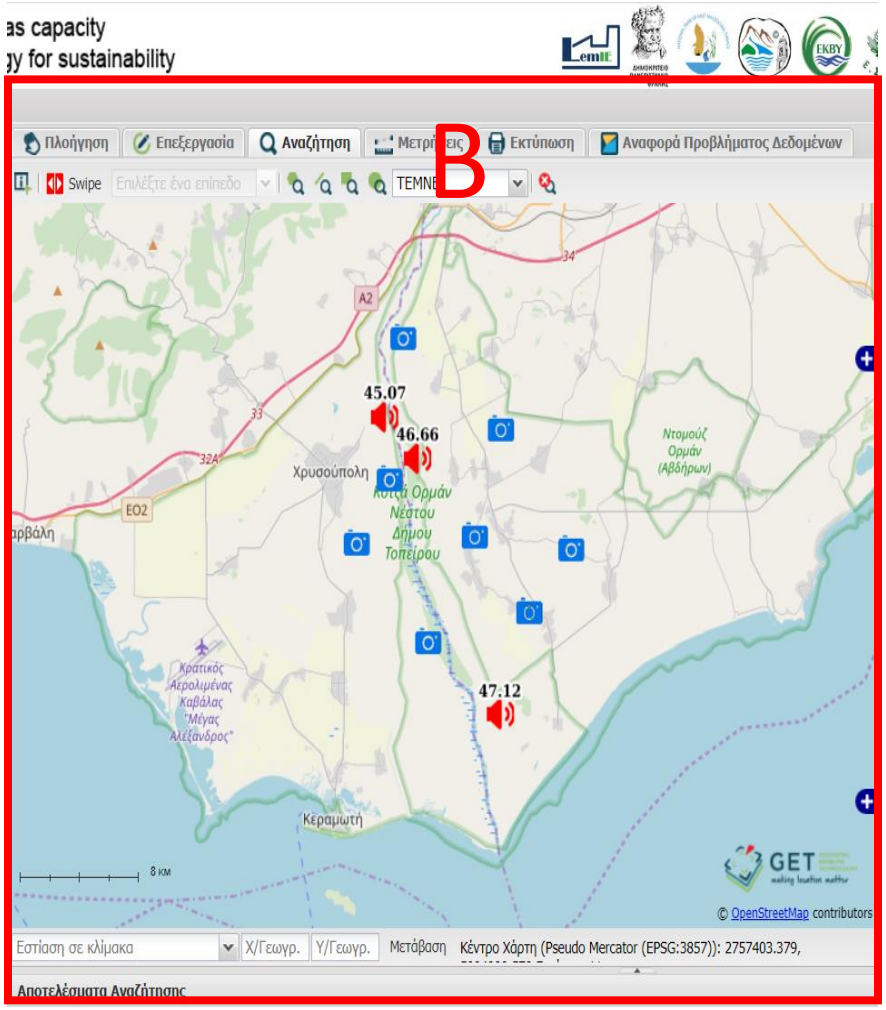


Interface of the software



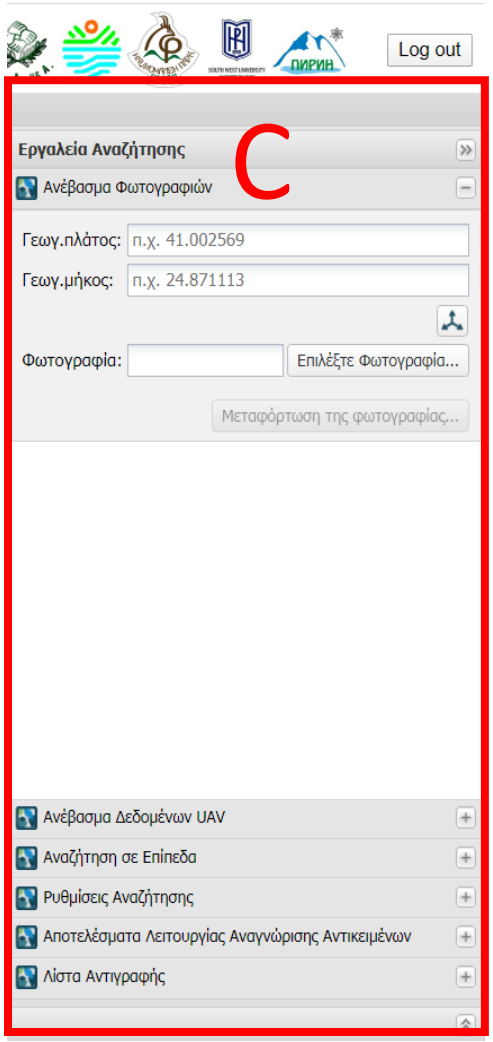
- Section A
  - Thematic Layers
    - Cartographic backgrounds
    - Operational data
    - Static cartographic data
  - Memo
  - General Settings

Interface of the software



- Section B
  - Interactive map
  - Interaction tools
    - Navigation
    - Search
    - Measuring
    - Printing
    - Report data problem

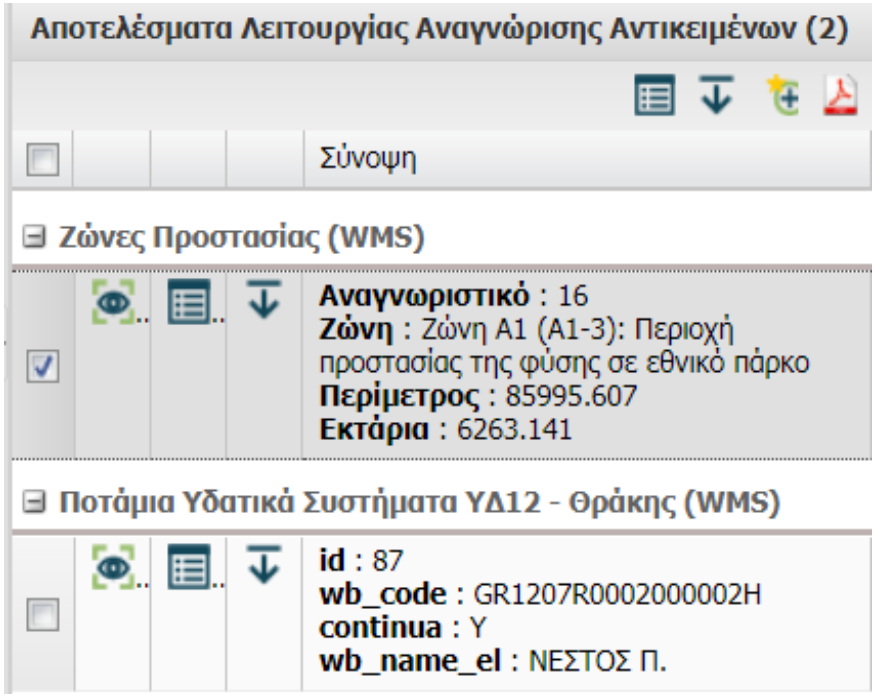
Interface of the software

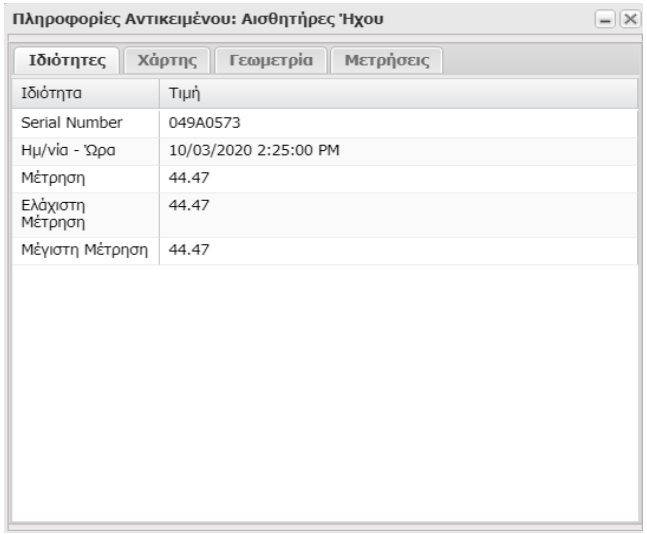


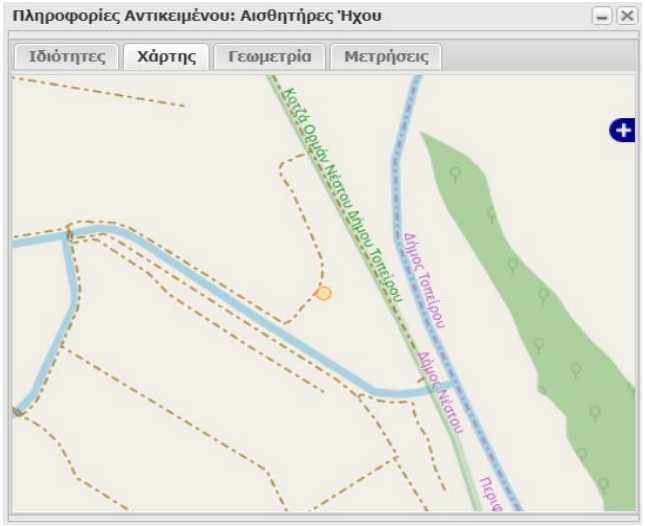
- Section C
  - Multi-level search
  - Photo upload (only for certified users)
  - UAV data upload (only for certified users)

Further functionalities

Point Information

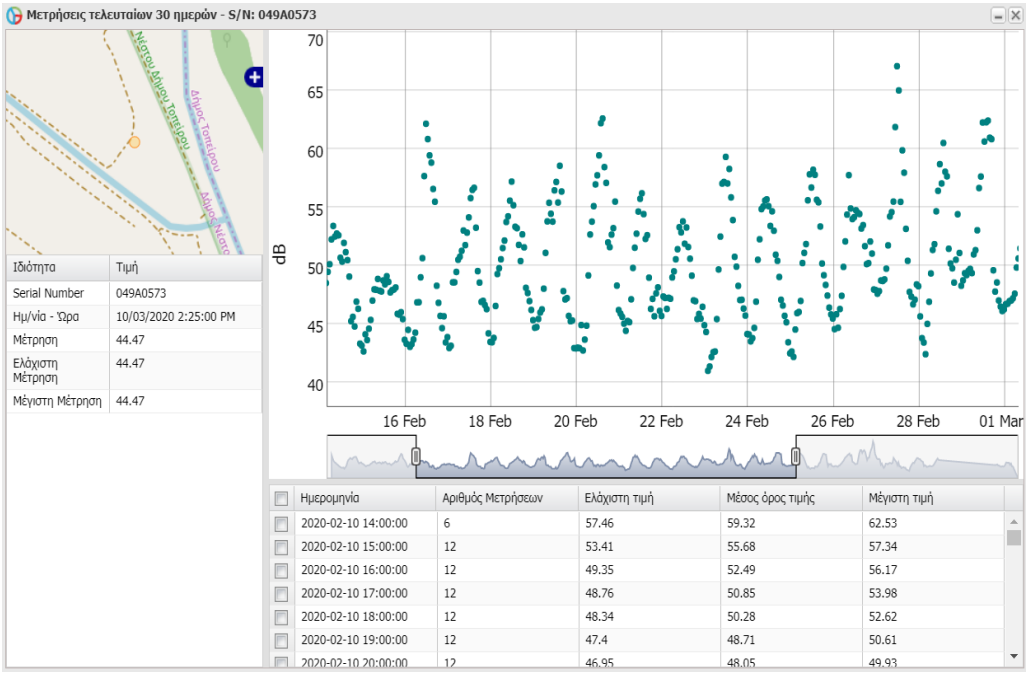






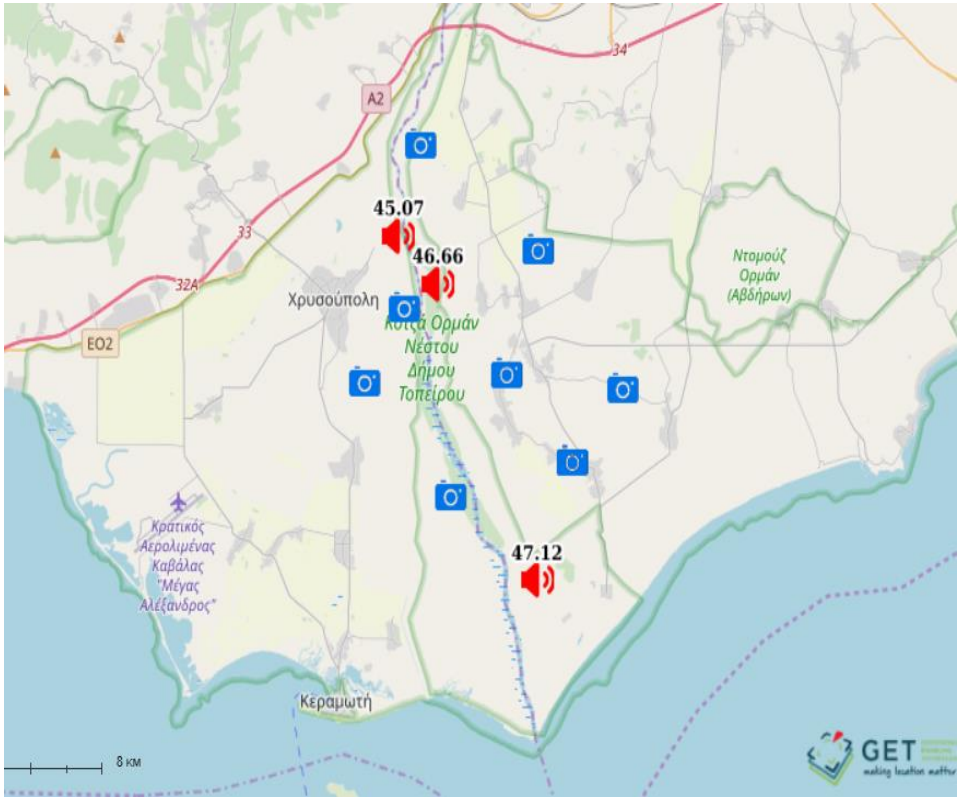
Point Information

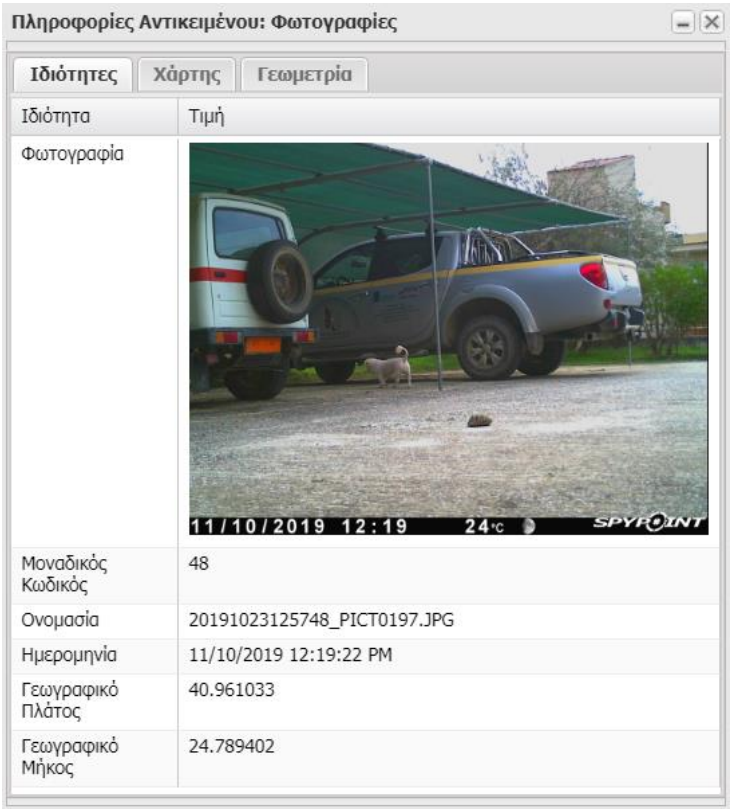
Noise monitoring stations



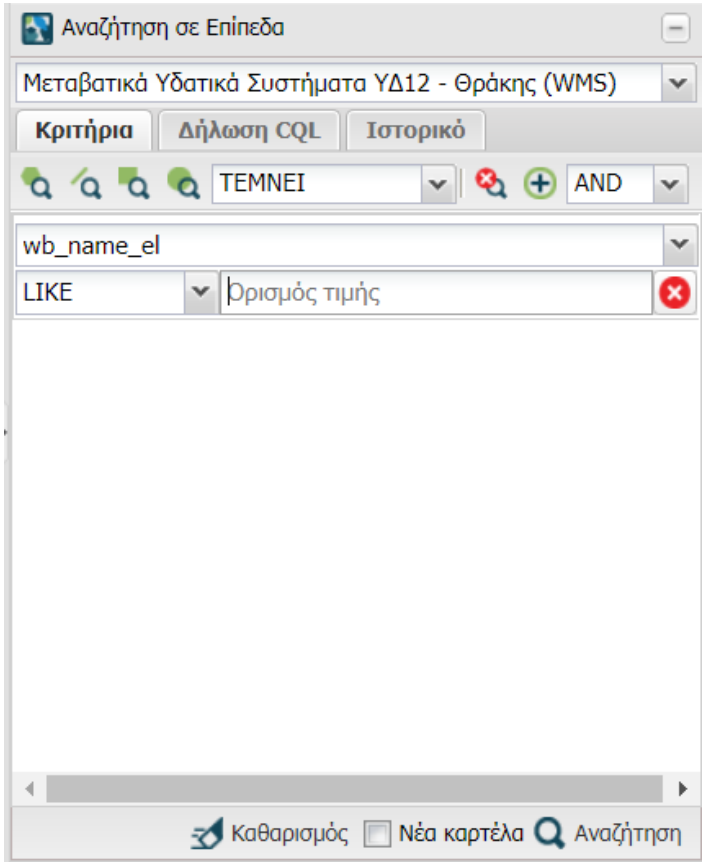
Point Information

Security Cameras





Search at thematic levels

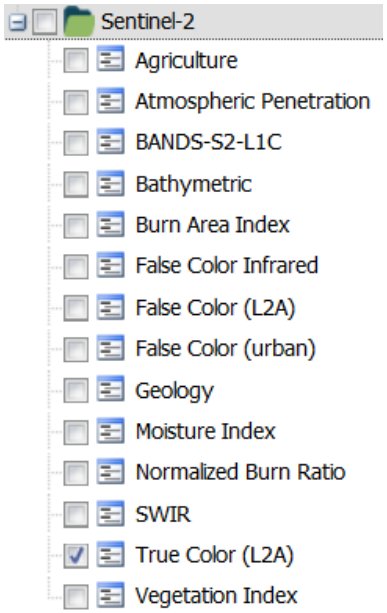


- With spatial criteria and interaction with the map
- With descriptive criteria
- Combination of the above

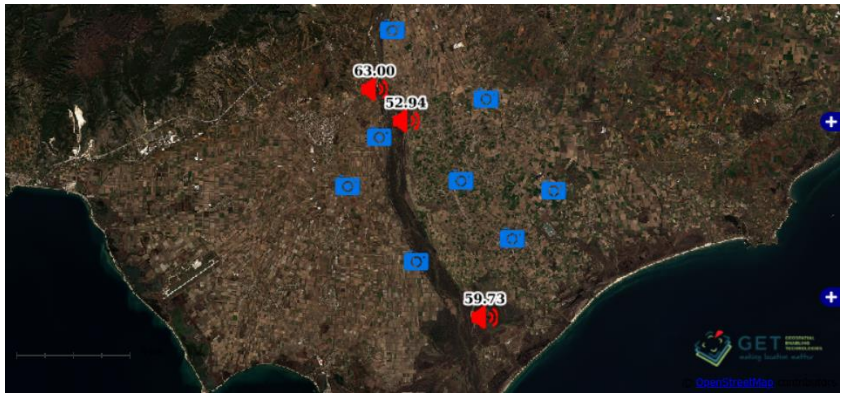
Further functionalities

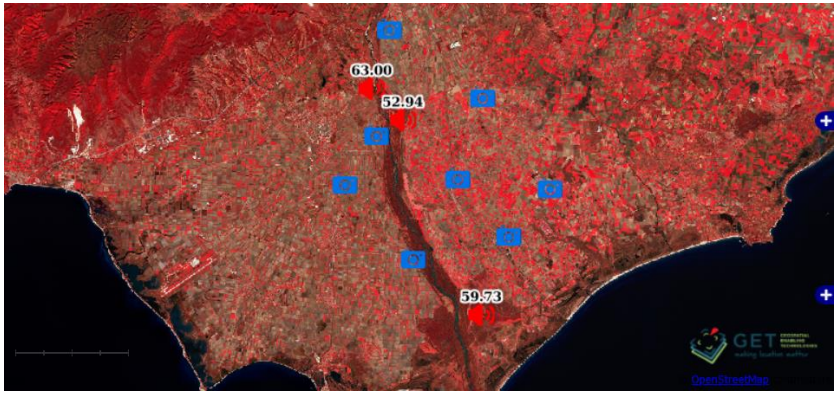
Sentinel Data

Select

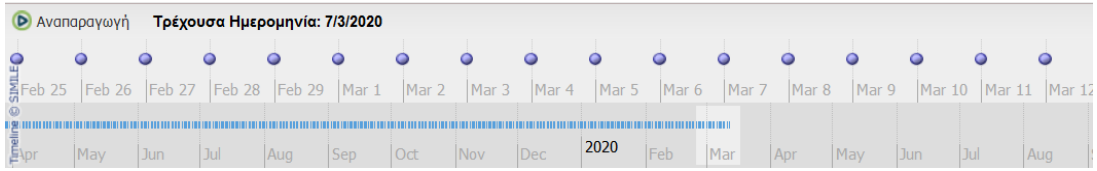


Appearance on the map



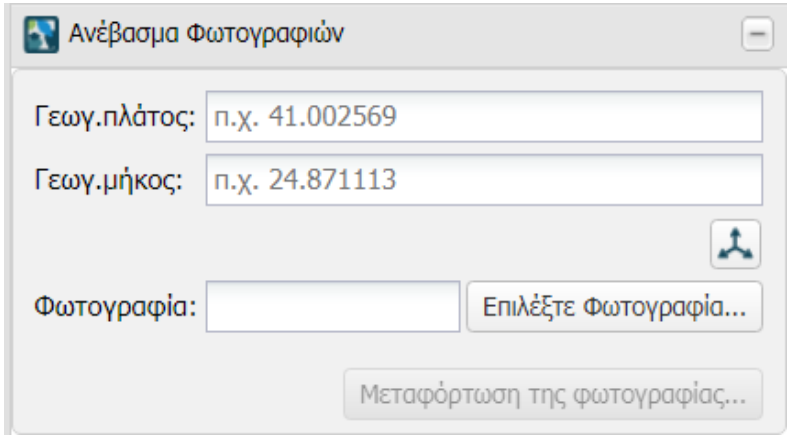


Select a reference time period

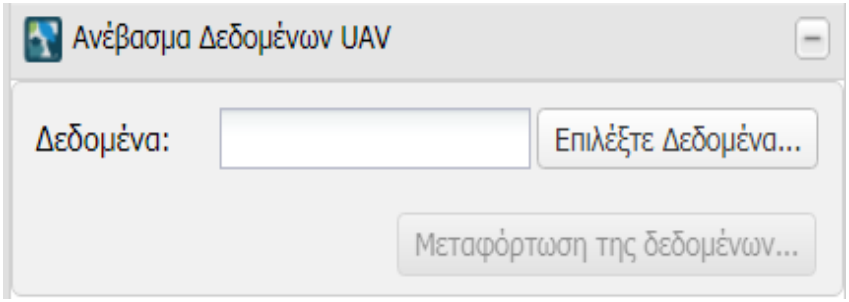


Data Management

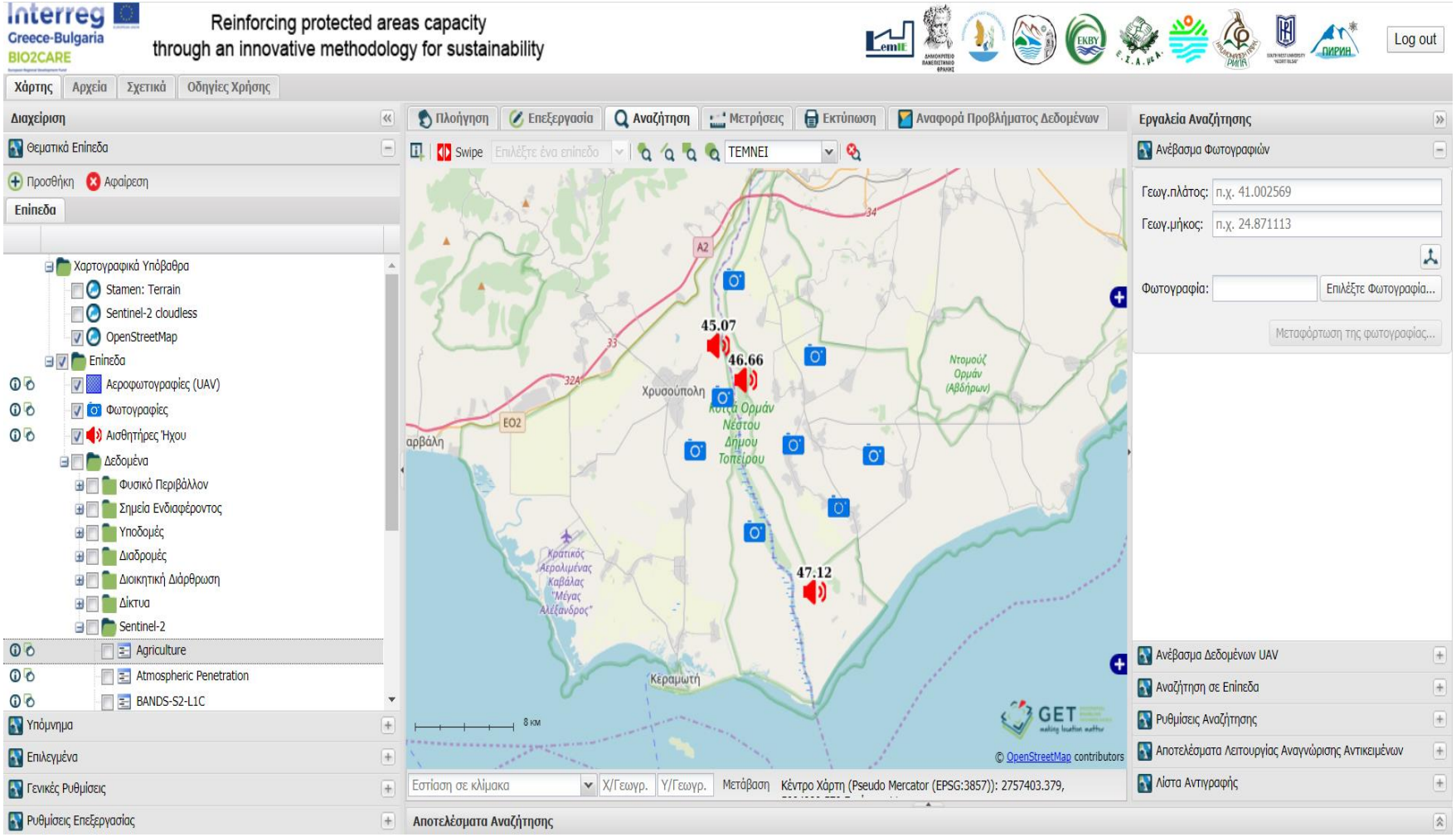
Photos from the security cameras



UAV Data



https://dpth.getmap.gr/



- Theoretical background of BIO2CARE software/tools
- BIO2CARE Decision Making Software
- **BIO2CARE Calc Tool**
- BIO2CARE Symbiosis Tool
- Benefits from BIO2CARE implementation

- The **Bio2Care Calc Tool** is an online application that provides the opportunity to the user to calculate the Carrying Capacity, the Ecological Footprint, the Biocapacity and the Carbon Footprint of a protected area

- The application has a simple and friendly work interface and integrates all the complicated calculations of the methodology included in the Deliverable 3.2, as it is available online.

Carrying Capacity in Protected Areas

project, a web tool for the estimation of the environmental status of a protected area has been developed.

Carrying Capacity (CC),
Ecological Footprint (EF),
Carbon Footprint (CF)

ber of people, animals, or crops which a region can support without environmental
g Capacity can be understood as the maximum number of persons (both visitors and
rmanent damage to the productivity of the environment and without considerably
ity of future generations to meet their needs.

the sustainability of a protected area it is necessary to extract the following two
footprints:

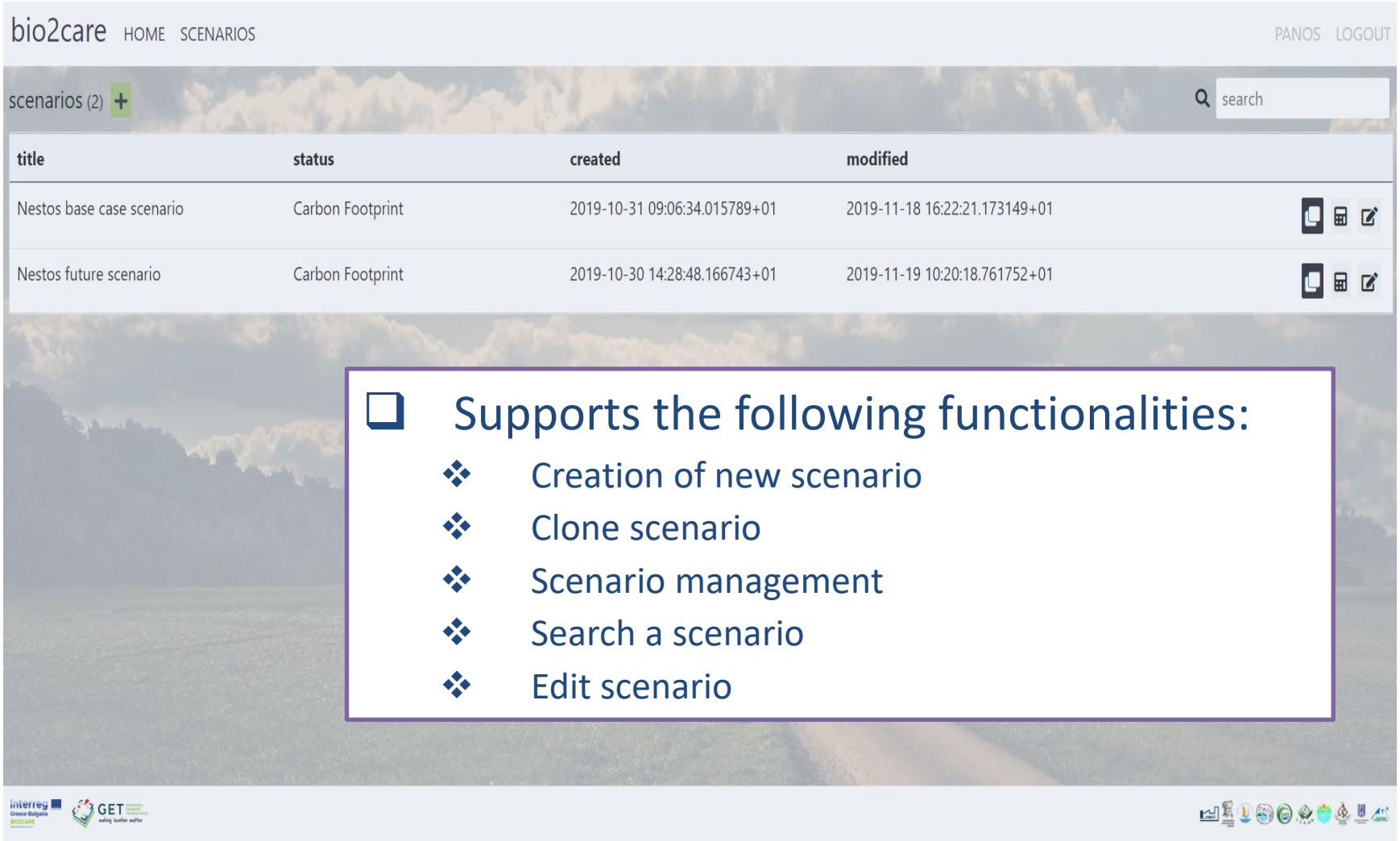
(expressed in hectares – Gha) that is needed for a population to produce in a
milate the waste it produces. The EF calculation method is necessary to convert
in order to compare them with the Biocapacity of the examined system (actual
le lands) and thus find the CC of the area.
xpressed in tones of carbon dioxide equivalent emissions – tons CO2) emitted to
d a sub-indicator of the EF, but it is essential to quantify and assess it on its own,
e of Global Warming Potential and Climate Change impacts.

documentation scenarios

Partners

The homepage provides basic information about the project Bio2Care and the notions of Carrying Capacity, Ecological Footprint, Biocapacity and Carbon Footprint

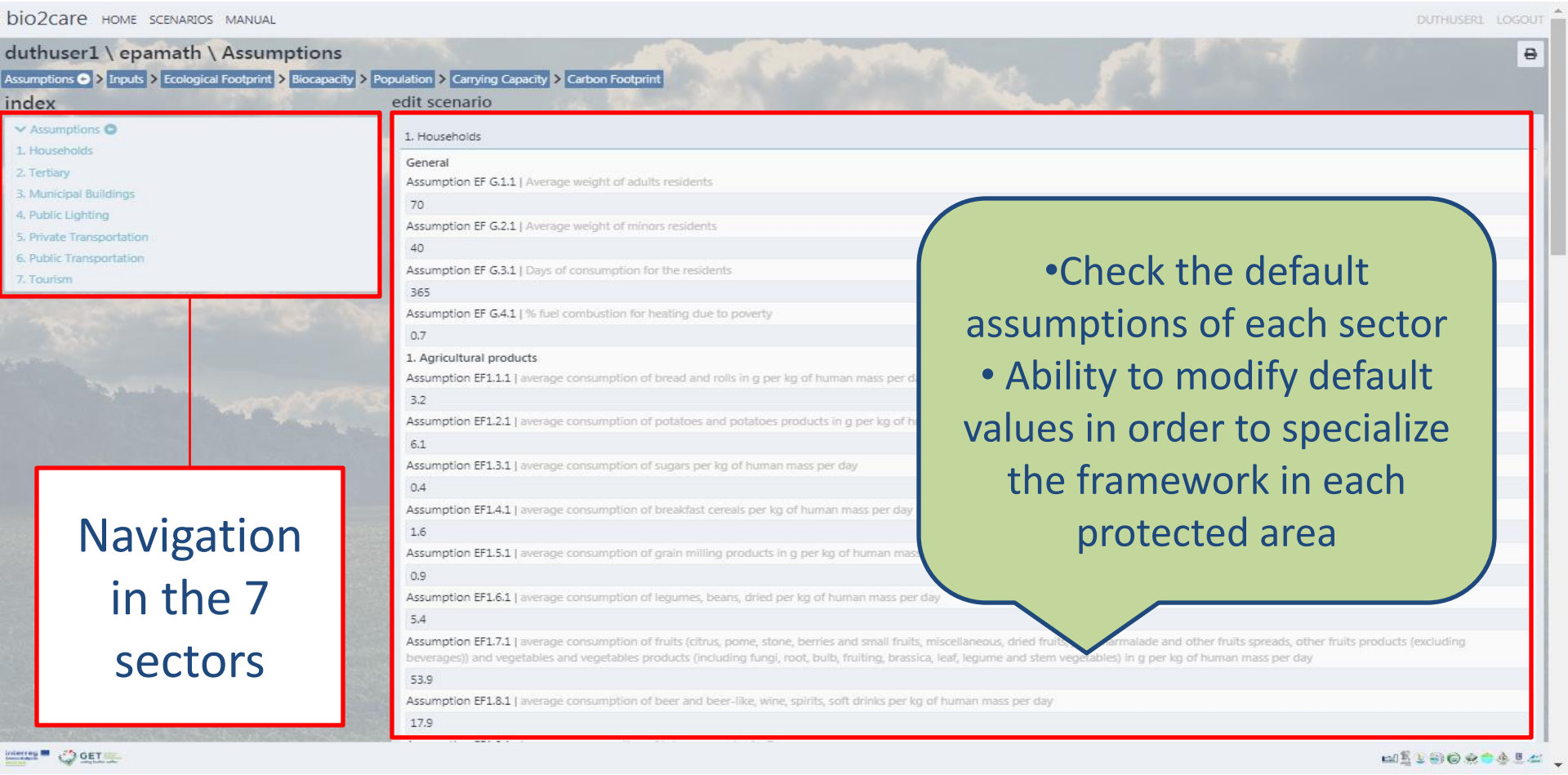
Scenarios management



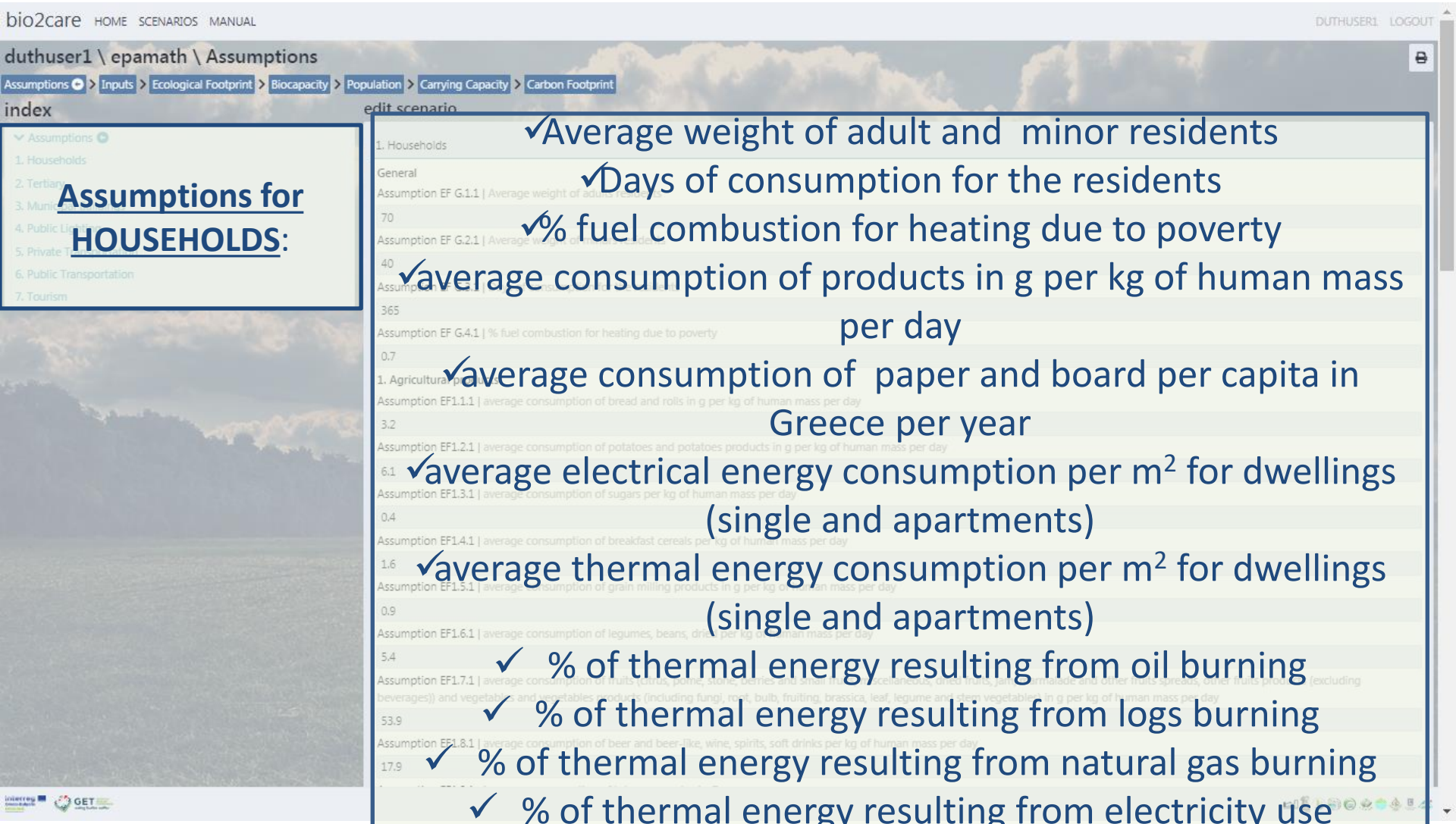
- Supports the following functionalities:
  - Creation of new scenario
  - Clone scenario
  - Scenario management
  - Search a scenario
  - Edit scenario

Bio2Care Calc Tool- Assumptions

➢At first, the application displays the **assumptions** of the methodology for calculating the carrying capacity of protected areas.



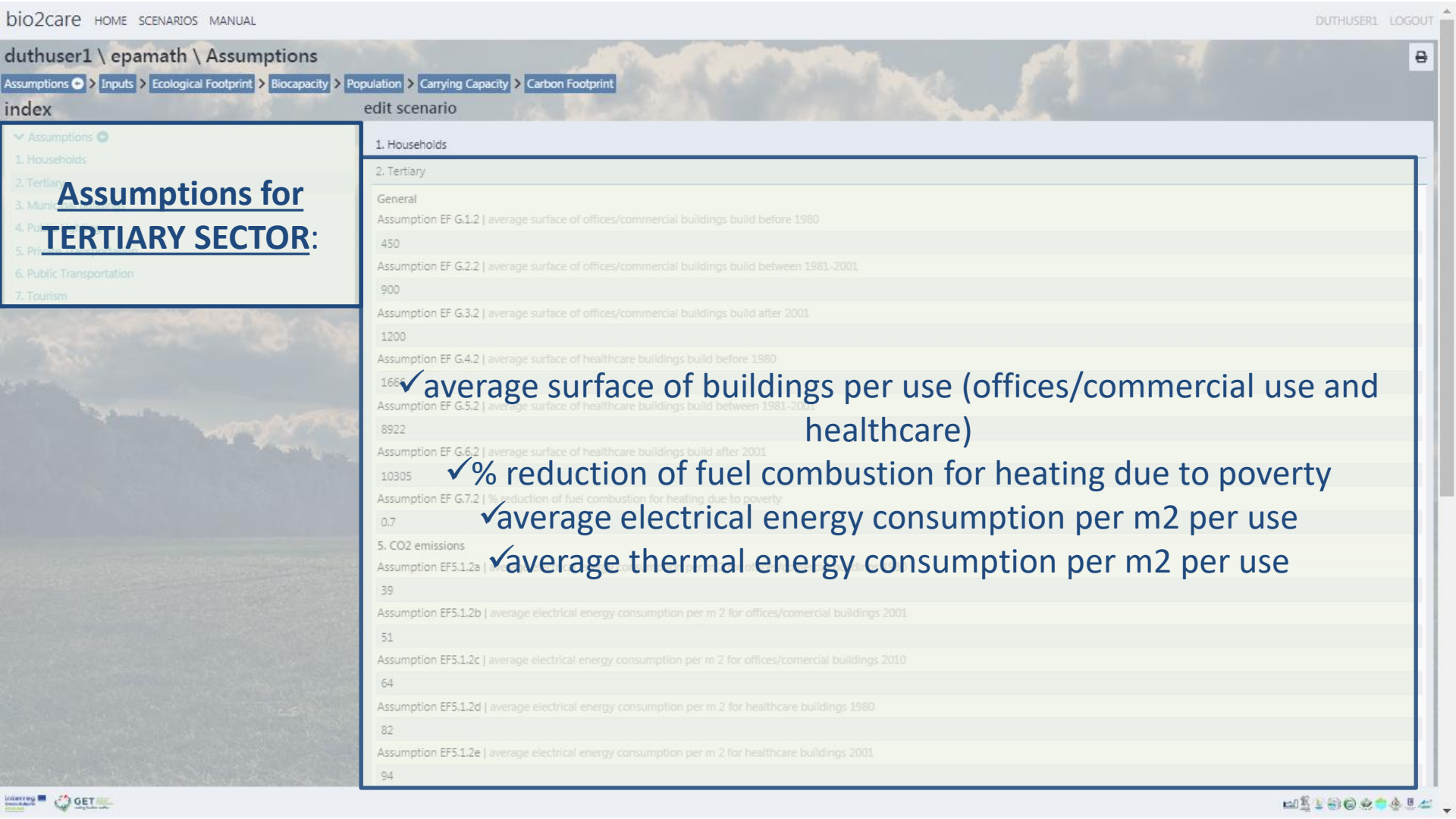
Bio2Care Calc Tool- Assumptions



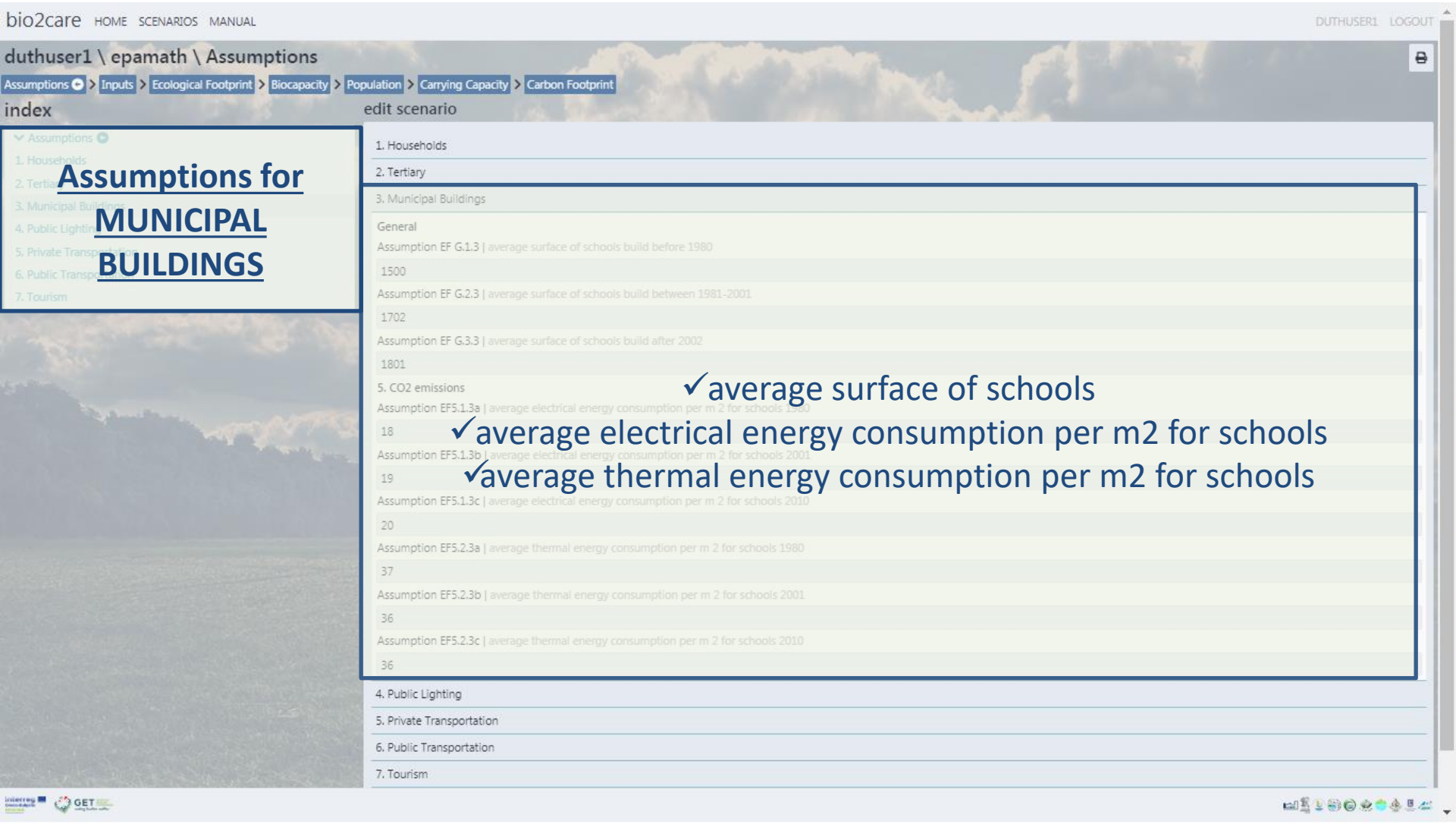
Assumptions for HOUSEHOLDS:

- ✓Average weight of adult and minor residents
- ✓Days of consumption for the residents
- ✓% fuel combustion for heating due to poverty
- ✓average consumption of products in g per kg of human mass per day
- ✓average consumption of paper and board per capita in Greece per year
- ✓average electrical energy consumption per m^2 for dwellings (single and apartments)
- ✓average thermal energy consumption per m^2 for dwellings (single and apartments)
- ✓ % of thermal energy resulting from oil burning
- ✓ % of thermal energy resulting from logs burning
- ✓ % of thermal energy resulting from natural gas burning
- ✓ % of thermal energy resulting from electricity use

Bio2Care Calc Tool- Assumptions



Bio2Care Calc Tool- Assumptions

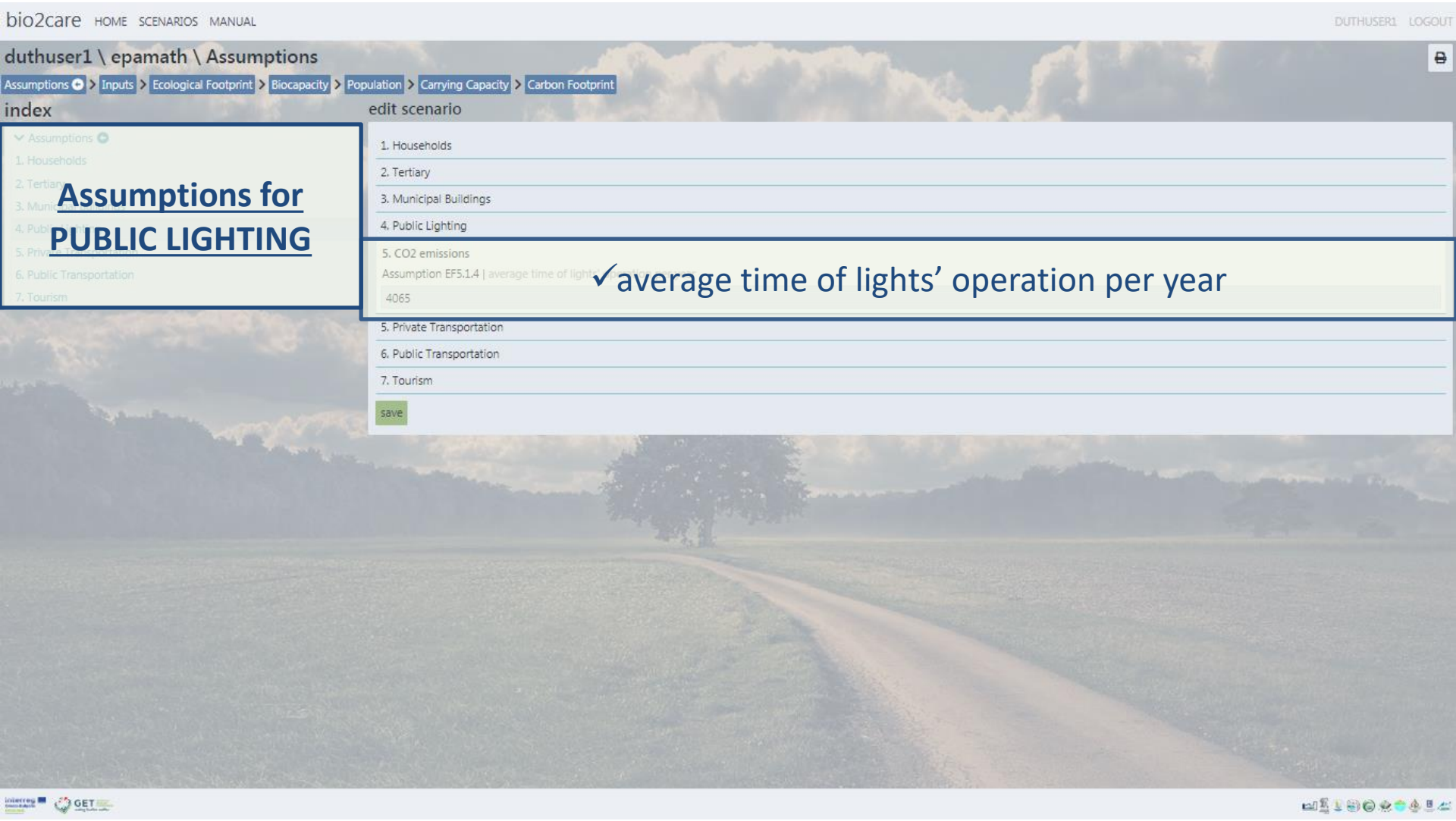


✓average surface of schools

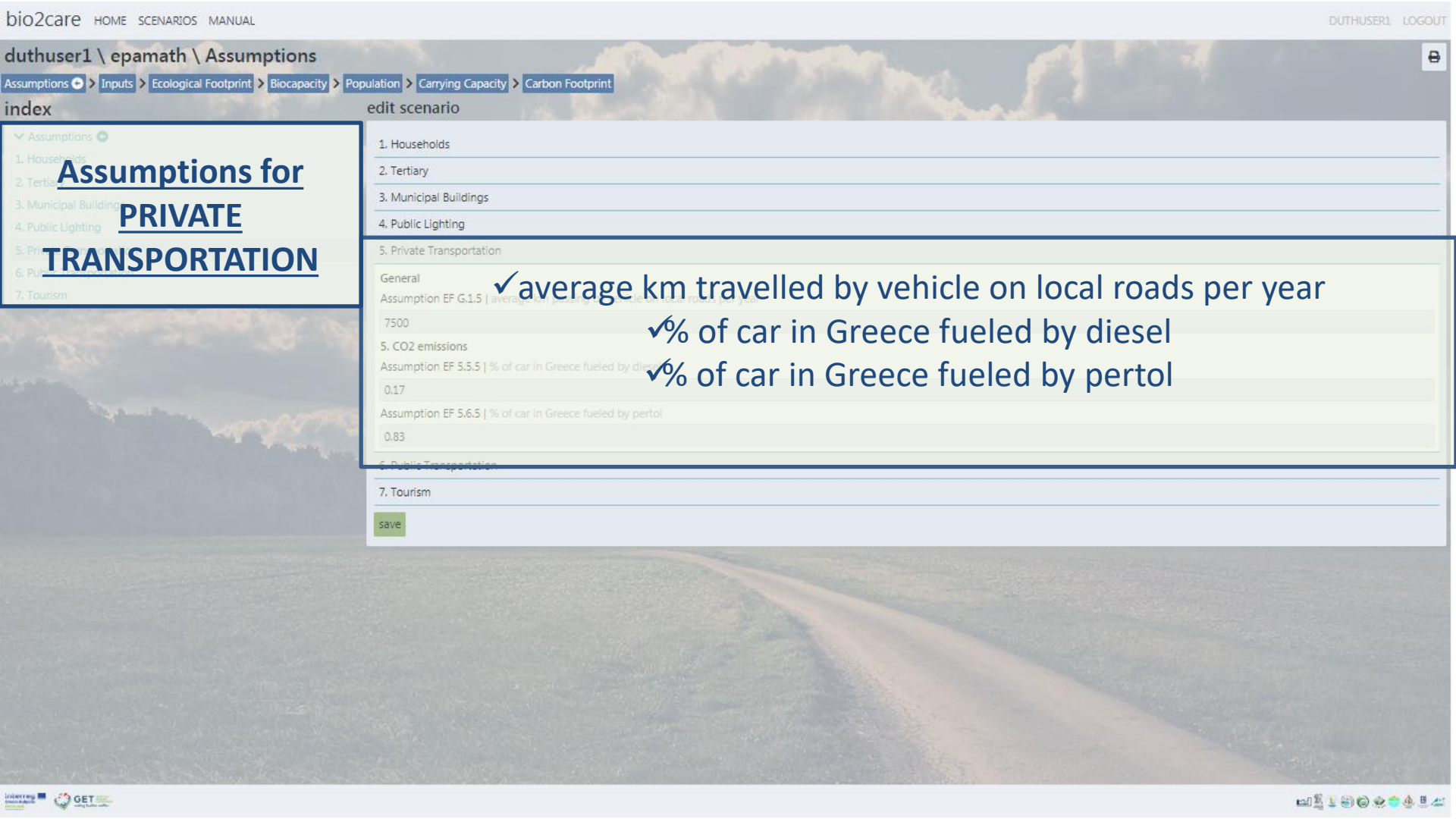
✓average electrical energy consumption per m2 for schools

✓average thermal energy consumption per m2 for schools

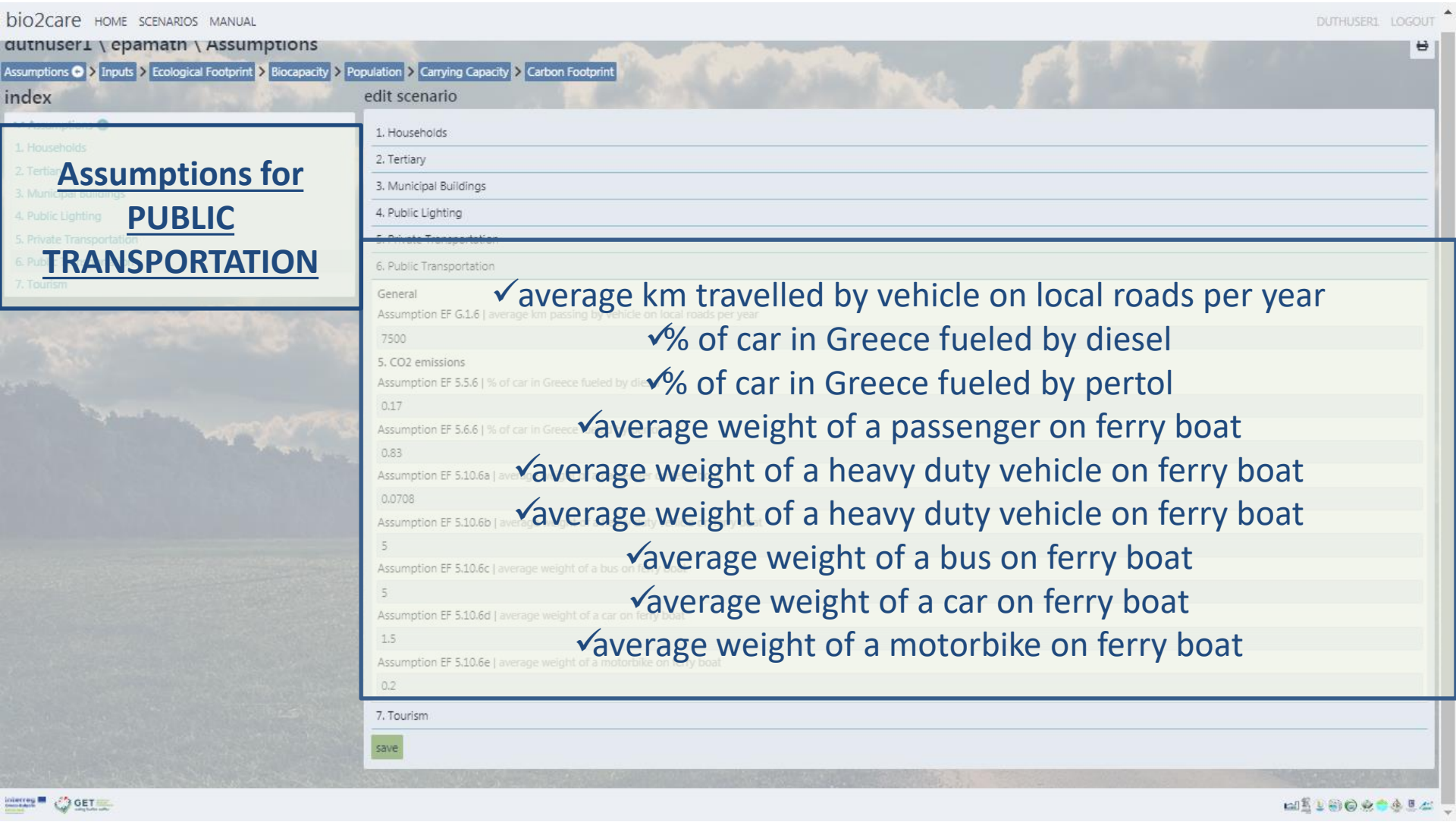
Bio2Care Calc Tool- Assumptions



Bio2Care Calc Tool- Assumptions



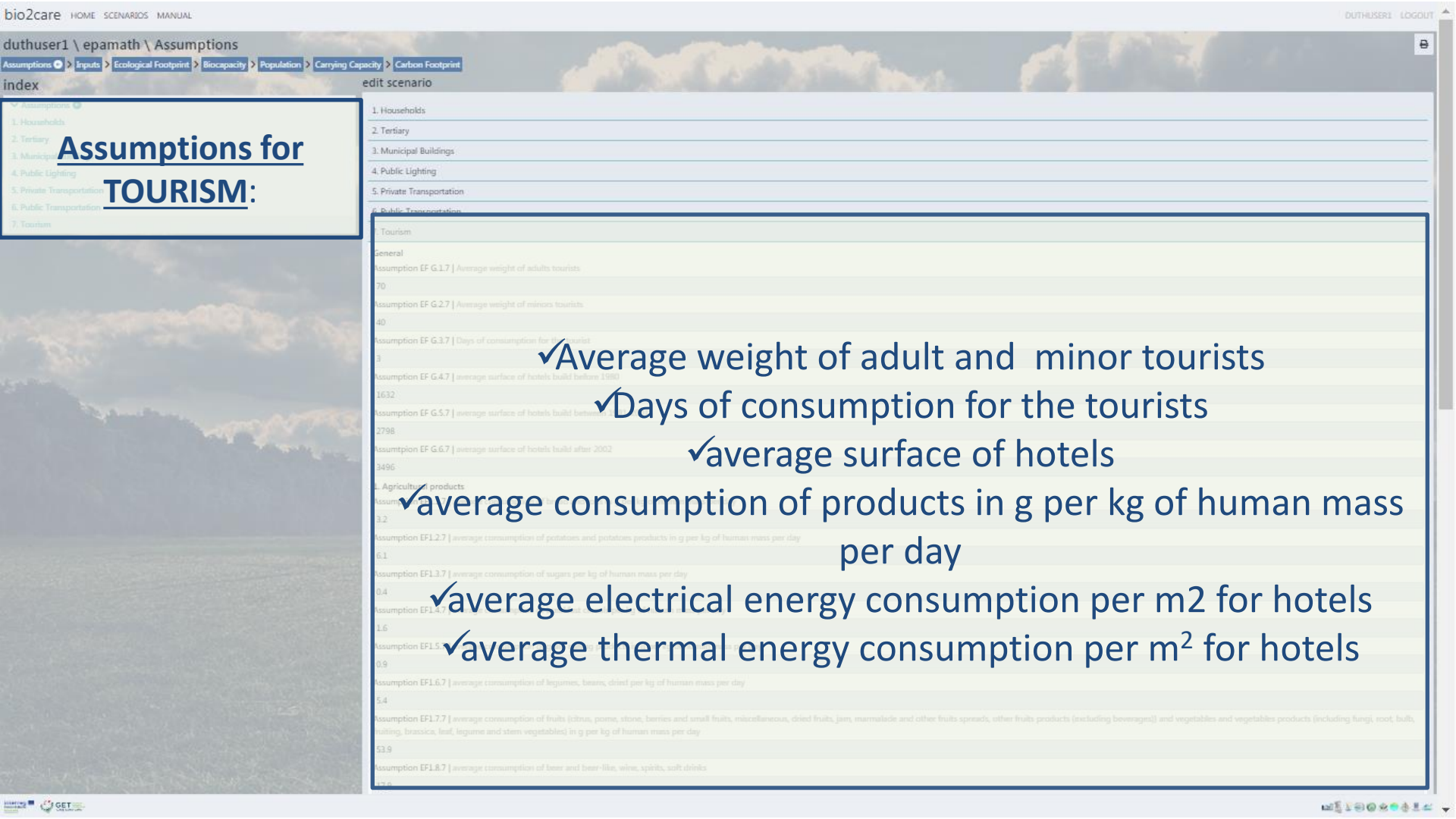
Bio2Care Calc Tool- Assumptions



Assumptions for PUBLIC TRANSPORTATION

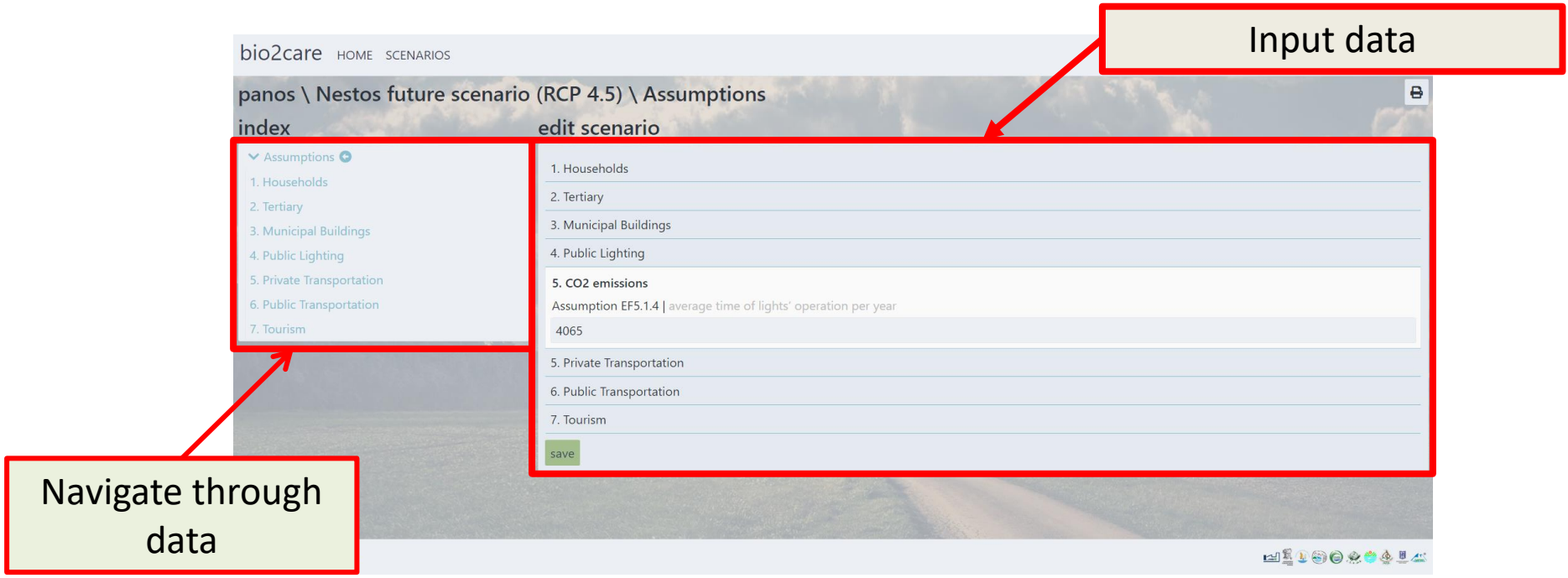
- ✓average km travelled by vehicle on local roads per year
- ✓% of car in Greece fueled by diesel
- ✓% of car in Greece fueled by pertol
- ✓average weight of a passenger on ferry boat
- ✓average weight of a heavy duty vehicle on ferry boat
- ✓average weight of a heavy duty vehicle on ferry boat
- ✓average weight of a bus on ferry boat
- ✓average weight of a car on ferry boat
- ✓average weight of a motorbike on ferry boat

Bio2Care Calc Tool- Assumptions



Data processing

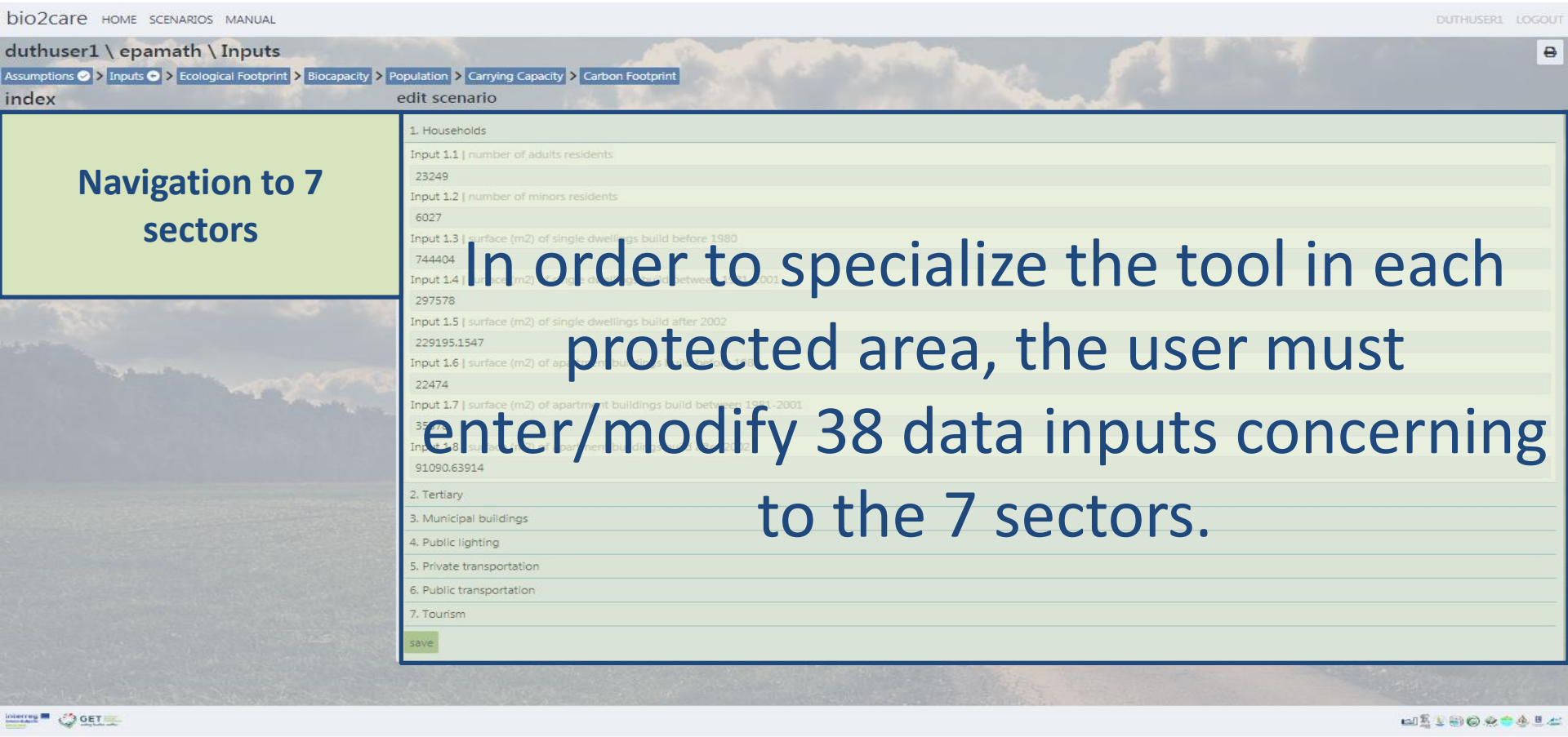
- The application displays the data that need to be filled in. This applied to different type of data that must be confirmed and/or provided by the user (e.g. assumptions, inputs) or data that are automatically calculated based on the BIO2CARE methodology (WP3)



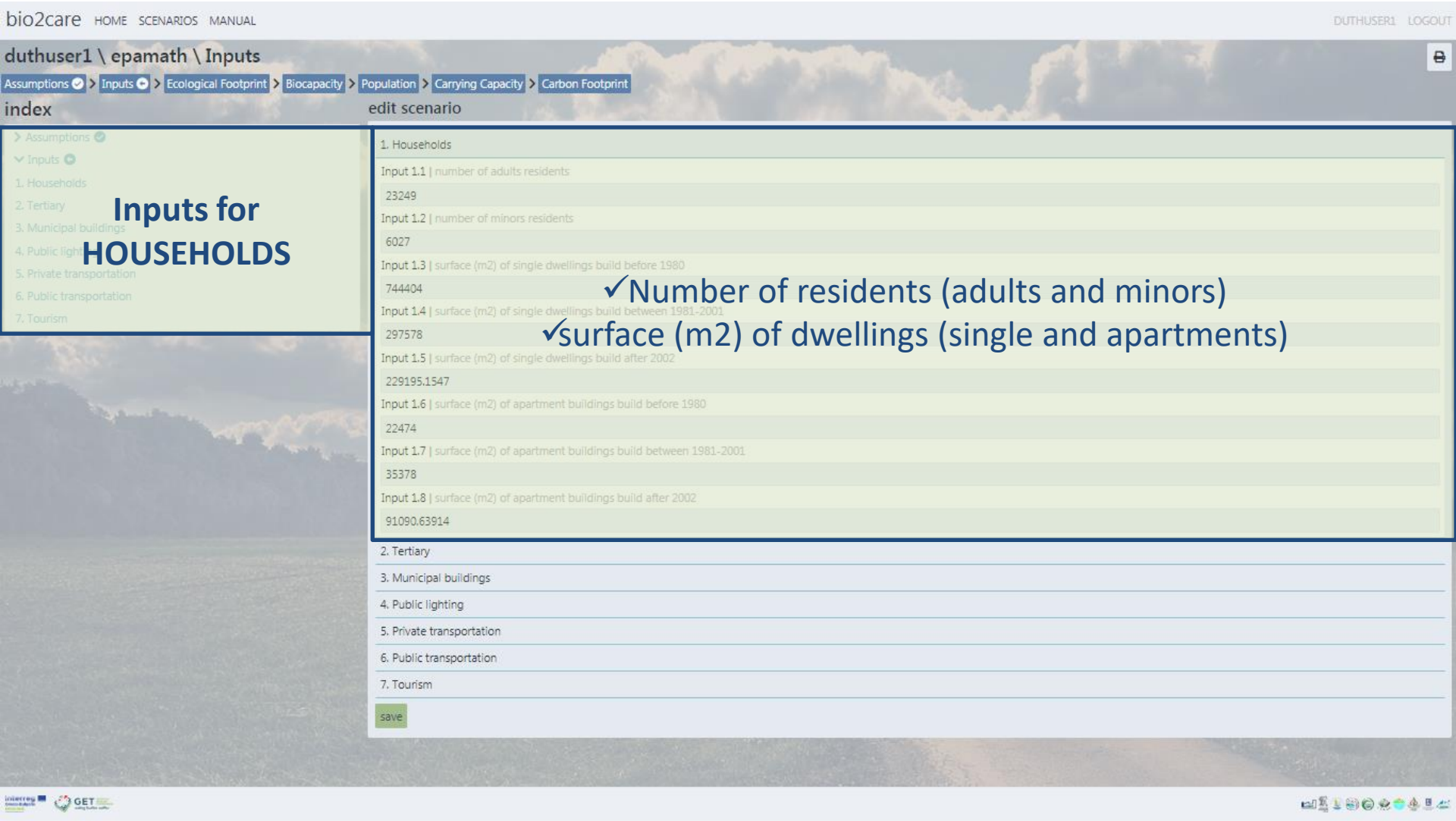
Calculations

Bio2Care Calc Tool- Inputs

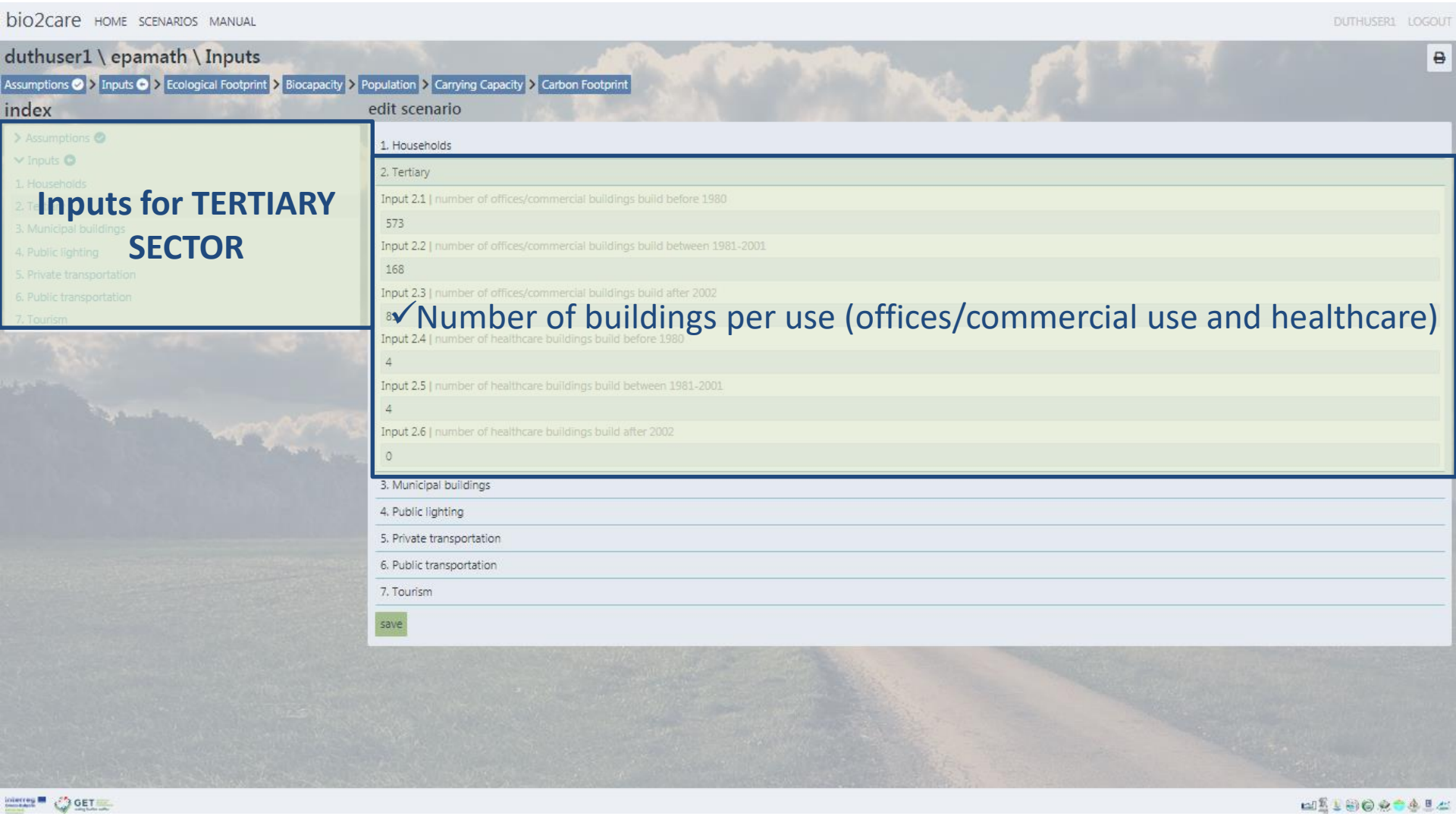
- Data collection and import is crucial to the results of the tool.



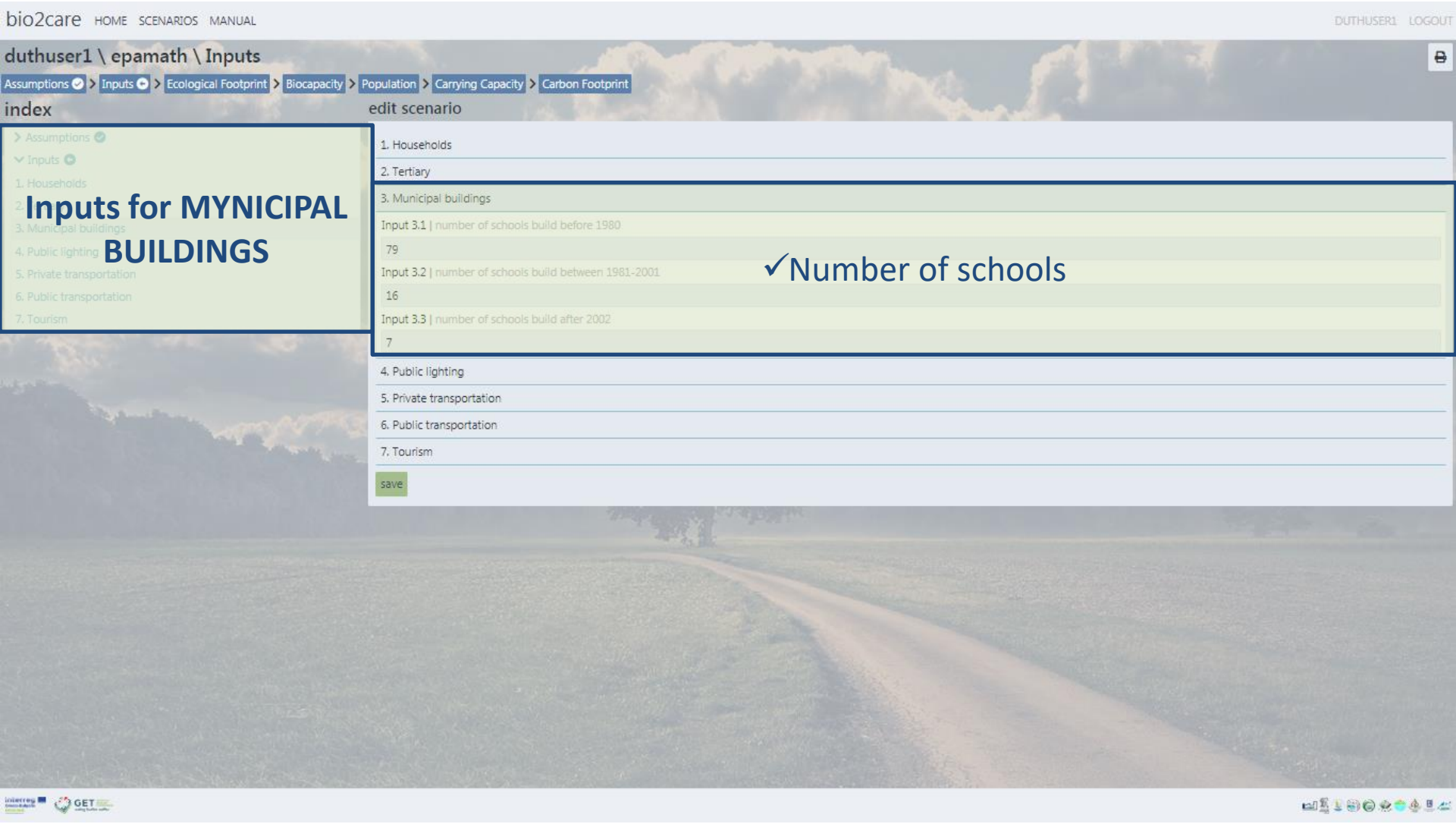
Bio2Care Calc Tool- Inputs



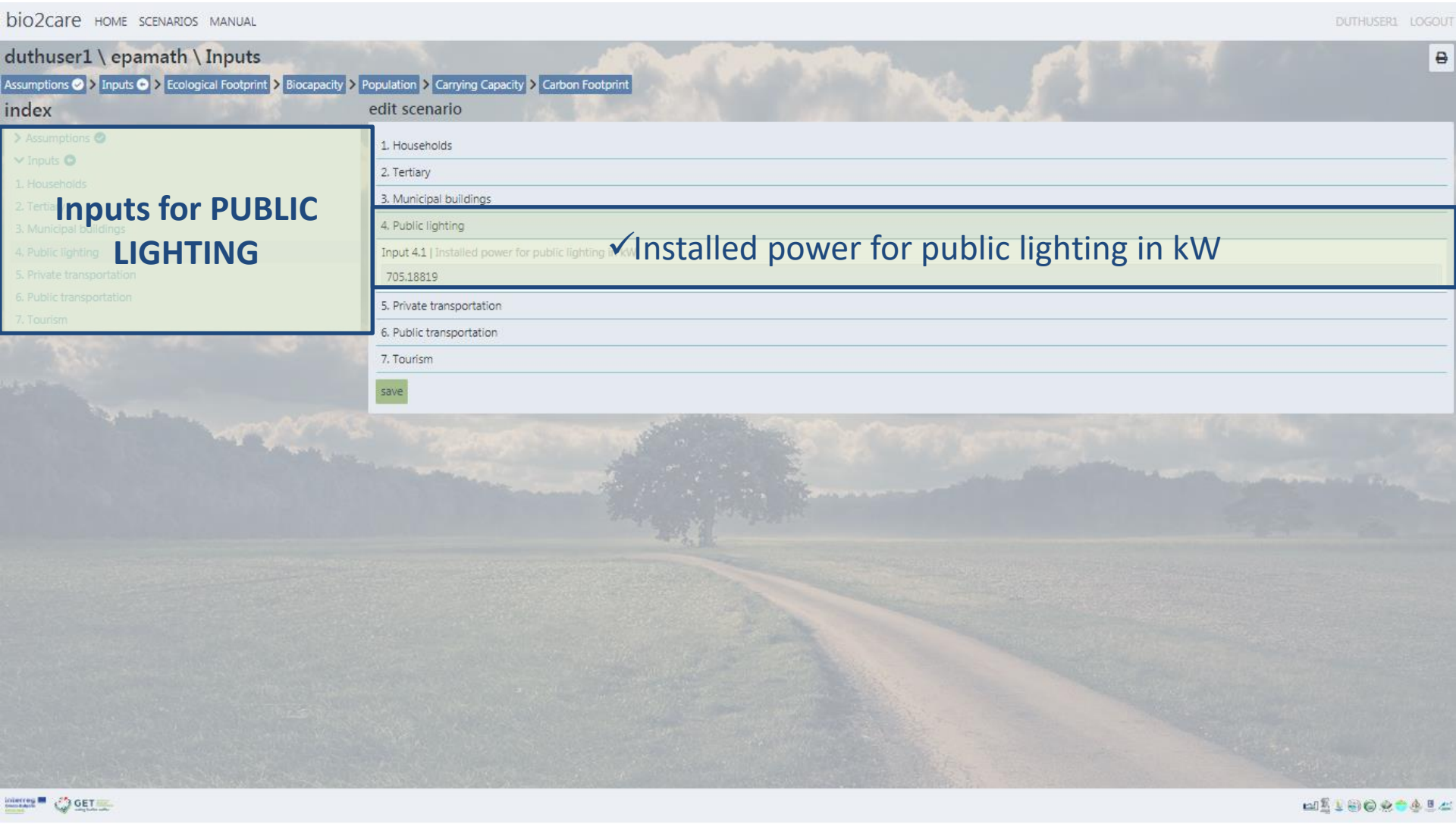
Bio2Care Calc Tool- Inputs



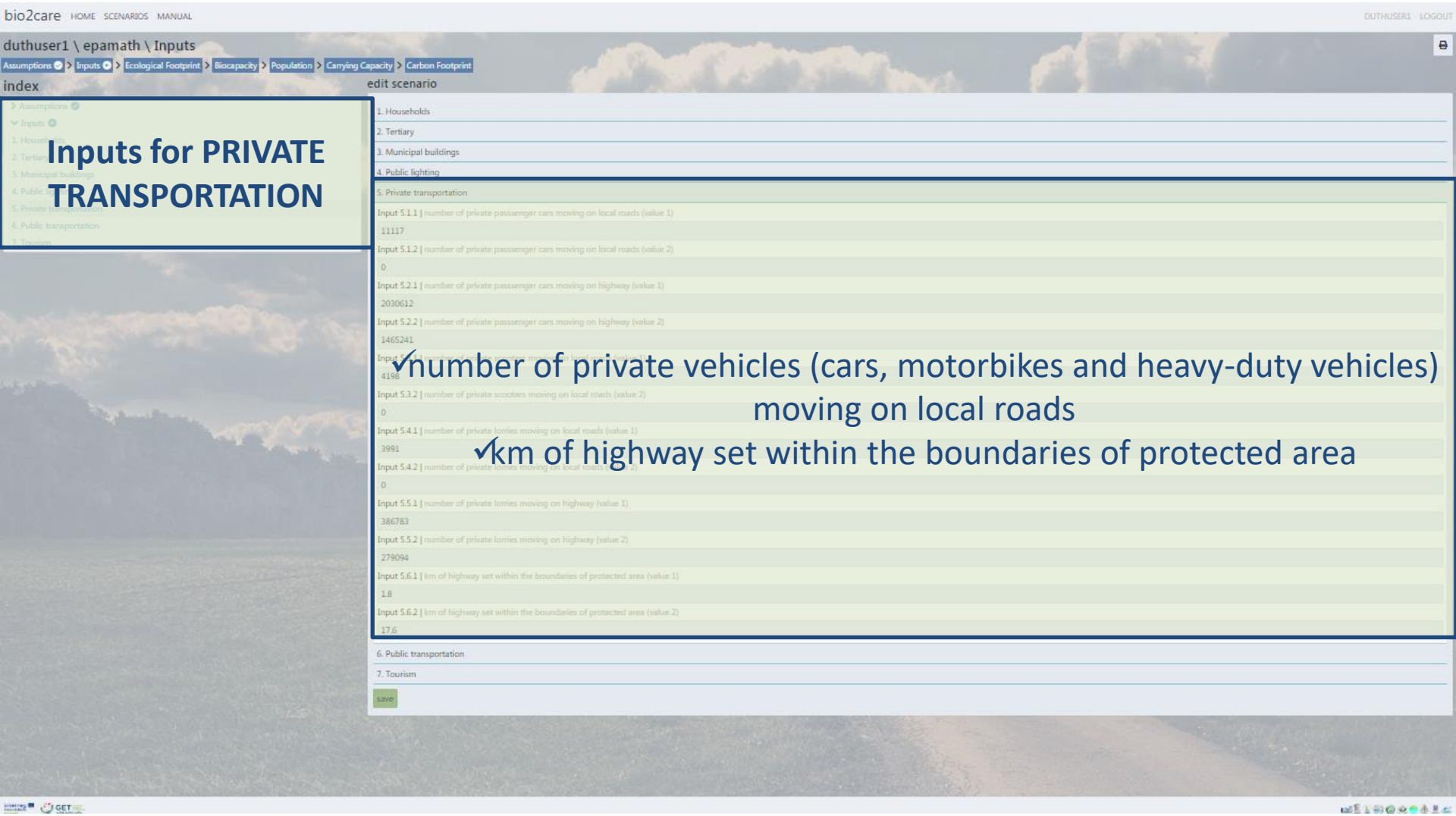
Bio2Care Calc Tool- Inputs



Bio2Care Calc Tool- Inputs



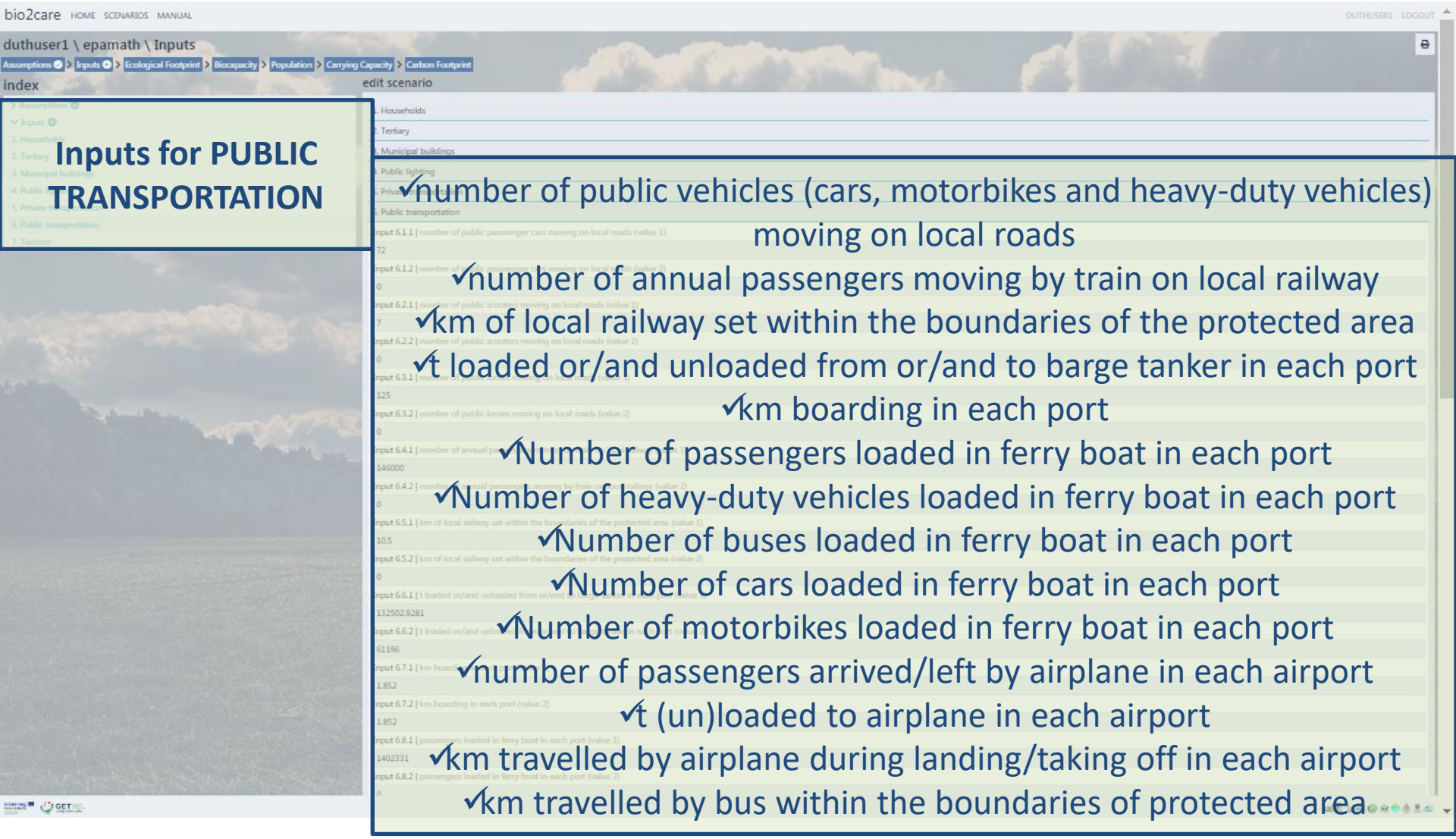
Bio2Care Calc Tool- Inputs



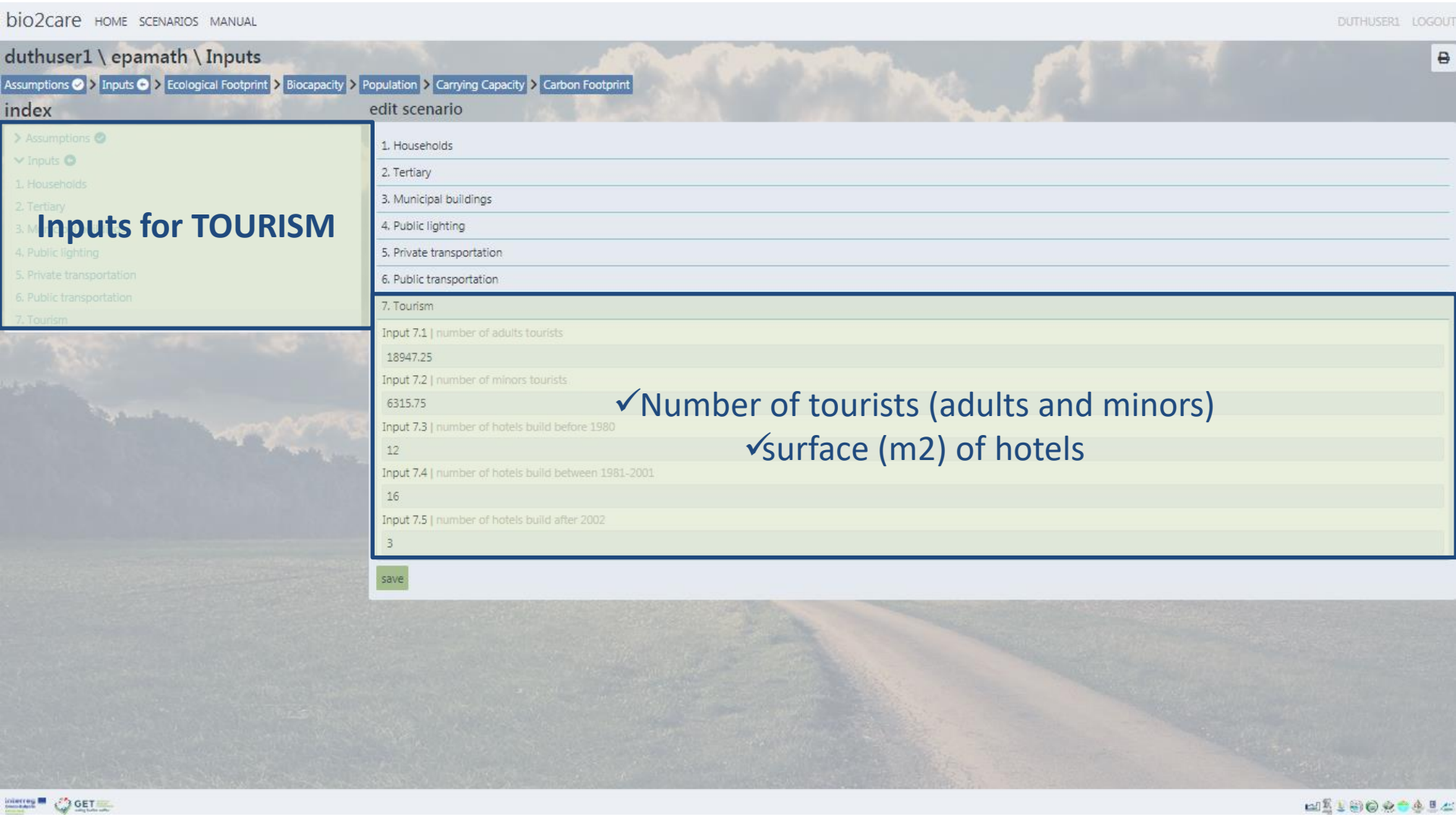
✓number of private vehicles (cars, motorbikes and heavy-duty vehicles) moving on local roads

✓km of highway set within the boundaries of protected area

Bio2Care Calc Tool- Inputs



Bio2Care Calc Tool- Inputs



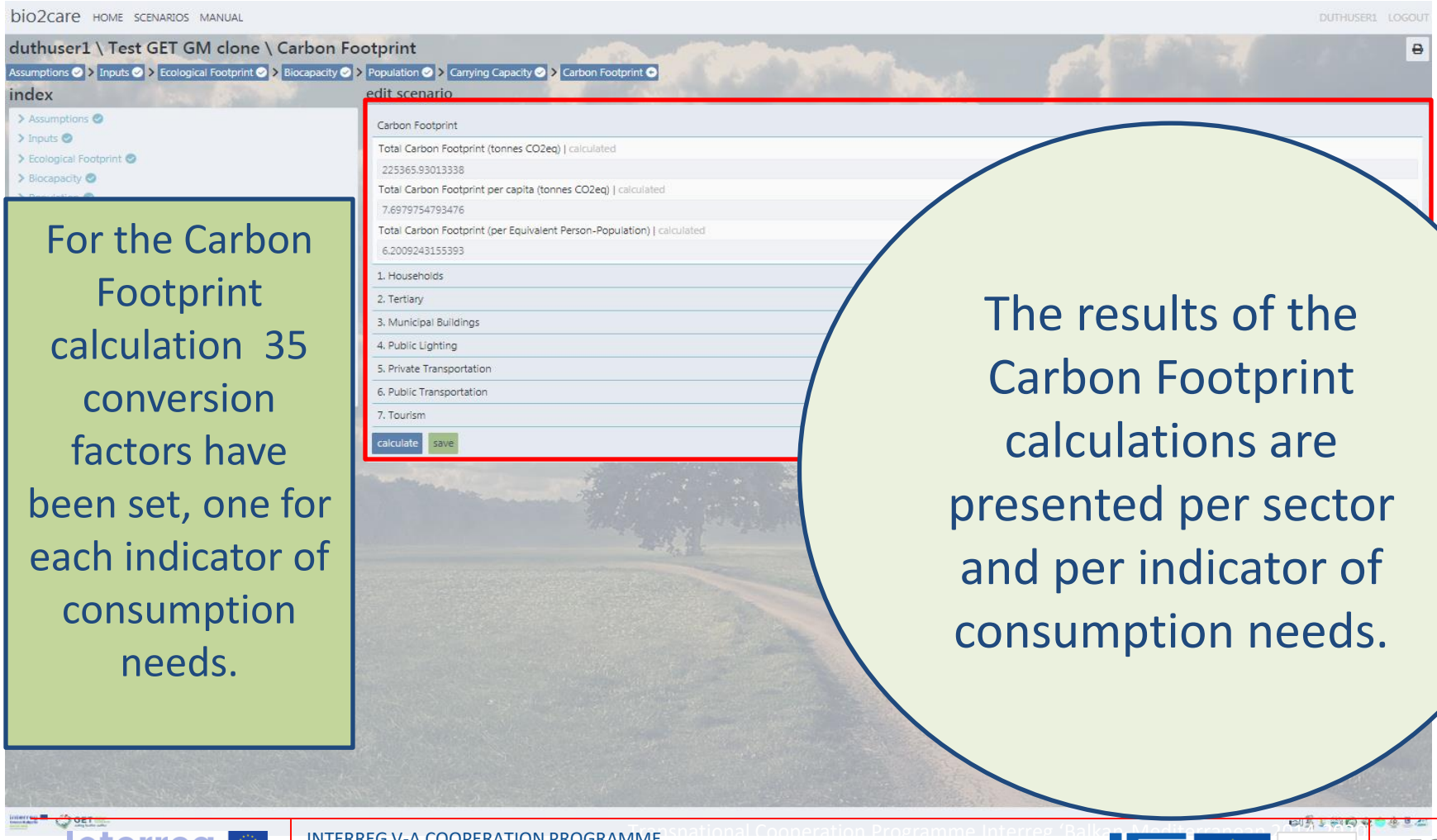
✓Number of tourists (adults and minors)

✓surface (m2) of hotels

Bio2Care Calc Tool- Ecological Footprint calculations

➢The tool automatically calculates the Ecological and Carbon Footprints of the protected area by entering the required inputs.

Bio2Care Calc Tool- Carbon Footprint calculations

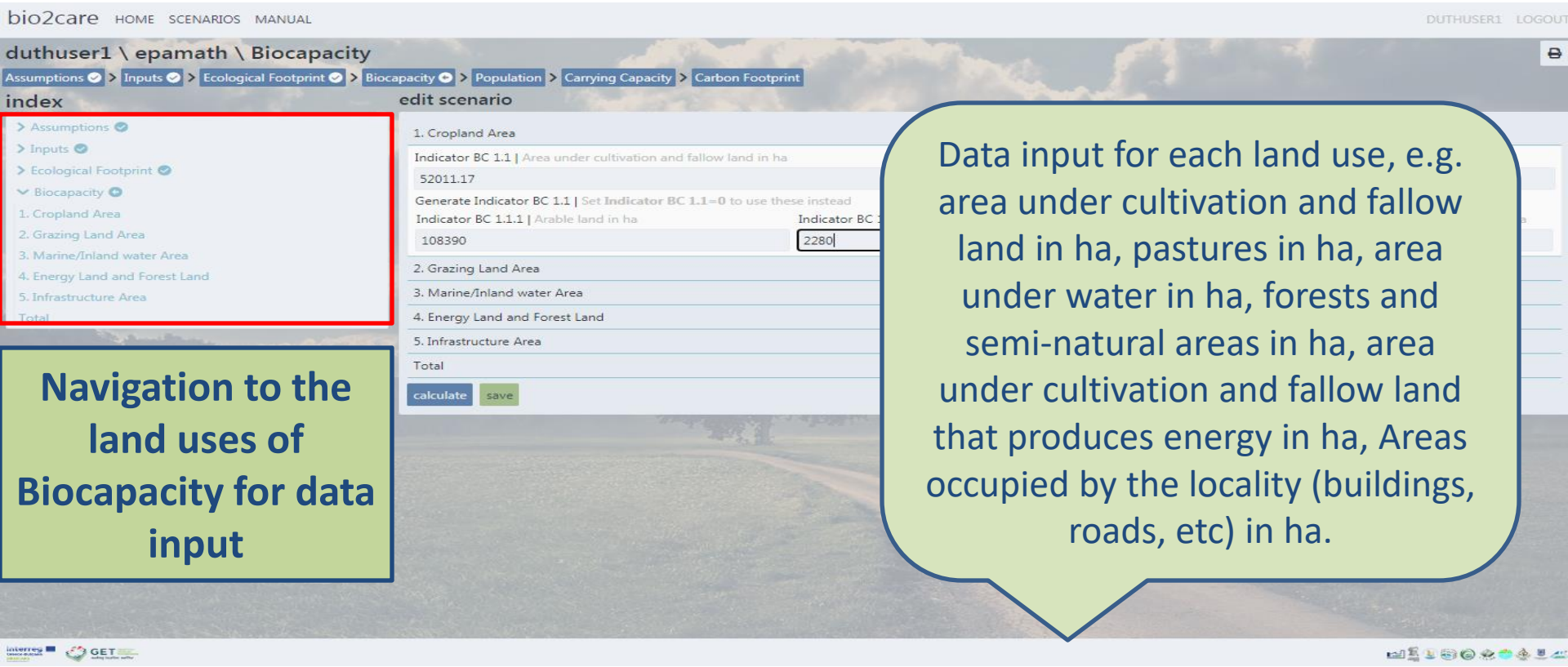


For the Carbon Footprint calculation 35 conversion factors have been set, one for each indicator of consumption needs.

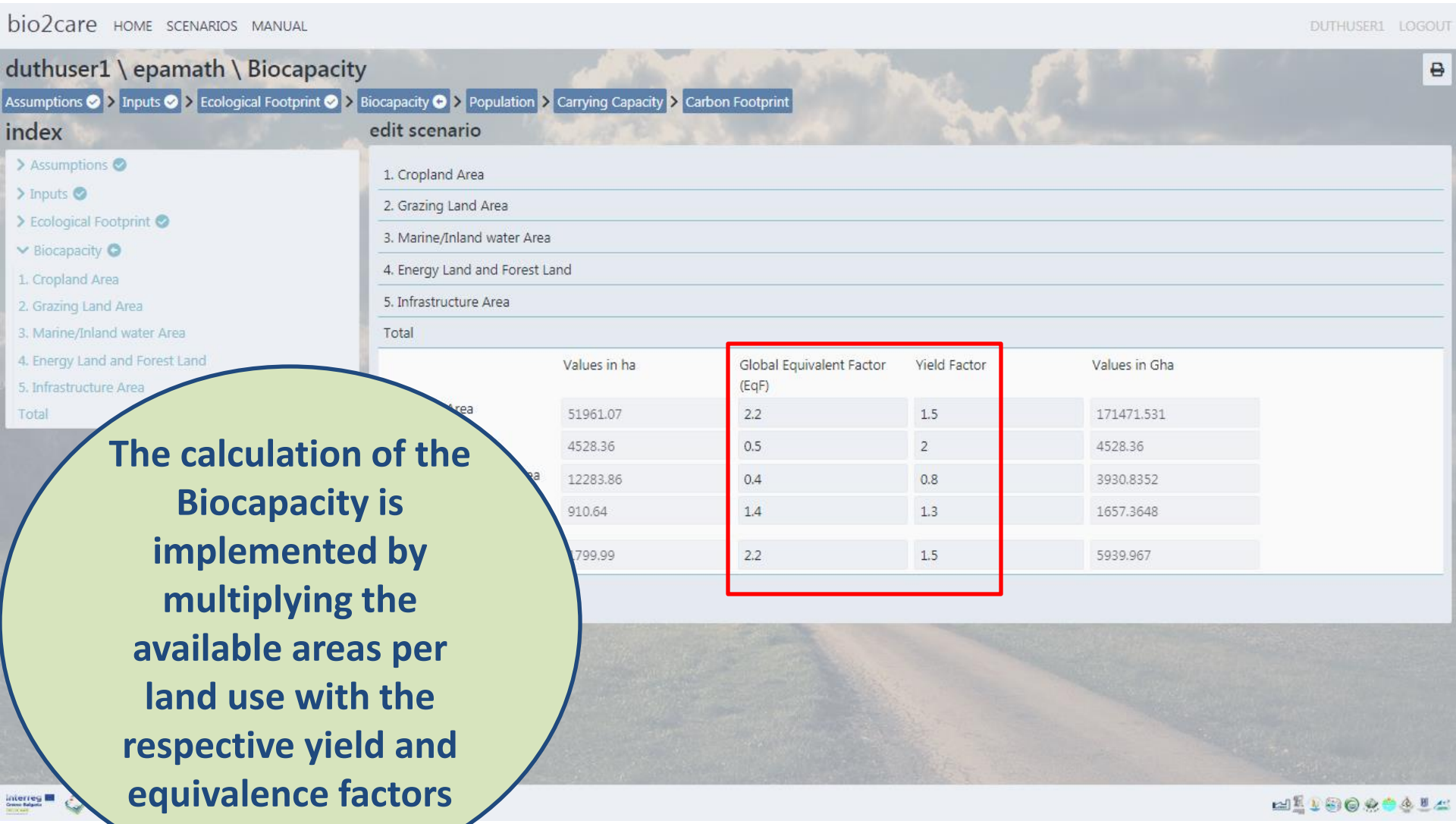
The results of the Carbon Footprint calculations are presented per sector and per indicator of consumption needs.

Bio2Care Calc Tool- Biocapacity calculations

- Data input concerning available land uses.
- For each land use of Biocapacity, in addition to the main indicators, data can be entered for the secondary indicators and the individual land uses can be calculated automatically.

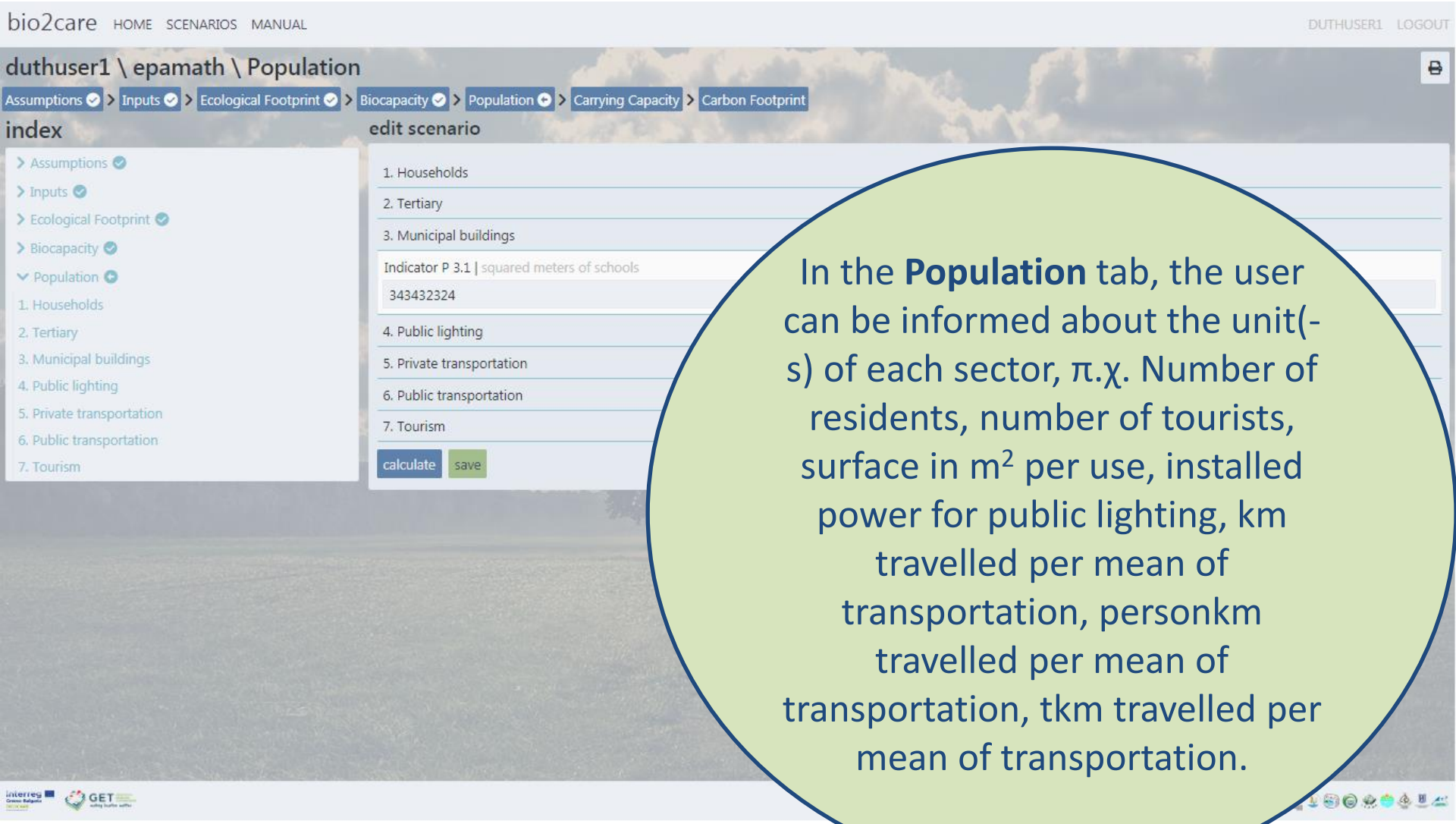


Bio2Care Calc Tool- Biocapacity calculations



The calculation of the Biocapacity is implemented by multiplying the available areas per land use with the respective yield and equivalence factors

Bio2Care Calc Tool- Population calculations



In the **Population** tab, the user can be informed about the unit(-s) of each sector, π.χ. Number of residents, number of tourists, surface in m^2 per use, installed power for public lighting, km travelled per mean of transportation, personkm travelled per mean of transportation, tkm travelled per mean of transportation.

Bio2Care Calc Tool- Carrying Capacity calculations

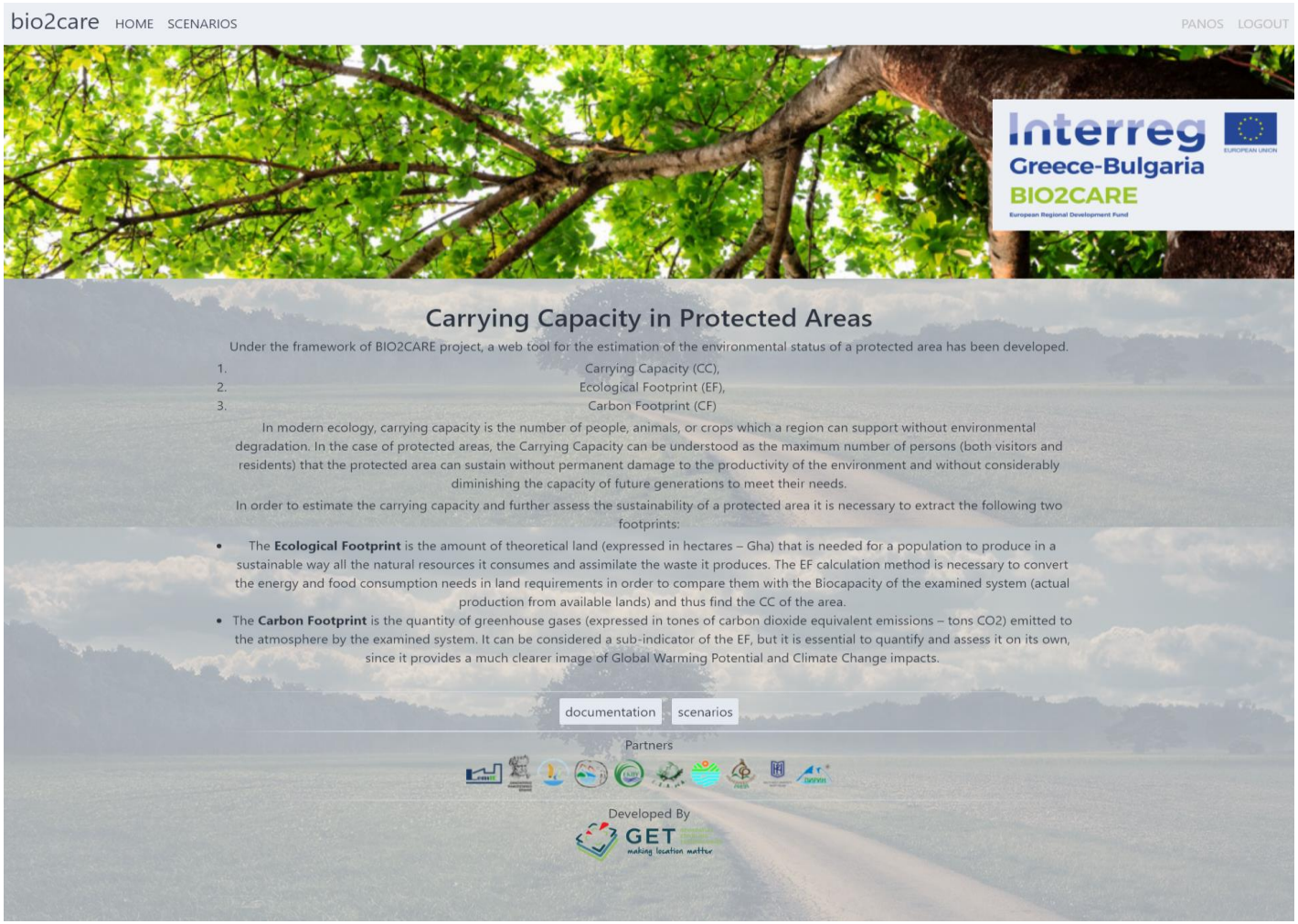
➢The **maximum equivalent population or Carrying Capacity** is automatically calculated by entering Input data concerning Ecological Footprint and the available areas per land use of Biocapacity.

The tool calculates a final score: **the maximum equivalent population** that can be sustained in the protected area without compromising the productivity ability of its environment!

Scenario status

- The status of a scenario varies depending on the phase of implementation
- To avoid inconsistencies between input data and results, it is not possible to make changes to previous phases
- If desired, the user can choose to change the status of the scenario to an earlier. In this way he/she can repeat the calculations from this point onwards
- Alternatively, it is possible to clone a scenario, that is, to use one scenario as a basis for calculating another scenario. This way both scenarios are stored and are available on the system

https://calctool.getmap.gr



- Theoretical background of BIO2CARE software/tools
- BIO2CARE Decision Making Software
- BIO2CARE Calc Tool
- **BIO2CARE Symbiosis Tool**
- Benefits from BIO2CARE implementation

- The **BIO2CARE Symbiosis Tool** is an online cartographic/mapping application that allows users to search for potential symbiotic activities, using as data the inputs and outputs of their own production activity, but also the production activities of other users.

- The application has a simple and friendly work interface and it was based upon the case study developed in the Deliverable 3.4.

- The development of the application contributes to the implementation of circular economy/industrial symbiosis principles at local scale.

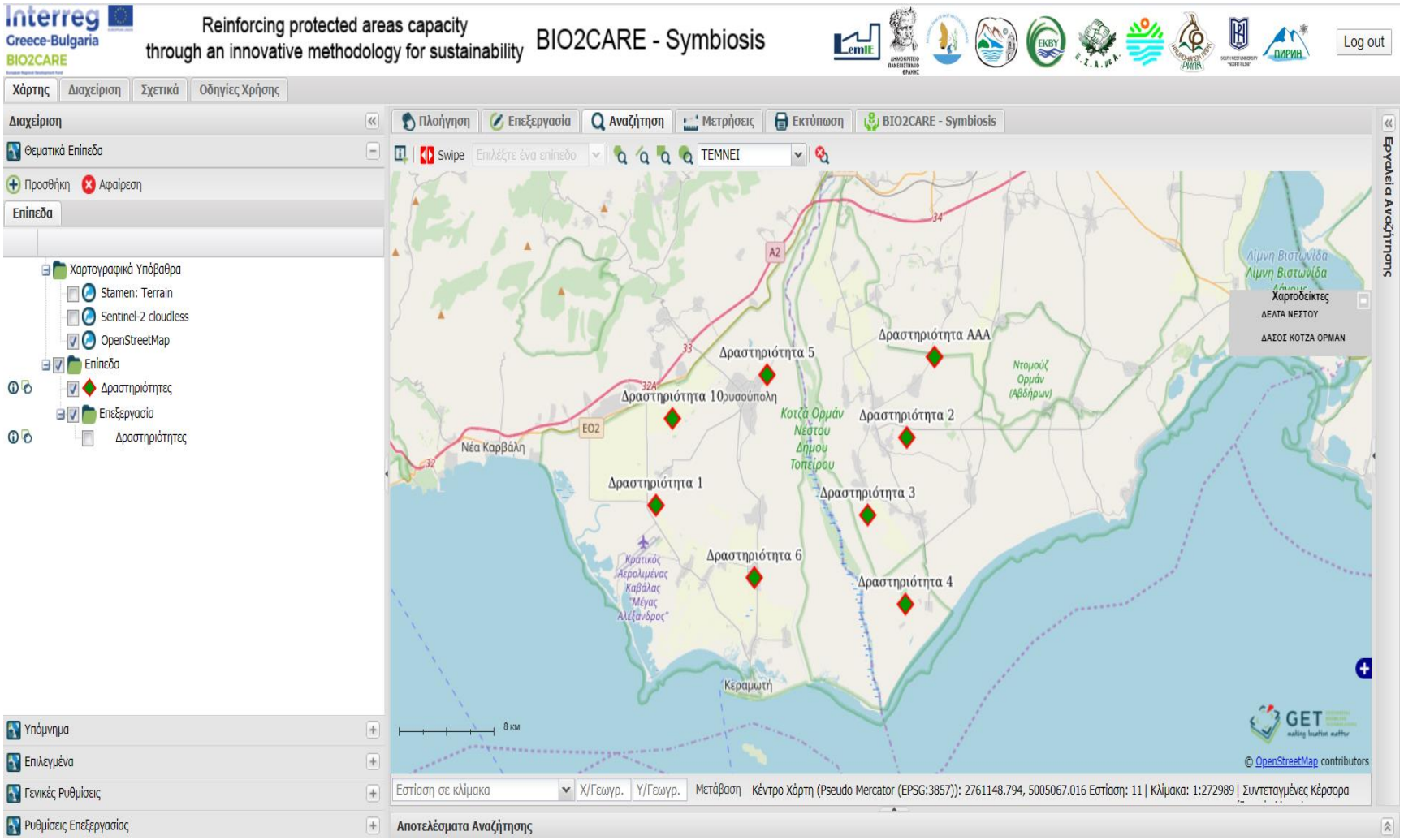
Functionalities

- Entry of activity data. The entry is initially made by selecting the location from the map. Then the users enter the requested data regarding the type of activity (Industry, Municipal Authority, Regional Authority, etc.) as well as the basic input and output material flow.
- Tool for finding activities with common input-output material flow. Users can search for activities that have common input-output material (raw materials, by-products etc.) with a selected activity. The search results are presented in a table and on the map, along with the relevant distances.
- Connectivity tool. Users have the ability to import links between activities with common input-output material flow. The application allows you to display all related activities on the map.
- Management environment. Enables users with the corresponding rights to manage the database, updating price lists and other data used in the system.

Sign-in

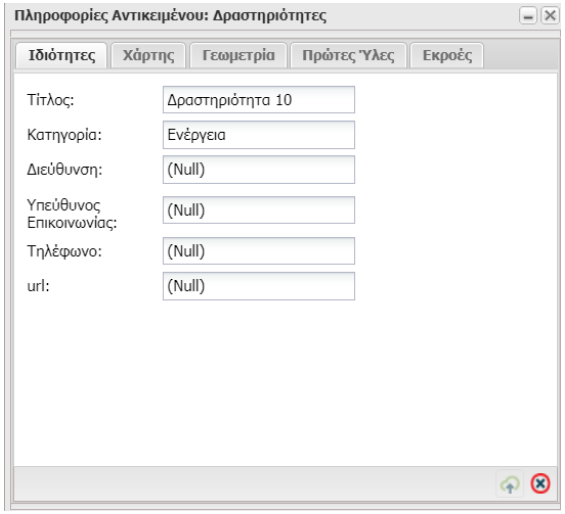

Interreg
Greece-Bulgaria
BIO2CARE
European Regional Development Fund
Reinforcing protected areas capacity through an innovative methodology for sustainability
BIO2CARE - Symbiosis
Login
Username
Username
Password
Password
Cancel
Login
Don't have a Bio2Care account yet? Please click here to create one!

Interface of the software

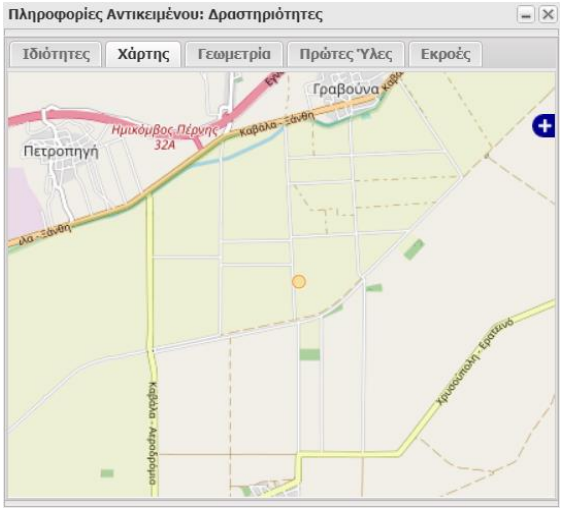


Point Information

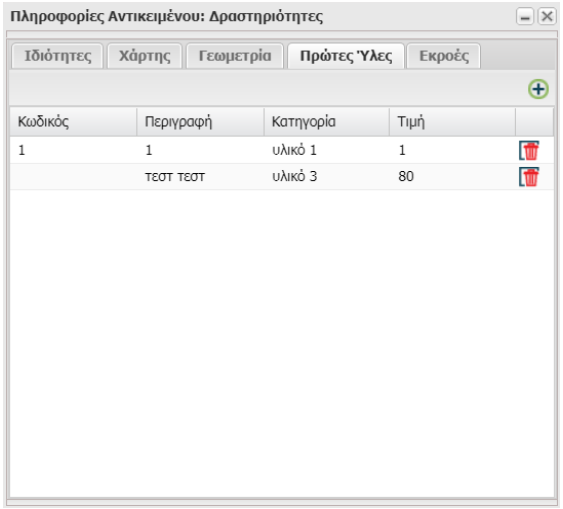
General Activity Information



Position



Raw materials / outputs

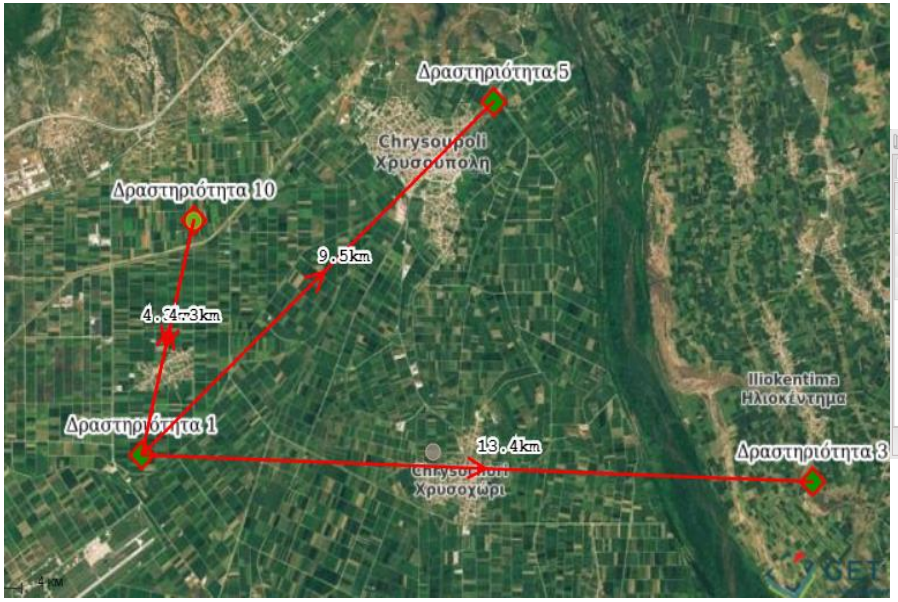


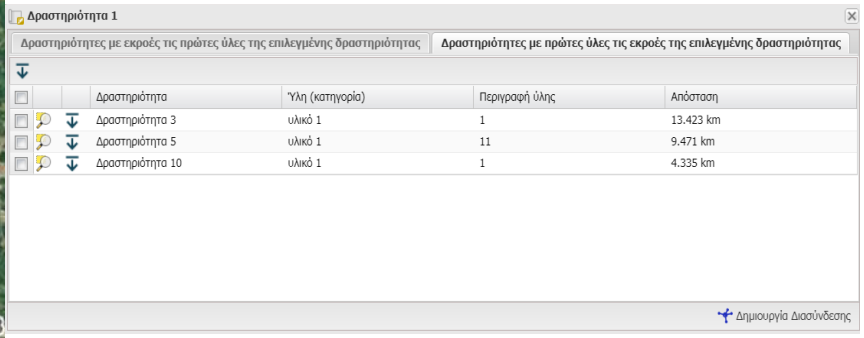
Editing tools

- **Object selection**
- Rectangular selection tool
- De-selecting object
- **Creating a new activity**
- Copy object
- Move object
- Delete object
- Undo action
- Redo action
- **Database update – save changes**
- Renew map / update user

Finding activities with common raw materials - outputs

The “find activities” tool allows the user to select an activity and see what other activities on the database have common input-output material flows. The result is shown schematically on the map and in a form.





Δραστηριότητα 1

Δραστηριότητες με εκροές τις πρώτες ύλες της επιλεγμένης δραστηριότητας | Δραστηριότητες με πρώτες ύλες τις εκροές της επιλεγμένης δραστηριότητας

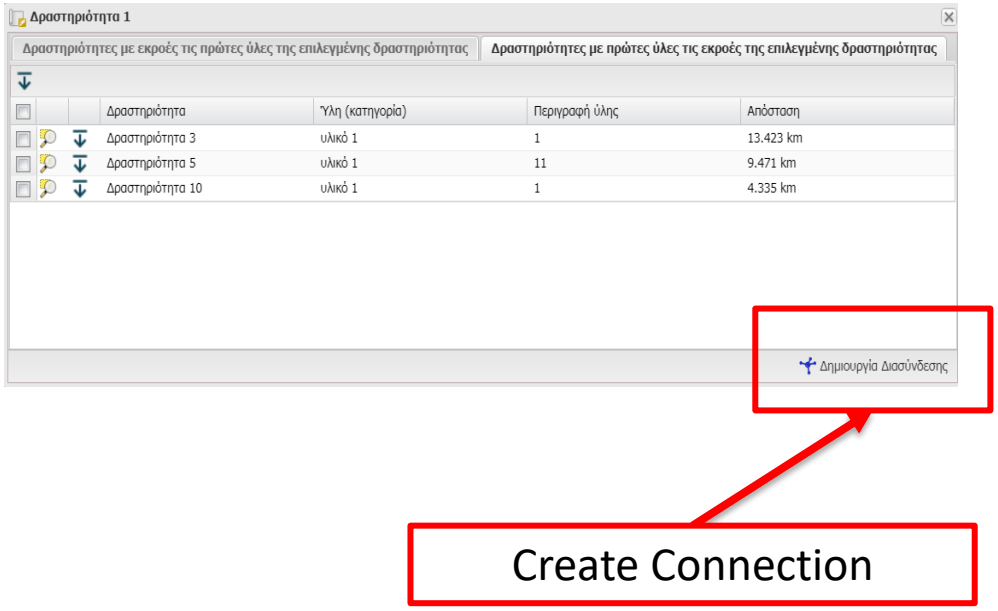
Δραστηριότητα	Ύλη (κατηγορία)	Περιγραφή ύλης	Απόσταση
Δραστηριότητα 3	υλικό 1	1	13.423 km
Δραστηριότητα 5	υλικό 1	11	9.471 km
Δραστηριότητα 10	υλικό 1	1	4.335 km

Δημιουργία Διασύνδεσης

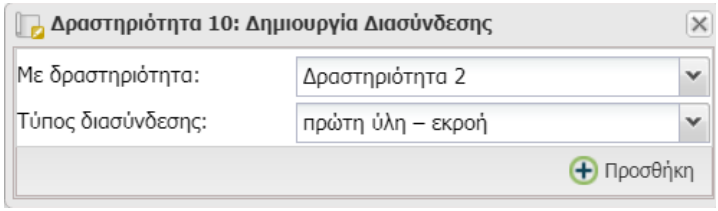
Symbiotic Connections

The form allows the use to create a symbiotic relationship. Selecting the relevant option opens up a new form in which the user specifies the connection. This connection then will be available exclusively for the user.

Step 1

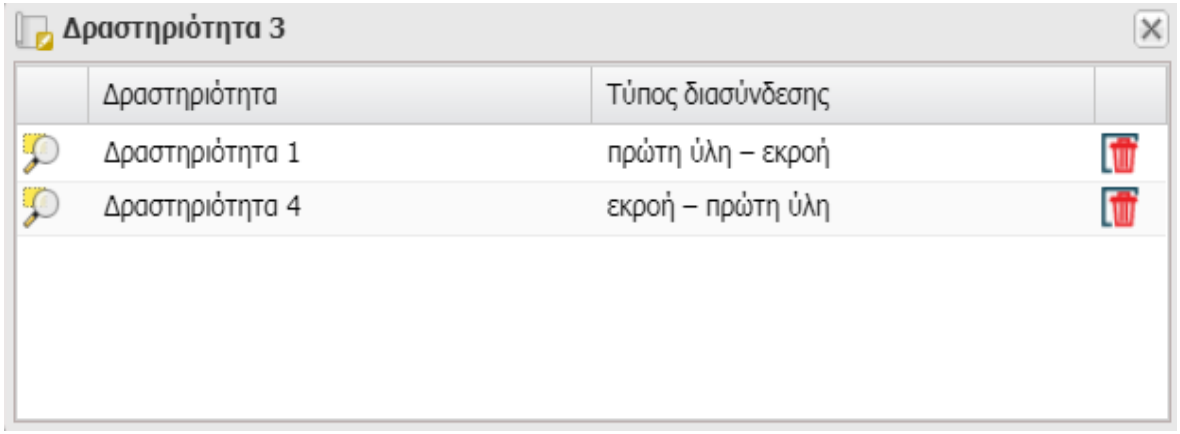


Step 2



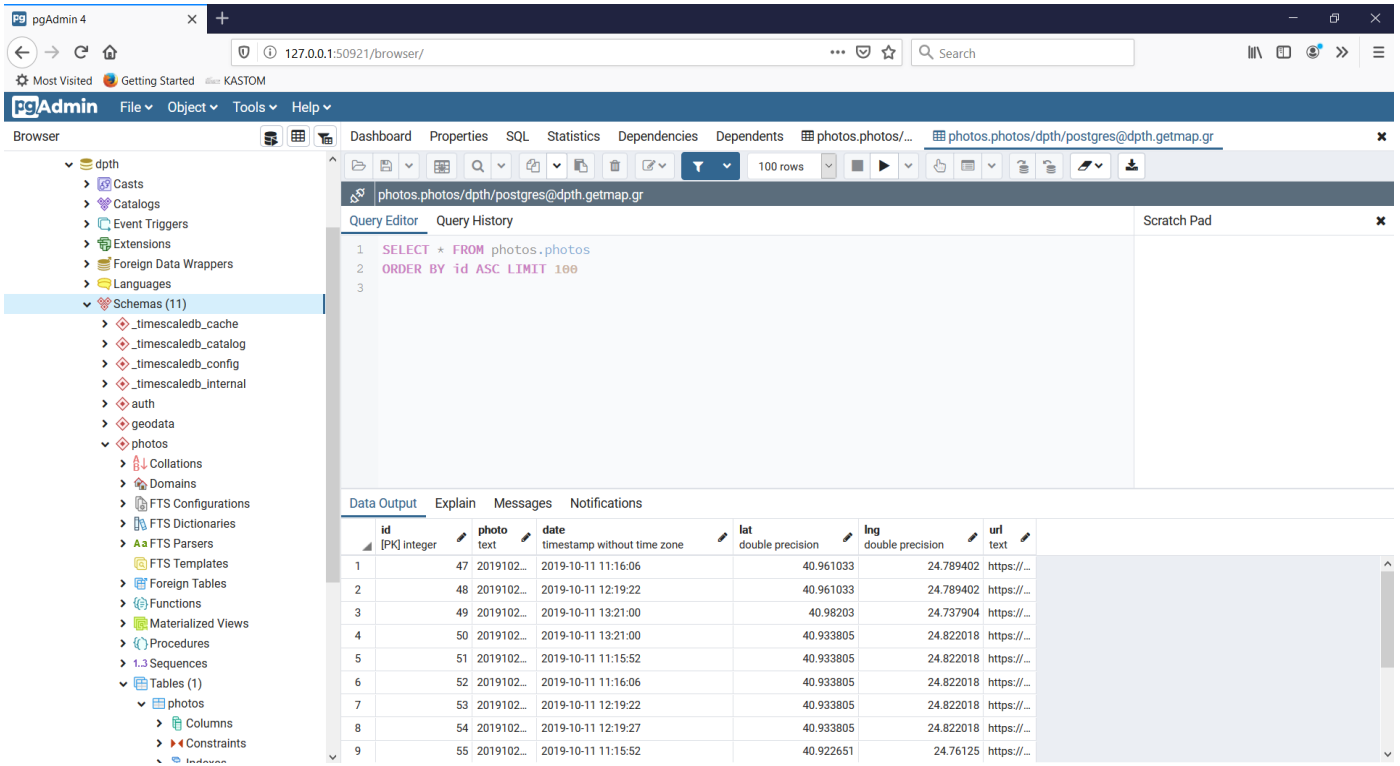
Symbiotic Connections

The “Symbiotic connections” tool allows the user to select a connection and see the data specified for the specific connection.



Databases

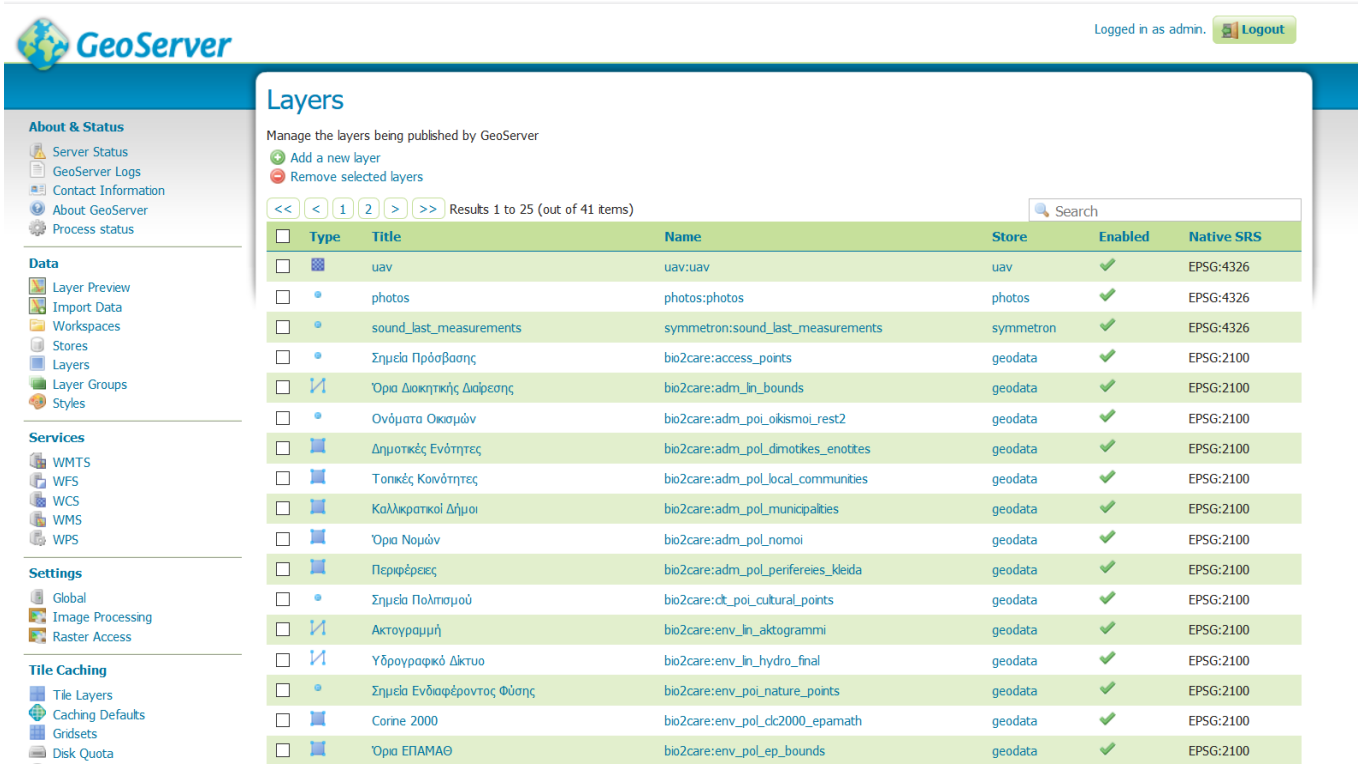
Administrators have the ability to manage their database and content using the PGAdmin software



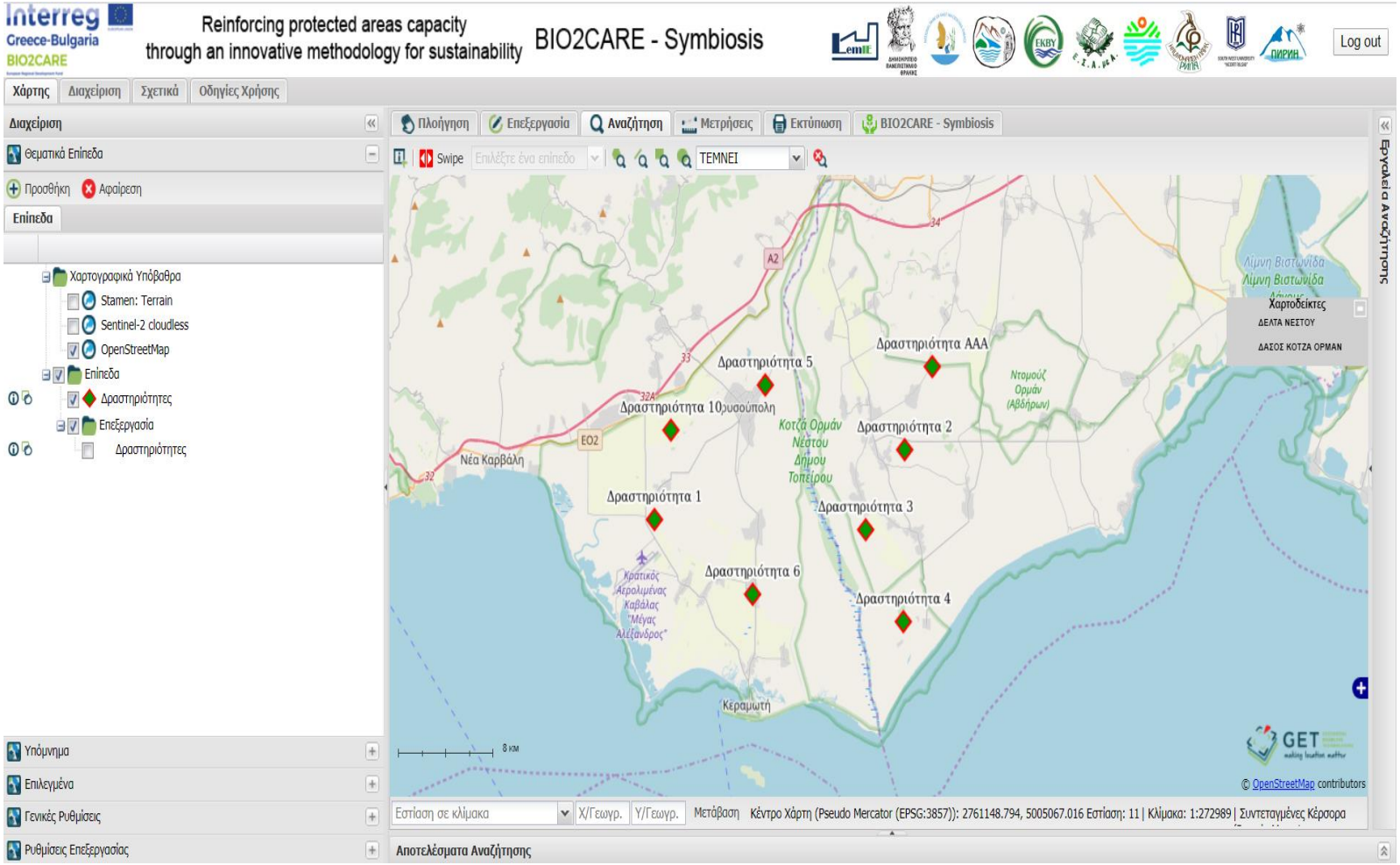
	id [PK] integer	photo text	date timestamp without time zone	lat double precision	lng double precision	url text
1	47	2019102...	2019-10-11 11:16:06	40.961033	24.789402	https://...
2	48	2019102...	2019-10-11 12:19:22	40.961033	24.789402	https://...
3	49	2019102...	2019-10-11 13:21:00	40.98203	24.737904	https://...
4	50	2019102...	2019-10-11 13:21:00	40.933805	24.822018	https://...
5	51	2019102...	2019-10-11 11:15:52	40.933805	24.822018	https://...
6	52	2019102...	2019-10-11 11:16:06	40.933805	24.822018	https://...
7	53	2019102...	2019-10-11 12:19:22	40.933805	24.822018	https://...
8	54	2019102...	2019-10-11 12:19:27	40.933805	24.822018	https://...
9	55	2019102...	2019-10-11 11:15:52	40.922651	24.76125	https://...

Geospatial Data Services

Administrators have the ability to manage geospatial services through GEOSRVER's online management environment



https://dpth.getmap.gr/symbiosis/admin/



- Theoretical background of BIO2CARE software/tools
- BIO2CARE Decision Making Software
- BIO2CARE Calc Tool
- BIO2CARE Symbiosis Tool
- **Benefits from BIO2CARE implementation**

Benefits from BIO2CARE implementation

CONTRIBUTION FROM STRATOS MANOS

Interreg
Greece-Bulgaria
European Regional Development Fund
EUROPEAN UNION
BIO2CARE

INTERREG V-A COOPERATION PROGRAMME
GREECE – BULGARIA 2014 – 2020

Reinforcing Protected Areas Capacity through an Innovative Methodology for Sustainability

– BIO2CARE –

(Reg. No: 1890)

Thank for your participating!

The Project is co-funded by the European Regional Development Fund and by national funds of the countries participating in the Interreg V-A "Greece-Bulgaria 2014-2020" Cooperation Programme