

A stylized graphic in the top left corner depicting a landscape with a blue sky, a green field, and a blue wave-like shape representing water or a path, with an orange sun above.

## How to make Ecosystem Services available for policy makers at sub-national level.

The case of Agri-Environment-Climate payments of Rural Development Program 2014-2020

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**Systems Ecological Perspectives on Sustainability**  
**Helsinki, 24-26 September 2014**

# Starting point:

## The Rural Development Program 2014-2020

- From the 3 axes to the 6 priorities
- The environmental issues are not constrained into a single axis but become cross-cutting
- The Agri-Environment-Climate (AEC) measure allows not only beneficial improvements to farming practices but also maintenance of existing beneficial practices
- The European Court of Auditors states that AEC commitments must be justified by evidence of likely environmental benefits
- Evidence could be: test plots, case study, quantified impact models, surveys, etc. (if the impact of given practices in given areas is not known, it is impossible to decide whether an EC measure will be effective or not)



**OBJECTIVE: TO INCLUDE THE ECOSYSTEM SERVICES IN THE JUSTIFICATION OF PAYMENTS**

**(Trentino Rural Development Program 2014-2020, Measure 10, Operation 10.1.1 related to Meadows management)**

# The project: build the justification for Agri-Environment- Climate payments by using an approach based on Ecosystem Services

- Step1: to build a model for livestock related activities
- Step2: scenario analysis on the management variables of the livestock related services model
- Step3: to identify and build models for the other ecosystem services linked to livestock related services
- Step4: scenario analysis on the impacts of livestock management on other ecosystem services

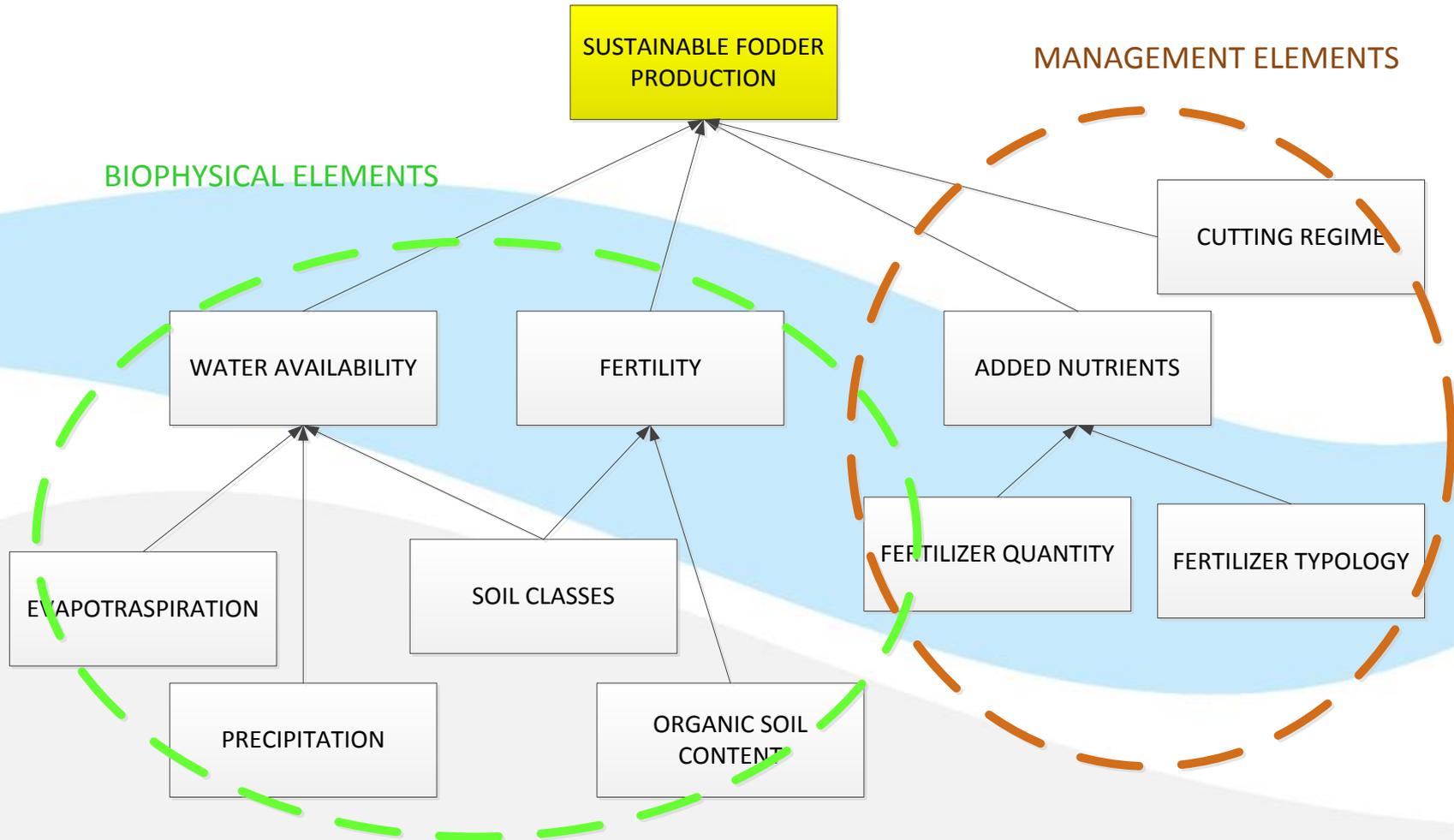
# What is the agrosystem service for livestock related activities?

- There is no livestock ecosystem service; need to identify related provisioning services

Need to distinguish between meadows and pasture

- when you focus on meadows the goal becomes fodder production for feeding
  - when you focus on pasture the goal is grassland regeneration for grazing
- Like other provision services, the borderline between agro-system services and agronomic equations is not clearcut

# Initial model



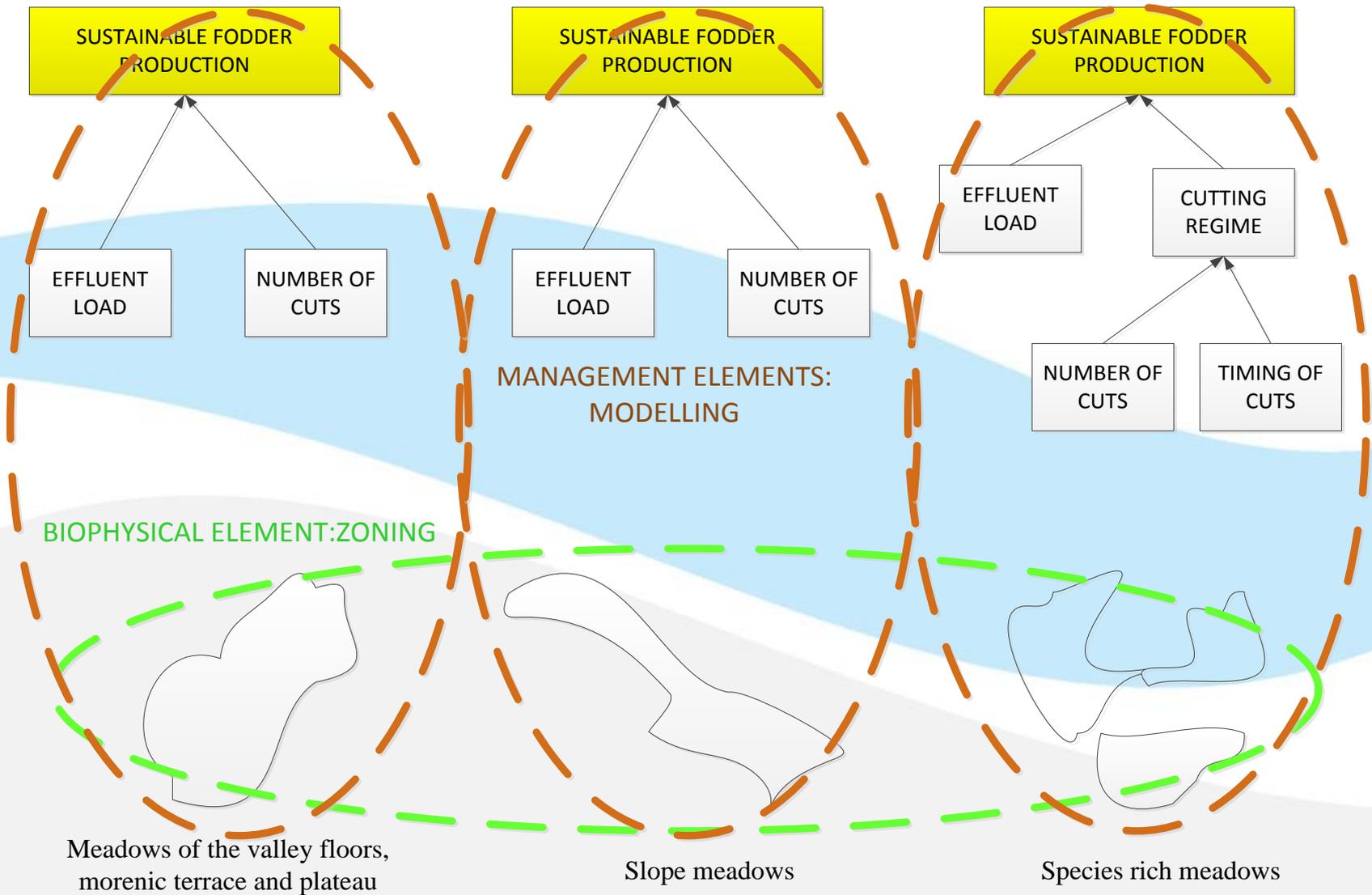
# Issues related to the use of ES-based approach within a public administration

- There is the need for a simpler framework
- All the data of the model must be available
- Variables must be controllable and verifiable

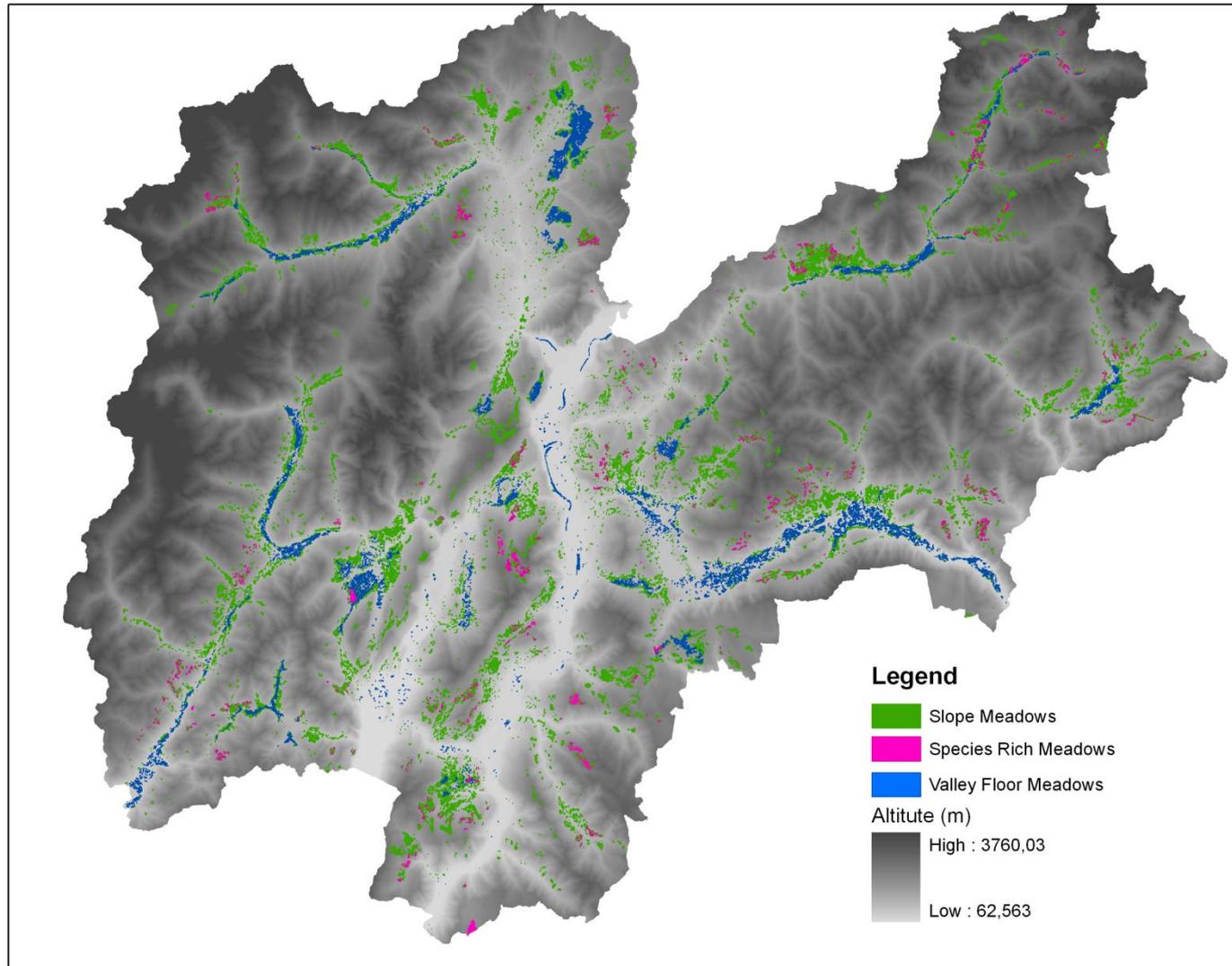
Zoning substitutes the biophysical elements

LSU/ha substitutes the N input

# Current model



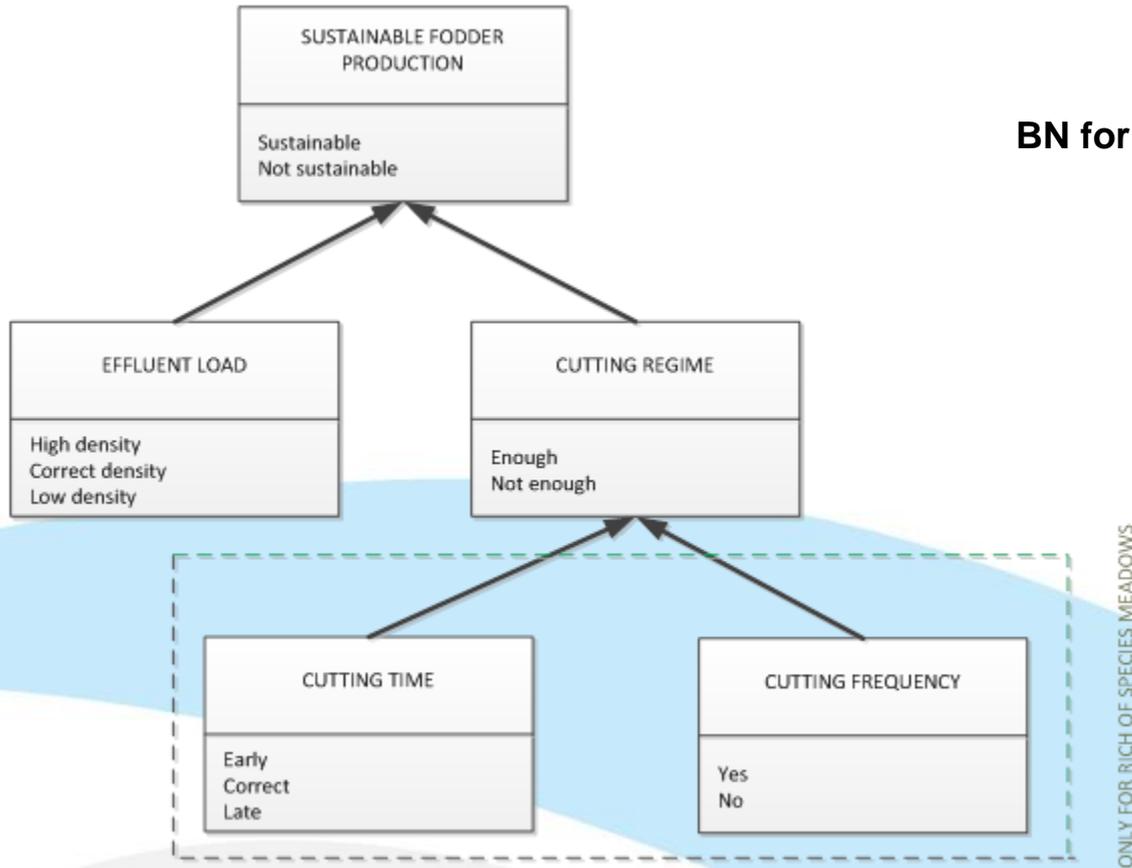
# Zoning: outcomes



## Typologies of meadows

	Added nutrient allowed	Number of cuts	Production	Fodder quality	Zoning class	proxy LSU/ha
<i>Bromion erecti</i>	<25	1	4.5-5.0	low	rich of species	0,26
<i>Arrhenathrion elatioris</i>	25-50	2	5.8-6.2	low	rich of species	0,53
<i>Festuca rubra</i>	0-50	1 or 2	4.5-5.0	low-medium	rich of species	0,53
<i>Centaureo transalpinae</i>	0-50	1	4.4-4.8	low-medium	slope	0,53
<i>Centaureo carniolicae</i>	75-100	2	5.8-6.4	medium	slope	1,05
<i>Anthoxantho</i>	50-75	2	6.0-6.5	low	slope	0,79
<i>Arrhenatheretum elatioris</i>	100-150	2 or 3	7.6-8.0	high	slope	1,58
<i>Arrhenatheretum el. facies</i>	225-275	3 or 4	7.5- 8.4	high	valley floor	2,89
<i>Ranunculo repentis</i>	200-225	2 or 3	7.0- 7.4	high	valley floor	2,37
<i>Lolietum multiflorae</i>	200-250	3	9.2-9.6	high	valley floor	2,63
<i>Agropyron repens</i>	200-275	2 or 3	8,0-9,0	high	valley floor	2,89

## BN for Sustainable Fodder Production model



**Management elements of the model: the variables as set in AEC Measure**

	LSU/ha	Cutting frequency	Cutting time
Rich of species meadows	1,5	1	15/06-15/08
Slope meadows	2,0	2	-
Valley floor meadows	2,5	3	-

# The digital platform used to model Ecosystem services: Artificial Intelligence for Ecosystem services

The image displays the Thinklab digital platform interface, which is used for modeling ecosystem services. The interface is divided into several panels:

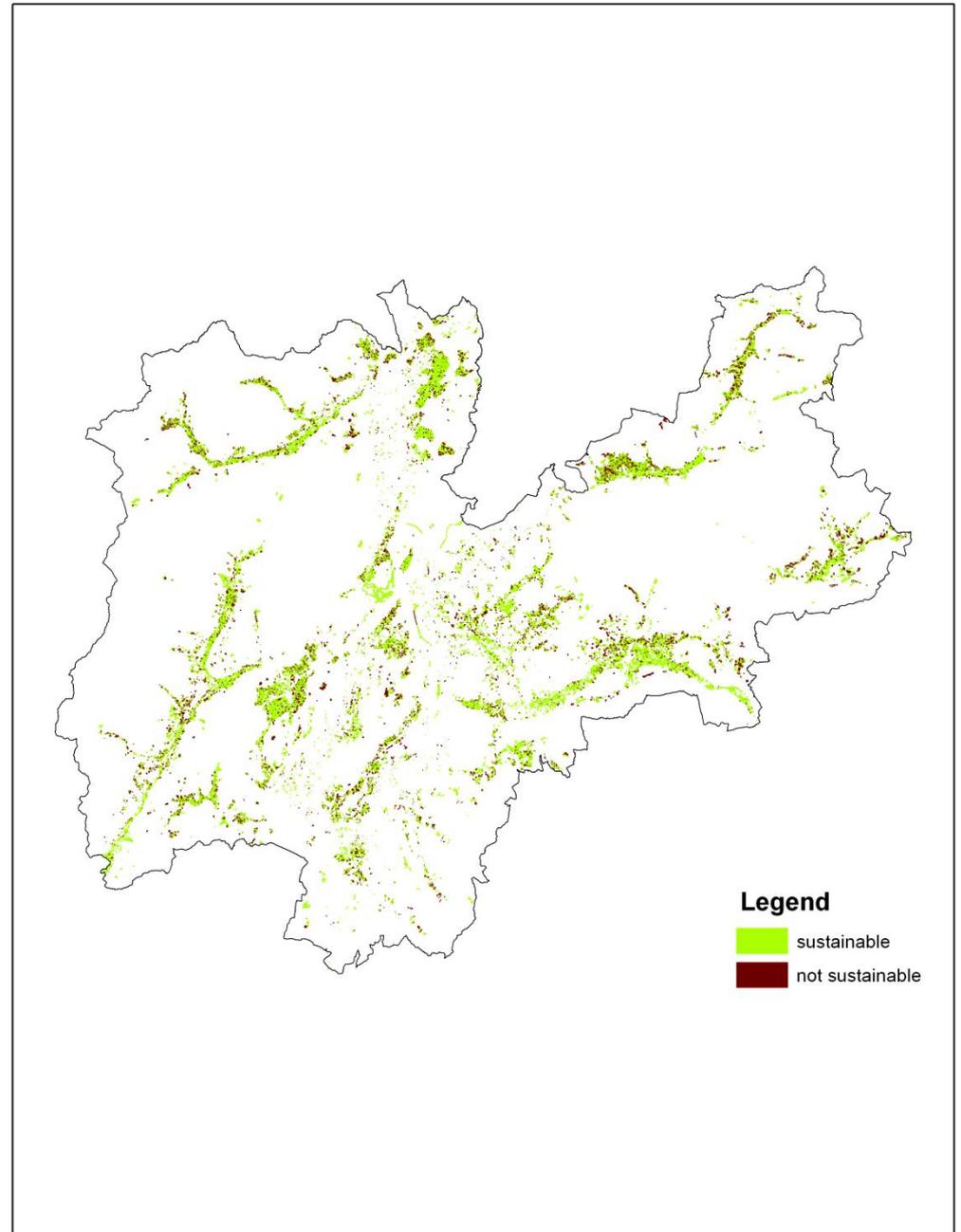
- Code Editor:** Shows the source code for the 'slope' model. The code includes model annotations, data loading, and classification rules. Key lines include:

```
44 private model ve  
45 named cut-number  
46 as count im.agri  
47 over time (year  
48 with metadata {  
49 im:reliability 7  
50 im:distribution  
51  
52  
53 //MODEL ANNOTATI  
54 //model to be ru  
55 private model Fo  
56 as classify im.a  
57 im:Sustainable,  
58 im:Unsustainable  
59 observing  
60 (LSU as classify  
61 im:Low if < 0.53  
62 im:Moderate if 0  
63 im:High if > 1.7  
64 (CuttingRegime a  
65 im:Appropriate i  
66 im:Inappropriate  
67 using bayesian(i  
68  
69
```
- Thinklab Navigator:** A tree view showing the project structure, including folders like 'aestheticview', 'bn', 'common', 'flat', 'flatscenario', 'ras', 'recreation', 'richofspecies', 'richofspeciesscenario', 'shp', and 'slope'. The 'slope' folder is currently selected.
- Map View:** A 3D topographic map of the Trentino region in Italy. The map shows various geographical features, including mountains, rivers, and towns. A legend in the bottom right corner indicates the classification of cattle individual count, with a color scale ranging from 0 to 100. The legend is titled 'im.ecology:CattleIndividualCount' and 'Classification'.
- Observation History:** A panel at the bottom of the map view showing the observation history and storylines for the selected classification.

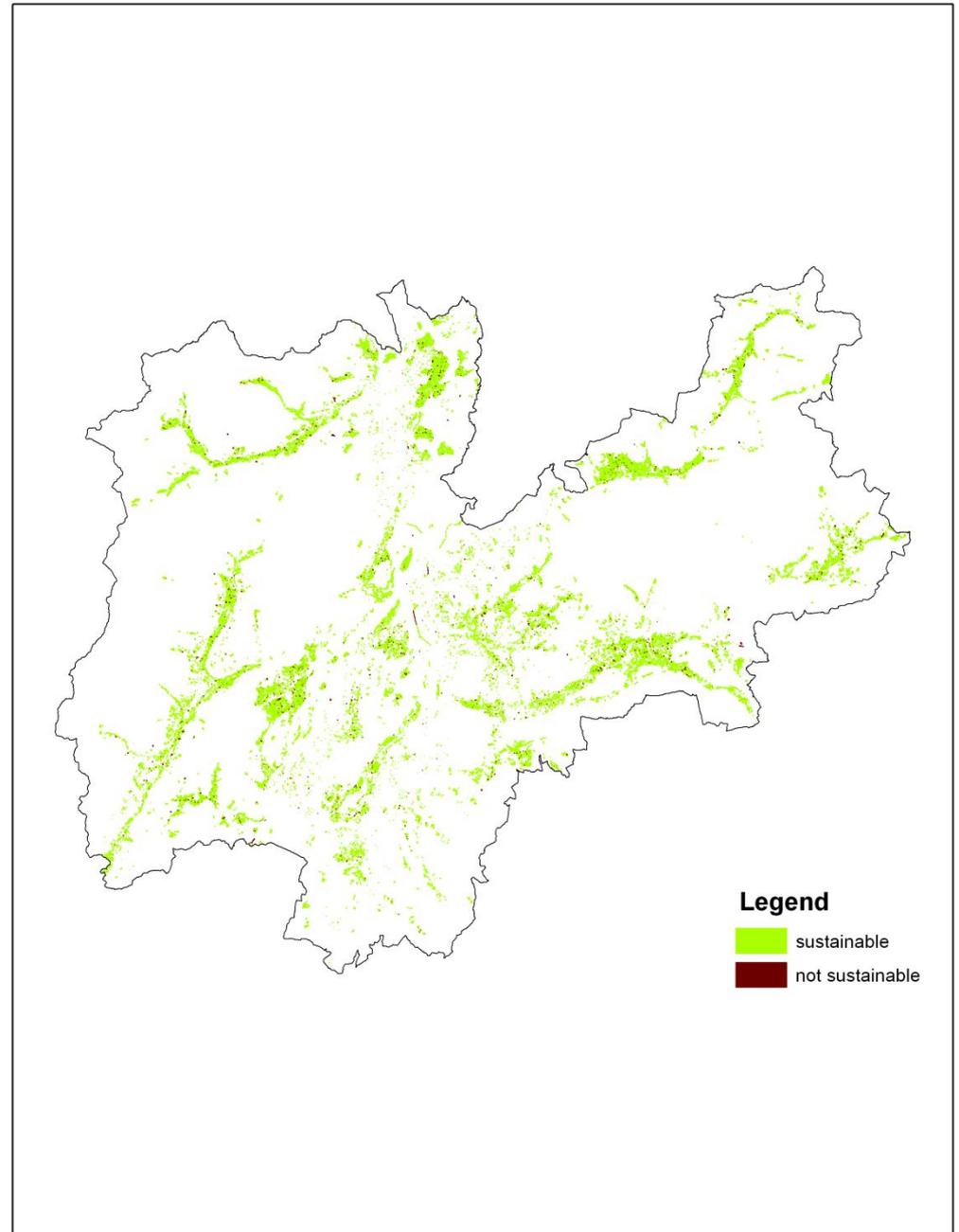
# Ecosystem services: outcomes for livestock\_meadow

- Scenario 0: the current situation of Sustainable Fodder Production
- Scenario 1: the situation of Sustainable Fodder Production with the AEC payments

# Scenario 0: current situation



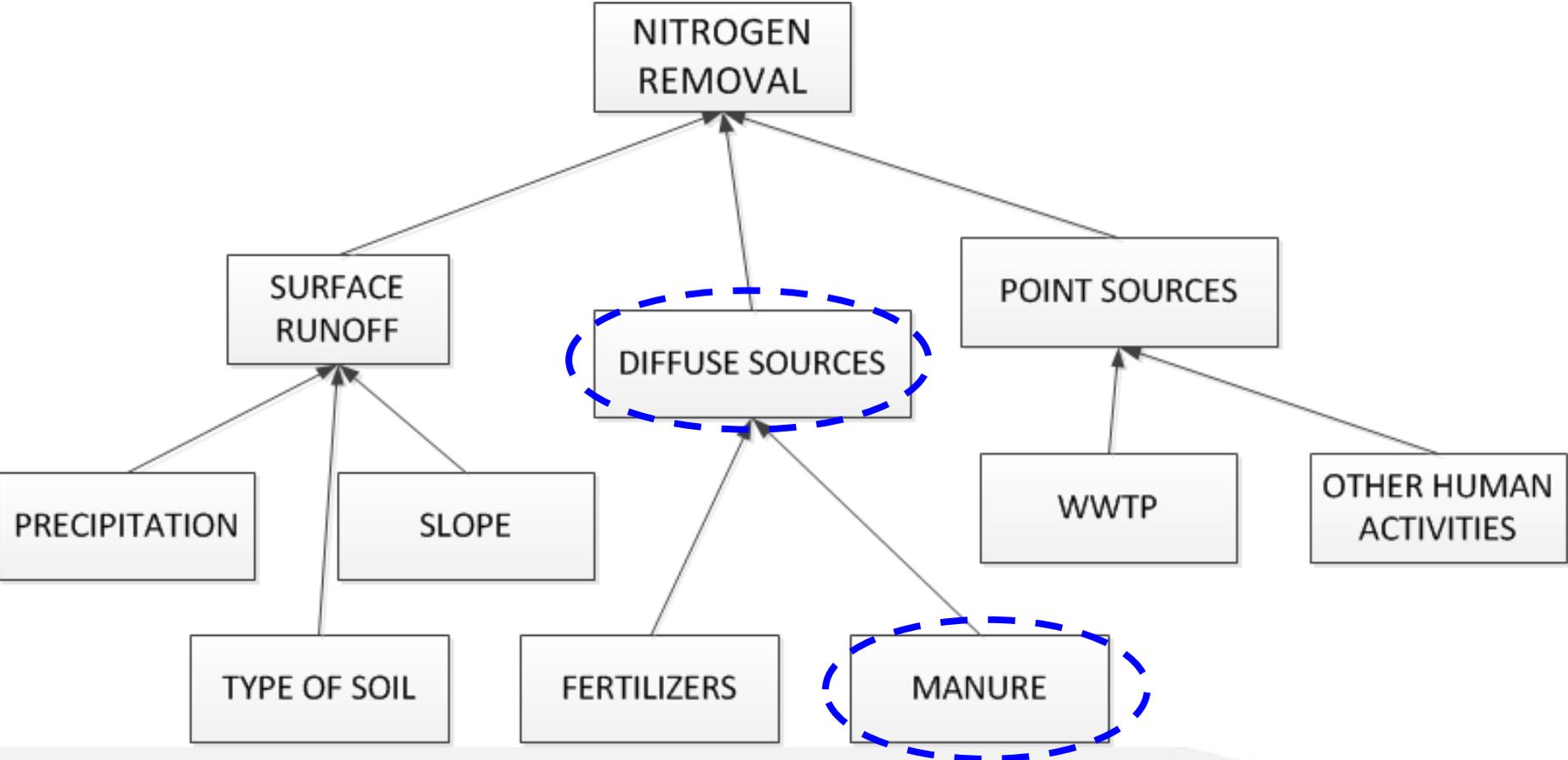
Scenario 1:  
Situation with  
AEC payments  
eligibility conditions  
and commitments



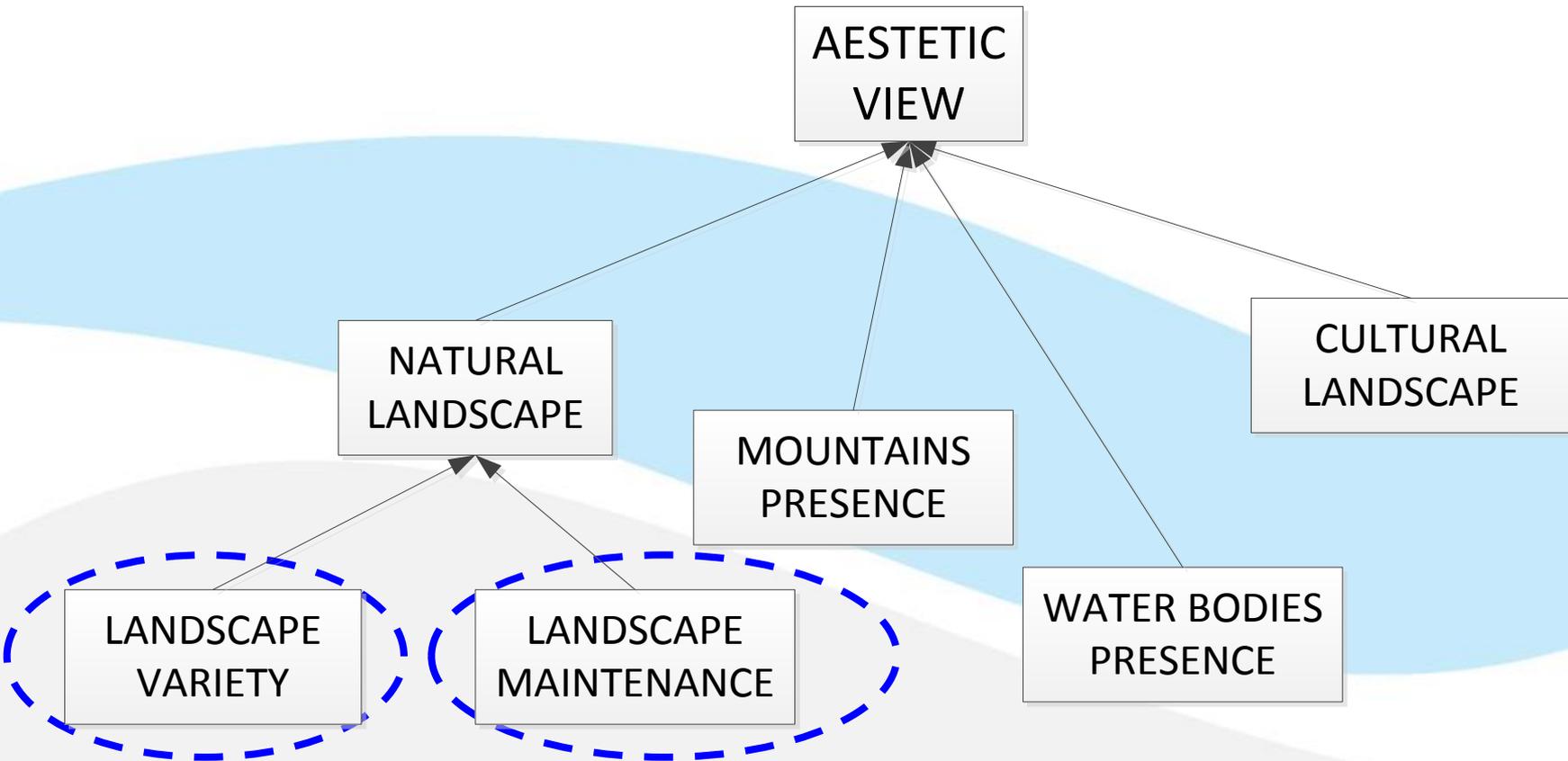
# Modelling: the work in progress

- Identification of the other ecosystem services related to Livestock\_meadow: water purification, aesthetic view and recreation
- Modelling of the identified ecosystem services  
Production
- Scenario analysis: what would happen if Measure 10 would not be there:
  - Intensification of valley floor meadows that impacts on water purification
  - Abandonment of slope and species rich meadows that impacts on aesthetic view and recreation

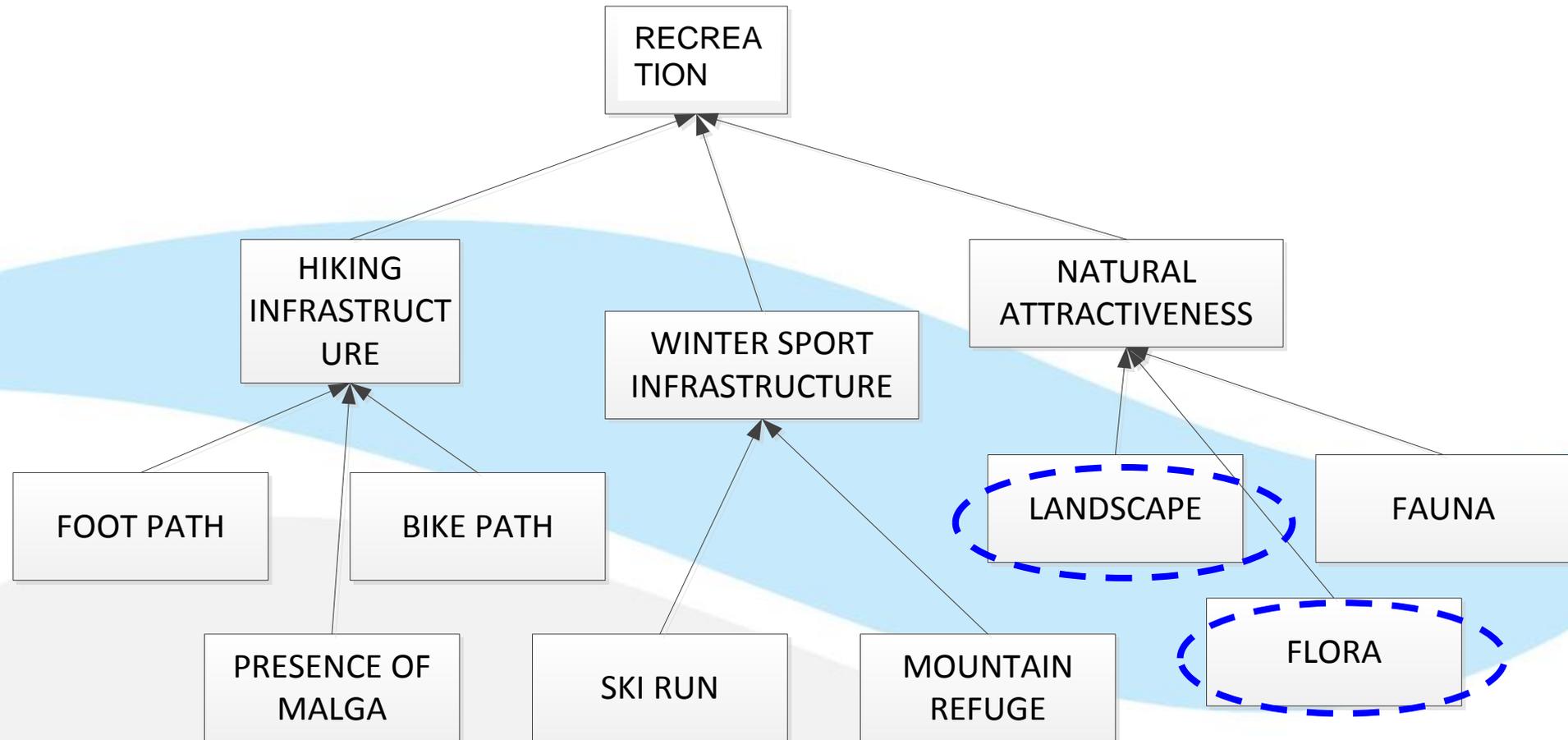
# Water purification



# Aesthetic view (scenic beauty)



# Recreation



# First set of conclusions: a case of applied research within a government agency

- Input from theory to practice:
  - Advantages of using BN when operating at local level
  - Advantages of using zoning instead of modelling
  - Advantages of using proxies that can be controlled and verified
- Feedback from practice to theory:
  - What is meant by 'Livestock-Ecosystem Services'
  - Importance of understanding the 'character' of variables (eligibility conditions Vs. commitments)
  - Importance of distinguishing farms statistics from spatial-environmental database in order to be able to harmonize them