The cooperation project SHARE Sustainable Hydropower in Alpine Rivers Ecosystems

AIM 2014 Alpine Space in Movement - Stakeholder meeting

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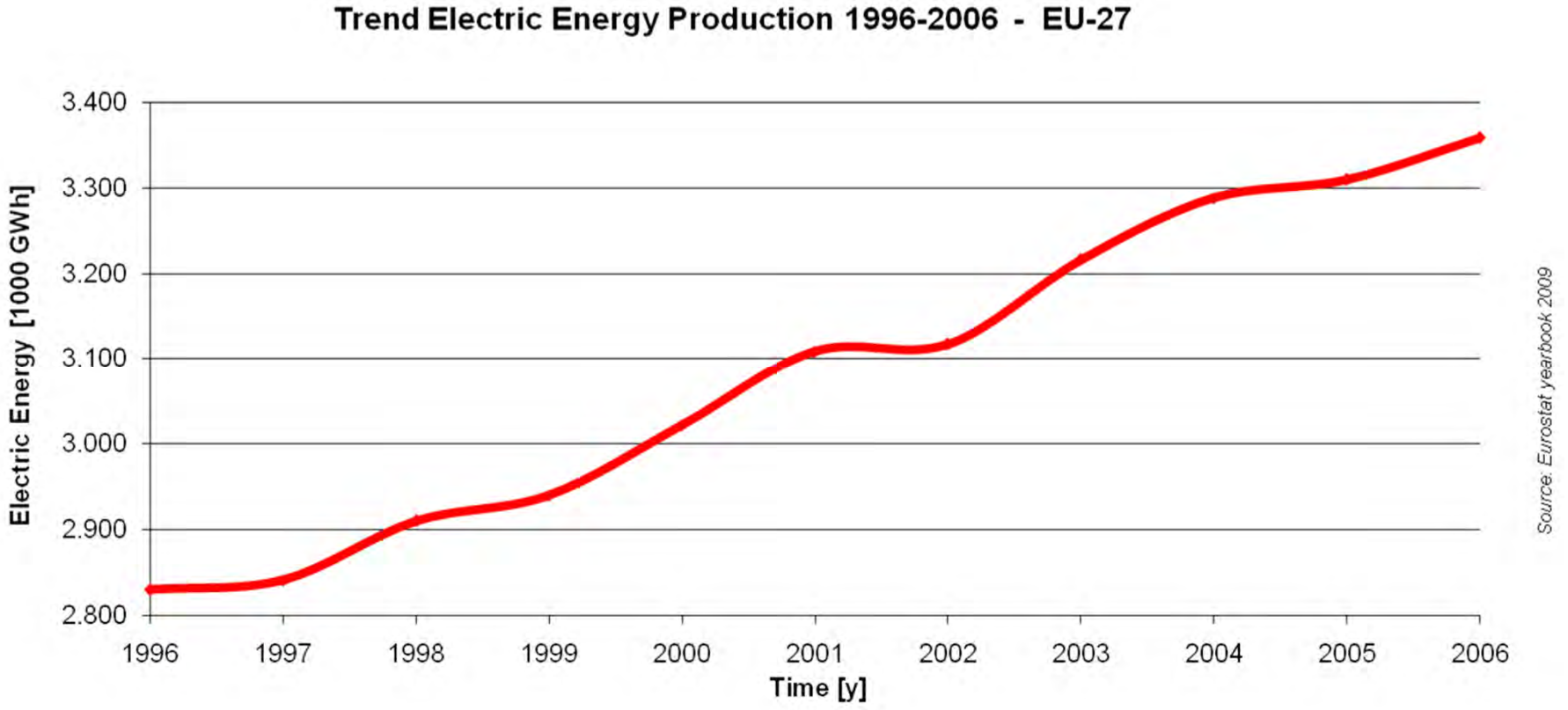
THIS PROJECT IS CO-FUNDED BY THE EUROPEAN REGIONAL DEVELOPMENT FUND

investing in your future

Electric energy production – UE 27

- The energy production in EU is **constantly in growth** (18.67% in 11 years) and strictly follows the demand



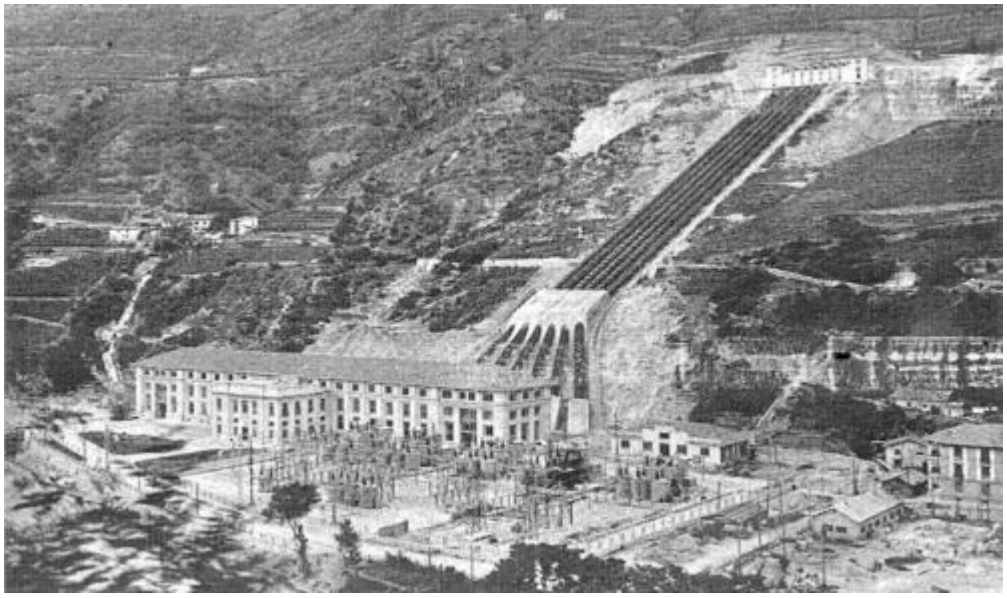
- The trend of energy demand will hardly change also because **energy need is nearly perceived as *"for granted"* from 450 million consumers!**

River Ecosystem Services view …

- River benefits are also generally taken ***"for granted" …***

HP strong points

- **Hydropower (HP)** is the most important renewable resource for electricity production in alpine areas
- Almost 84 % of the electricity generated from renewable energy sources in the EU-15 and 19 % of total electricity production in UE is generated by HP; SHP (up to 10 MW) contributing 2 % of the total electricity generated (ESHA, 2005)
- HP contributes and strongly contributed to **economy & industry** and related development in both mountain regions and in big alpine towns



HP strong points

- HP is a flexible and mature technology and creates occupation in mountain areas
- On a wider scale HP is a highly reliable and largely CO_2-free renewable source for electricity production
- HP brings the added value of helping to stabilize the European energy grid (mainly with storage plants)
- Modification of rivers affected from *old* HP exploitations in the Alps are often considered "common & normal" by the population and by local administrators, so generally accepted as largely environmental friendly
- **HP benefits are clear!**

Mountain rivers ecosystems services

- **River benefits** are not always obvious …
- Ecosystems services are generally **more evident** in other environmental circumstances

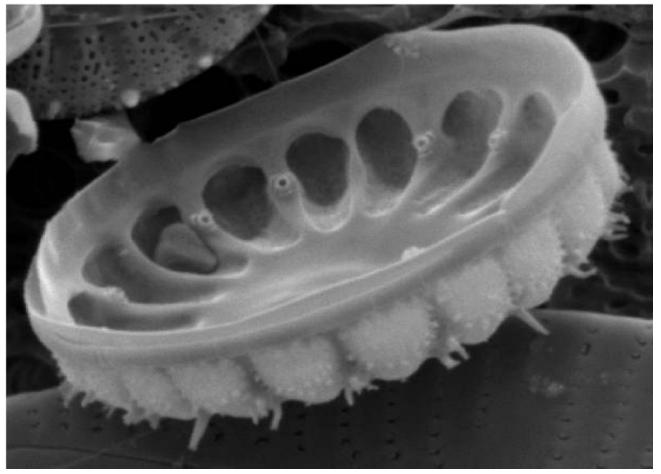
Mountain rivers ecosystems services

- Even more evident ecological services supported by a healthy river are often difficult to be measured and, in general, to be compared with HP production even if they have related **stakeholders**
- The HP impact size and occurrence on rivers **depend on the specific characters of each HP plant** (micro HP plant ≠ big dam) **and each mountain river** (HMWB ≠ pristine river) , all have **to be measured & cross-compared**

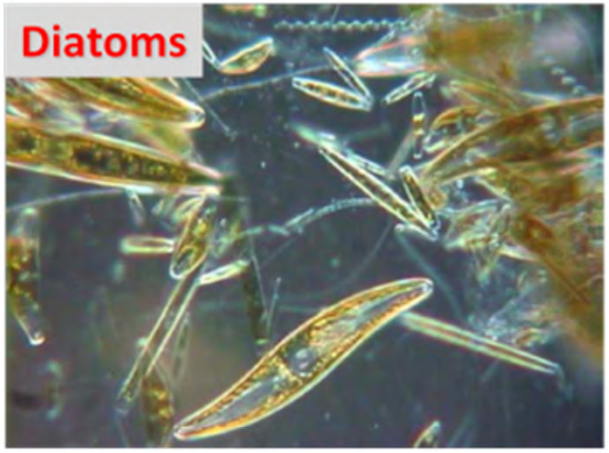
Mountain rivers ecosystems services

- Alpine rivers embody a big asset in terms of **natural capital and biodiversity stock**
- Only **10%** of Alpine rivers are (partly) in natural or near-natural conditions (CIPRA, 2010)



WFD indicators biological communities & HP



- **No evident HP upstream - downstream gradient**, official community based metrics seems to respond more to trophic status & substrate modification than to river HP effects
- Fish populations fit but can be heavily affected by **uncontrolled restocking**

WFD indicators - hydromorphology

- The **water discharge and hydromorphological elements** are reactive to HP pressure BUT considered in the assessment of water bodies only for "high ecological status" (WFD, All. V, tab 1.2.1)

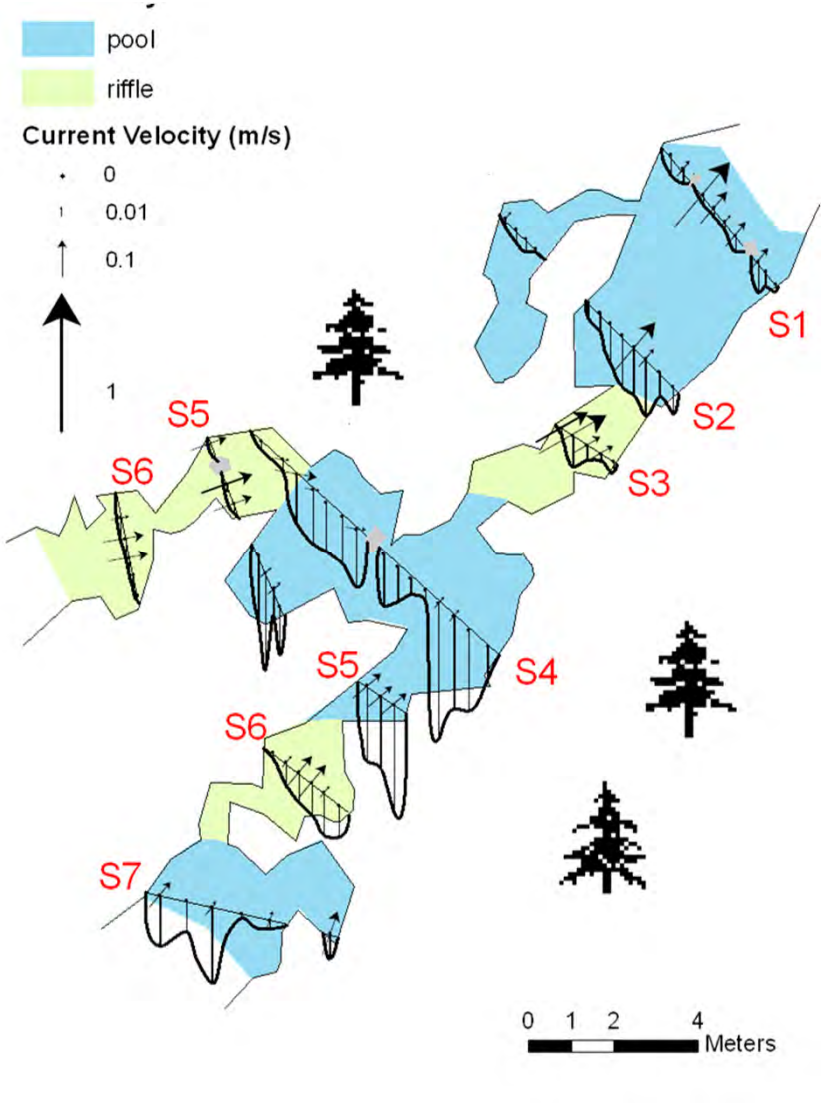
Riverbed modification

Hydrology alteration

Riparian vegetation

River continuity

WFD indicators - hydromorphology



Hydromorphological methods can be used at single HP plant level

- Wet Area (Volume) variation weighted on meso - habitat
- Depth variation weighted on meso-habitat
- Weighted usable area (WUA) for biota accommodation

- CASiMiR Computer Aided Simulation Model for Instream Flow Requirement (*Noack et al.2010*)
  - MESOHABSIM *(Parasiewicz et al. 2007)*
  - IFIM Instream Flow Incremental Methodolgy *(Bovee et al. 1998)*

River habitat loss modeling ↔ HP pressure

WFD indicators - hydromorphology

- Hydromorphological methods are **available for wider (basin) scales**

- Linked both to **riparian vegetation status and anthropogenic pressures** in the riverbank buffer
- Their value is generally positive related to other WFD communities' status ("**umbrella indicators**")

Mountain rivers ecosystems services

- Rivers are the best **natural water purification systems …**

Mountain rivers ecosystems services

- **Landscape** is a unique asset represented by healthy rivers

Mountain rivers ecosystems services

- **Agriculture** is a strategic river stakeholder in alpine regions

Mountain rivers ecosystems services

- **River tourism** holds evident stakeholders too

Mountain rivers ecosystems services

- **Fishing & angling** have stakeholders very well represented in alpine regions

Alpine rivers & set of laws

- **RES-e Directives (20/20/20)** require a renewable electricity enhance but, at the same time, the **Water Framework Directive** obliges member states to reach or maintain a water bodies "good" ecological status, intrinsically limiting the hydropower exploitation

- Mountain rivers are not the ***"egg-laying wool-milk-sow" …***

- Mountain **local administrators** daily face an **increasing demand of water abstraction and concessions renovations** but normally **lack reliable tools** to evaluate interaction of their effects on mountain rivers and energetic, economical and social outputs on longer time scale

- They need to be better equipped **to pass from data to strategic information**

SHARE - Sustainable Hydropower in Alpine Rivers Ecosystems

- **SHARE** is a ***bottom-up* cooperation project** approved and cofunded by the European regional development fund in the context of the European Territorial Cooperation Alpine Space programme 2007 – 2013.

- The project has been formally on going from August 2009 to July 2012.

share
Sustainable Hydropower in Alpine Rivers Ecosystems

SHARE objective

- The project has developed, tested and promoted a **decision support system** to merge river ecosystems services and hydropower requirements

- This approach has been led using existing scientific tools (Multi Criteria Analysis - MCA), adjustable to transnational, national and local normative and carried on by a network of administrators and stakeholders

SHARE project participants

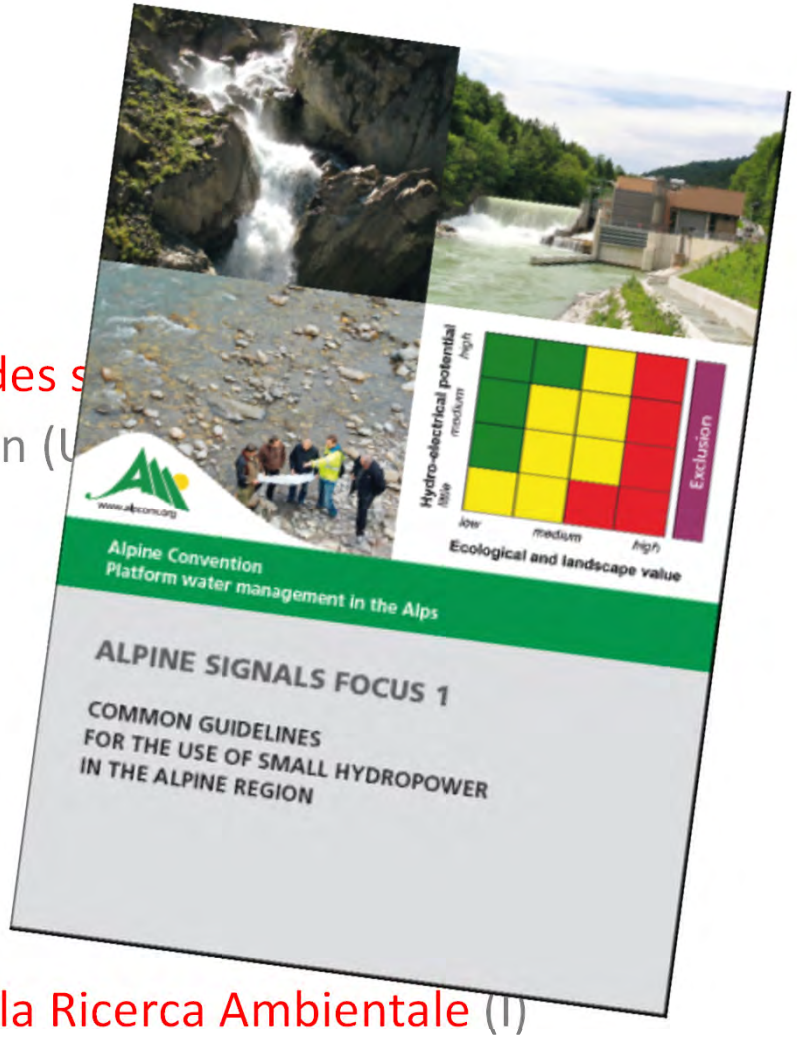
- 13 Partners (public administrations, environmental agencies, research centers, NGOs) in 5 countries
- 16 Official observers

SHARE project participants

- LP: ARPA Valle d'Aosta (I)
- PP1: Regione Piemonte (I)
- PP2: ARPA Veneto (I)
- PP3: RSE (I)
- PP4: E-zavod (Sl)
- PP5: University of Ljubljana (Sl)
- PP6: Graz University of Technology (AT)
- PP7: University of Innsbruck (AT)
- PP8: Government of Styria (AT)
- PP9: University of Grenoble, (F)
- PP10: GERES (F)
- PP11: University of Stuttgart (D)
- PP12: AEM (F)

SHARE official observers

- ALPINE CONVENTION secretariat (UE) – Water platform – ***Common guidelines for SHP***
- Land of Tyrol (AT)
- CETE (F)
- Landesfischereiverband Bayern (D)
- Fisheries Research Institute of Slovenja (SI)
- Syndicat mixte d'Aménagement de l'Arve et des s
- ESHA European Small Hydropower Association (U
- CVA Compagnia Valdostana delle Acque (I)
- ALP WATER SCARCE Lead Partner
- SEDIRISK Lead Partner (F)
- CH2OICE coordinator (I – UE)
- Provincia di Vicenza (I)
- Civiltà dell'acqua (I)
- Università di Bolzano (I)
- ISPRA - Istituto Superiore per la Protezione e la Ricerca Ambientale (I)

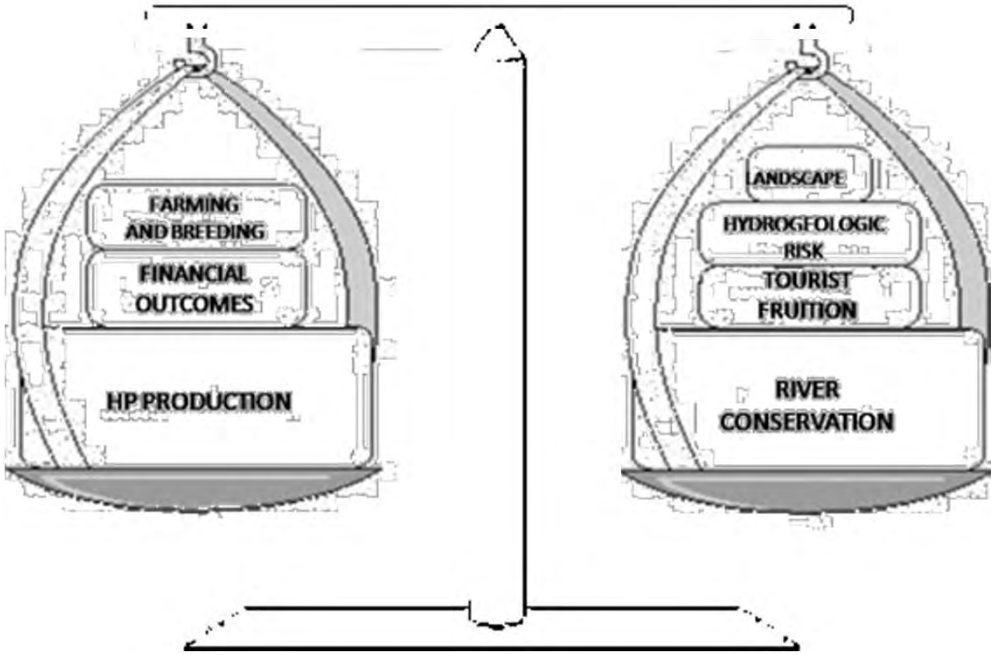


SHARE pilot case studies

- SHARE approach has been tested in 11 Pilot case studies : **different mountain rivers, same needs for sustainable HP management**

MCA approach

- The methodological "core" of the project is the application of the MULTICRITERIA ANALYSIS (MCA)



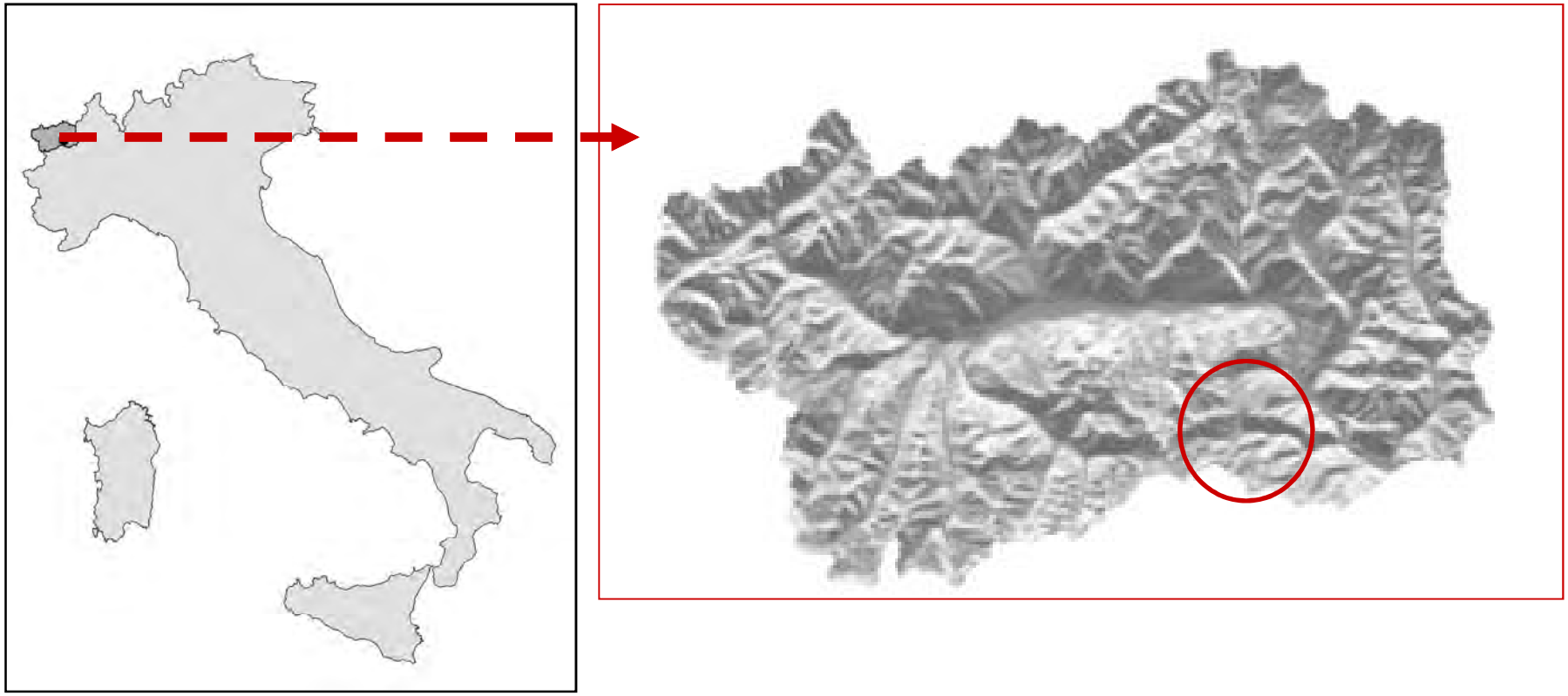
- The MCA is applied as "balance" for evaluating different river management alternatives defined by different criteria detailed by indicators

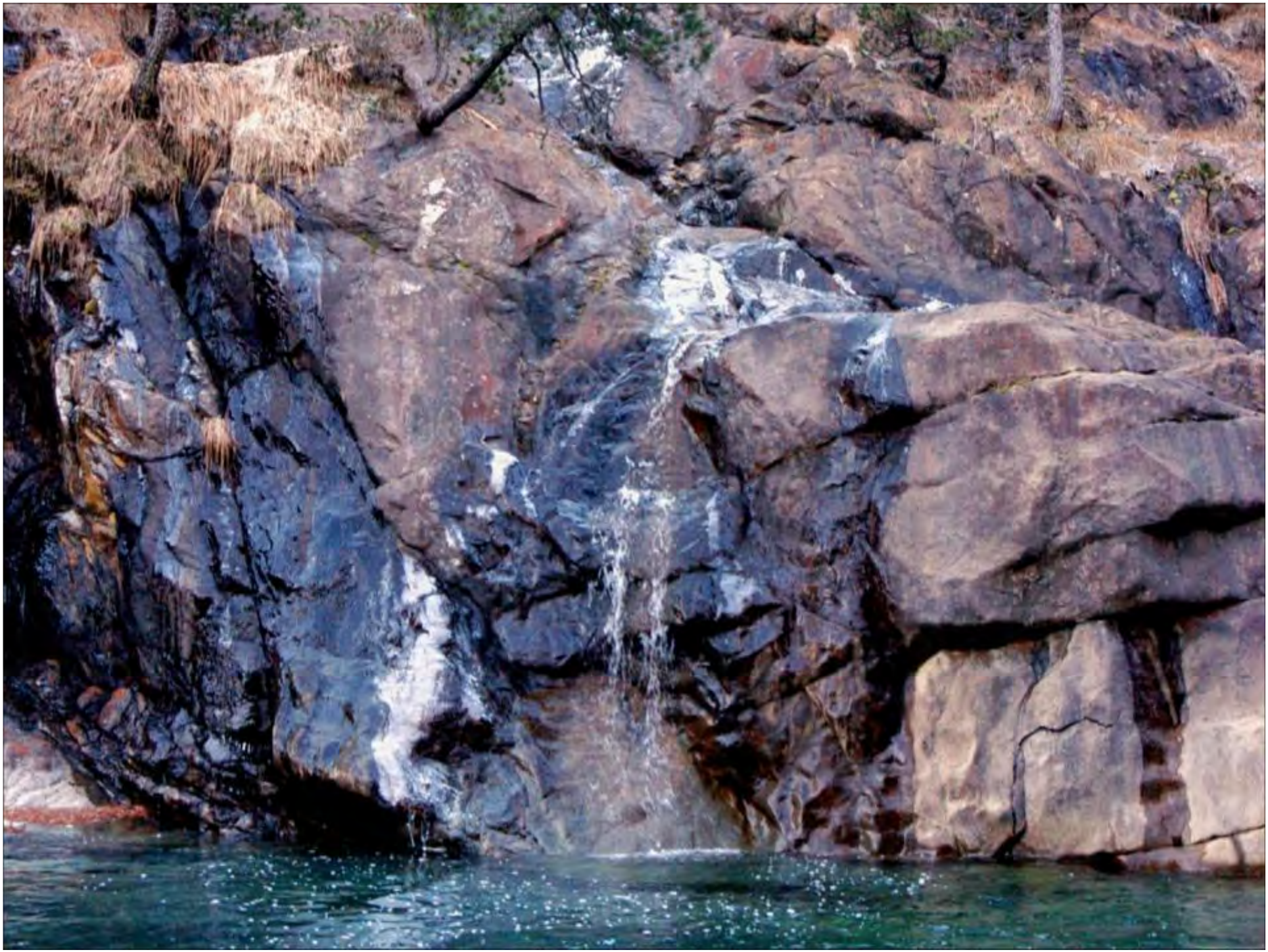
MCA approach

1. Identification of different management alternatives to be considered and stakeholders involved by river management
2. Identification of criteria and indicators (coming also from set of laws) to describe the whole river management context
3. Indicators implementation using all available datasets
4. Utility functions definition: making indicators comparable assigning to each value of the indicators a relative value of stakeholder preference/utility between 0 and 1 (*"consider both hard & soft information")*
5. Indicators and criteria importance weight assignment (with different stakeholders contribution)
6. Performance evaluation of each alternative
7. Sensitivity check, similar to *back analysis evaluation* to define the uncertainty influence on alternative performance

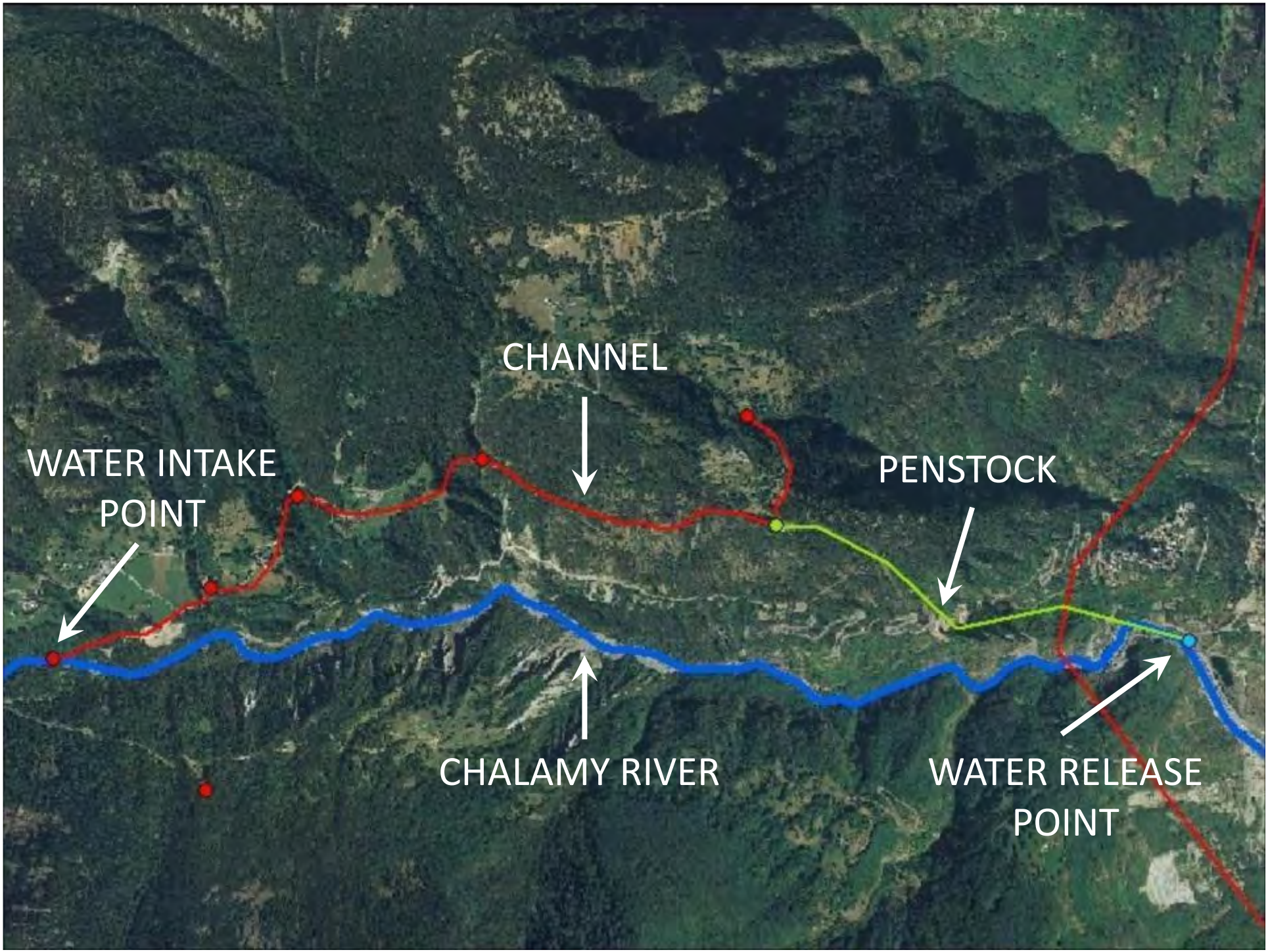
MCA approach

- The Chalamy is a pluvial-snow regime torrent partially included in Mont Avic Natural Park (Aosta Valley)






Compagnie Valdotaine des Eaux, loc. Blanchette, Champdepraz (AO - Italie)


CHANNEL
WATER INTAKE POINT
PENSTOCK
CHALAMY RIVER
WATER RELEASE POINT

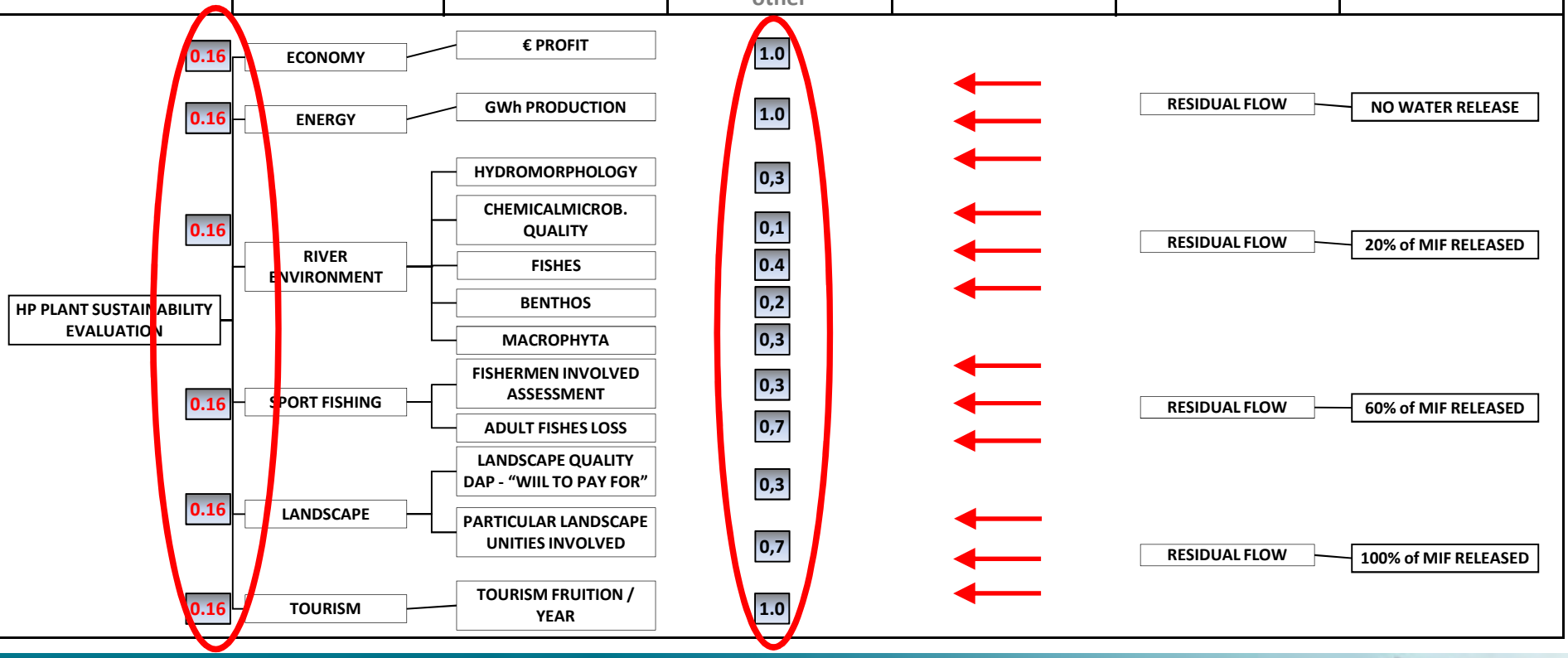
MCA approach

- The management alternatives for the Chalamy river case study are related to **different quantitative experimental releases**:

  - **Alternative 1**: NO WATER RELEASE (2008 status)
  - **Alternative 2**: WATER RELEASE 20% of theoretical M.I.F.
  - **Alternative 3**: WATER RELEASE 60% of theoretical M.I.F.
  - **Alternative 4**: WATER RELEASE 100% of theoretical M.I.F.

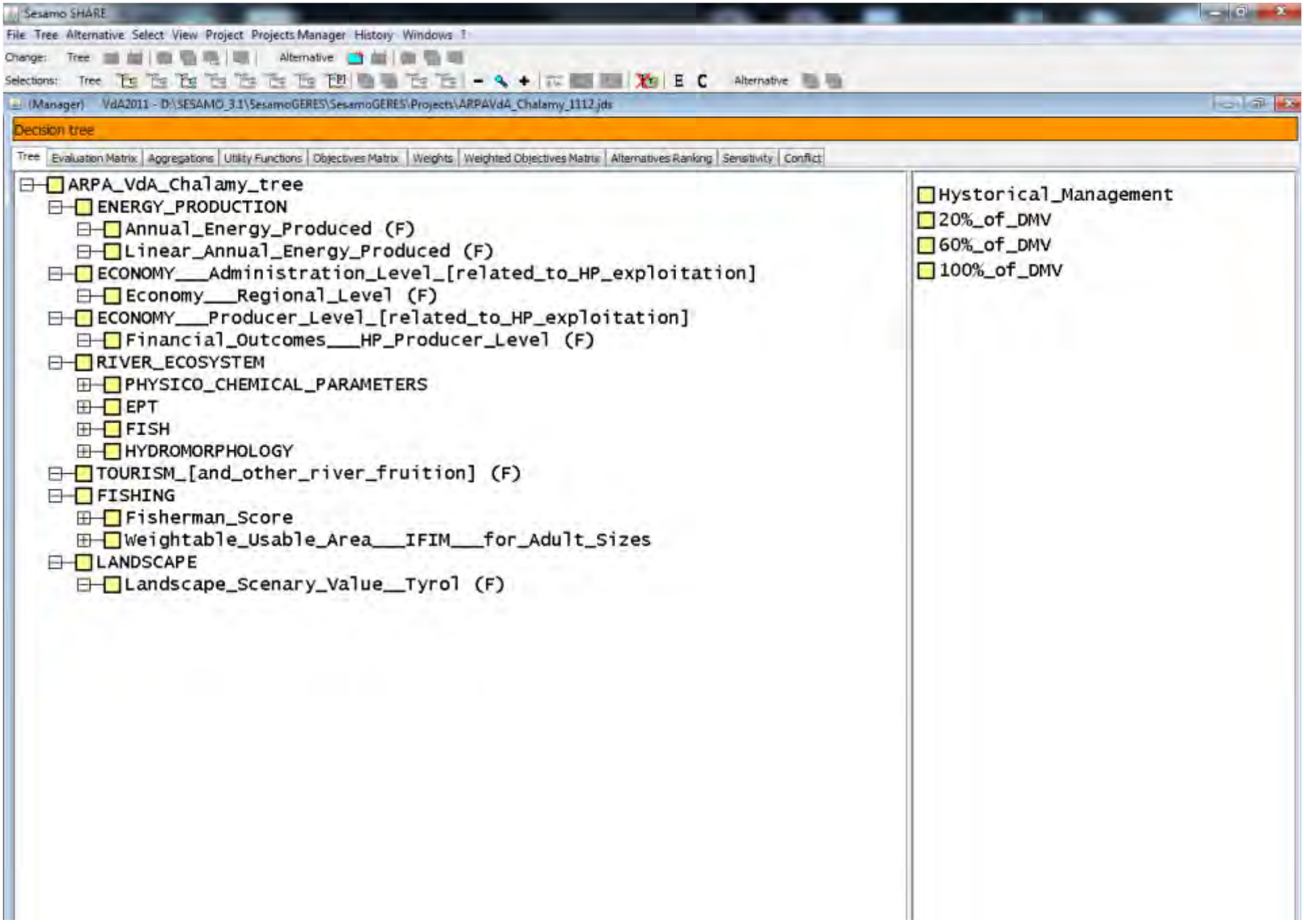
MCA approach

PROBLEM	SYSTEM DESCRIPTION		RELATIVE IMPORTANCE ASSESSMENT	EFFECTS ASSESSMENT		ALTERNATIVES
Identify the **SPECIFIC CASE**	Fully describe the specific case through **CRITERIA**	Fully describe each **CRITERION** through **INDICATORS**	Assign a **WEIGHT** to each indicator / criterion indicates its importance in relation with the other	**ASSESS/ CALCULATE** the **EFFECTS** of each alternative on the specific case	Alternatives are detailed by one or more **CAUSAL FACTORS INDICATORS**	Identify different possible management **ALTERNATIVES**



Policy step *Technical - scientific step*

share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Decision tree
Tree
Evaluation Matrix
Aggregations
Utility Functions
Objectives Matrix
Weights
Weighted Objectives Matrix
Alternatives Ranking
Sensitivity
Conflict
ARPA_VdA_Chalamy_tree
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Annual_Energy_Produced (F)
Linear_Annual_Energy_Produced (F)
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Economy___Regional_Level (F)
ECONOMY___Producer_Level_[related_to_HP_exploitation]
Financial_Outcomes___HP_Producer_Level (F)
RIVER_ECOSYSTEM
PHYSICO_CHEMICAL_PARAMETERS
EPT
FISH
HYDROMORPHOLOGY
TOURISM_[and_other_river_fruition] (F)
FISHING
Fisherman_Score
Weightable_Usable_Area___IFIM___for_Adult_Sizes
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Landscape_Scenary_Value__Tyrol (F)
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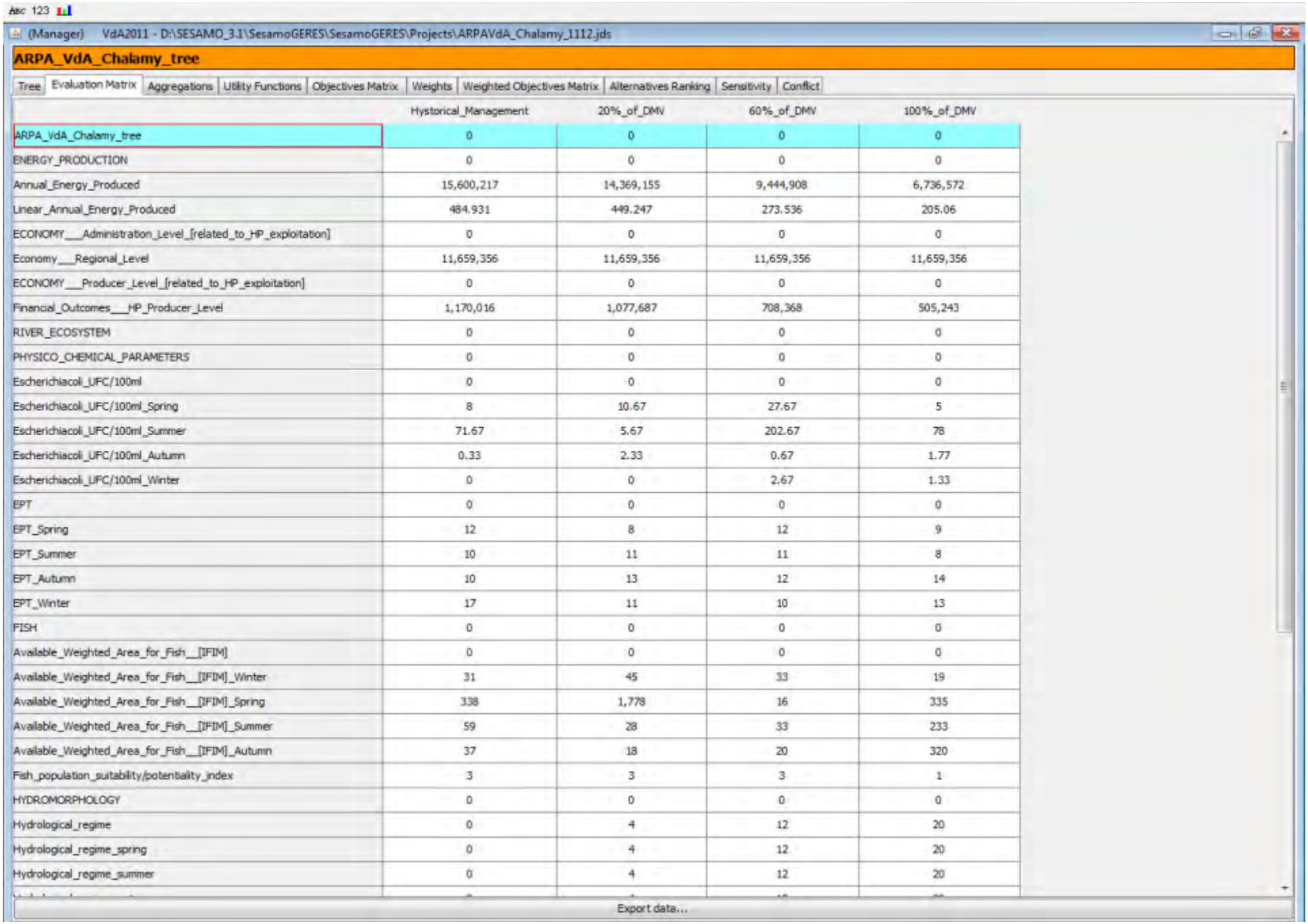
20%_of_DMV
60%_of_DMV
100%_of_DMV



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Annual_Energy_Produced	15,600,217	14,369,155	9,444,908	6,736,572
Linear_Annual_Energy_Produced	484.931	449.247	273.536	205.06
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ECONOMY___Producer_Level_[related_to_HP_exploitation]	0	0	0	0
Financial_Outcomes___HP_Producer_Level	1,170,016	1,077,687	708,368	505,243
RIVER_ECOSYSTEM	0	0	0	0
PHYSICO_CHEMICAL_PARAMETERS	0	0	0	0
Escherichiacoli_UFC/100ml	0	0	0	0
Escherichiacoli_UFC/100ml_Spring	8	10.67	27.67	5
Escherichiacoli_UFC/100ml_Summer	71.67	5.67	202.67	78
Escherichiacoli_UFC/100ml_Autumn	0.33	2.33	0.67	1.77
Escherichiacoli_UFC/100ml_Winter	0	0	2.67	1.33
EPT	0	0	0	0
EPT_Spring	12	8	12	9
EPT_Summer	10	11	11	8
EPT_Autumn	10	13	12	14
EPT_Winter	17	11	10	13
FISH	0	0	0	0
Available_Weighted_Area_for_Fish__[IFIM]	0	0	0	0
Available_Weighted_Area_for_Fish__[IFIM]_Winter	31	45	33	19
Available_Weighted_Area_for_Fish__[IFIM]_Spring	338	1,778	16	335
Available_Weighted_Area_for_Fish__[IFIM]_Summer	59	28	33	233
Available_Weighted_Area_for_Fish__[IFIM]_Autumn	37	18	20	320
Fish_population_suitability/potentiality_index	3	3	3	1
HYDROMORPHOLOGY	0	0	0	0
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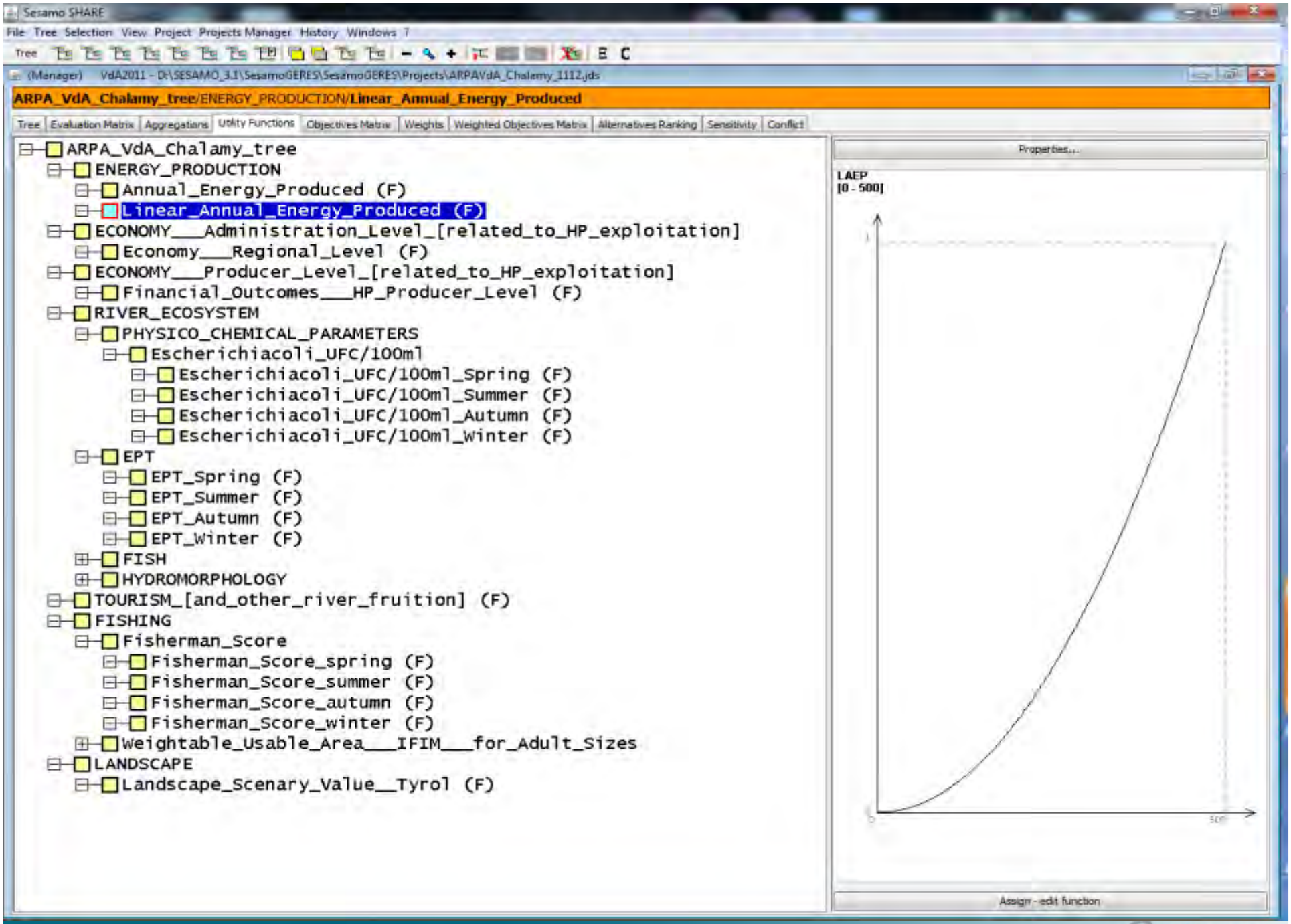
Hydrological_regime_spring	0	4	12	20
Hydrological_regime_summer	0	4	12	20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Linear_Annual_Energy_Produced (F)
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Economy___Regional_Level (F)
ECONOMY___Producer_Level_[related_to_HP_exploitation]
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Escherichiacoli_UFC/100ml_Summer (F)
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Escherichiacoli_UFC/100ml_Winter (F)
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HYDROMORPHOLOGY
TOURISM_[and_other_river_fruition] (F)
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Fisherman_Score
Fisherman_Score_spring (F)
Fisherman_Score_summer (F)
Fisherman_Score_autumn (F)
Fisherman_Score_winter (F)
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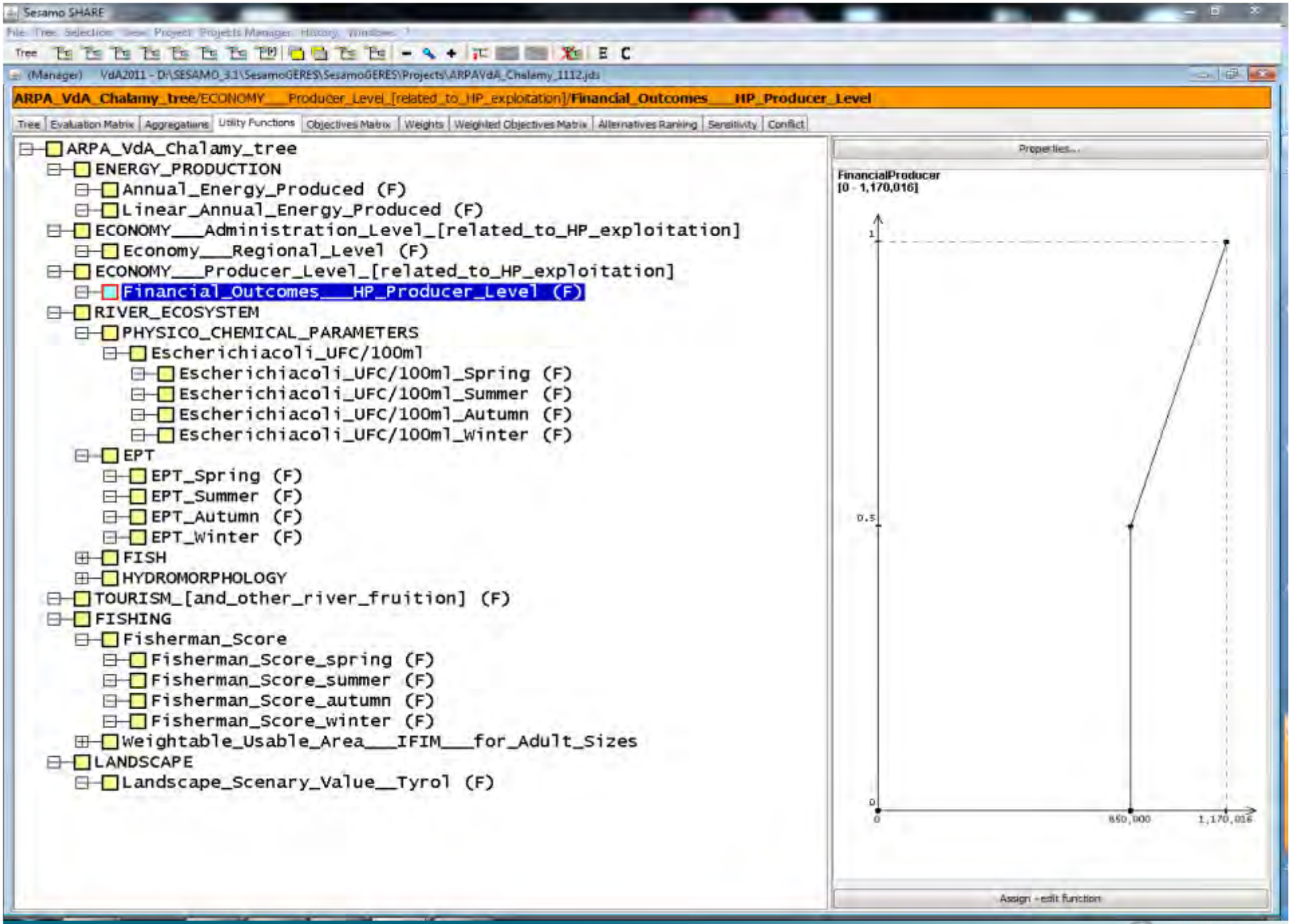
Assign - edit function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Evaluation Matrix
Aggregations
Utility Functions
Objectives Matrix
Weights
Weighted Objectives Matrix
Alternatives Ranking
Sensitivity
Conflict
ARPA_VdA_Chalamy_tree
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Linear_Annual_Energy_Produced (F)
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Economy___Regional_Level (F)
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RIVER_ECOSYSTEM
PHYSICO_CHEMICAL_PARAMETERS
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Escherichiacoli_UFC/100ml_Winter (F)
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HYDROMORPHOLOGY
TOURISM_[and_other_river_fruition] (F)
FISHING
Fisherman_Score
Fisherman_Score_spring (F)
Fisherman_Score_summer (F)
Fisherman_Score_autumn (F)
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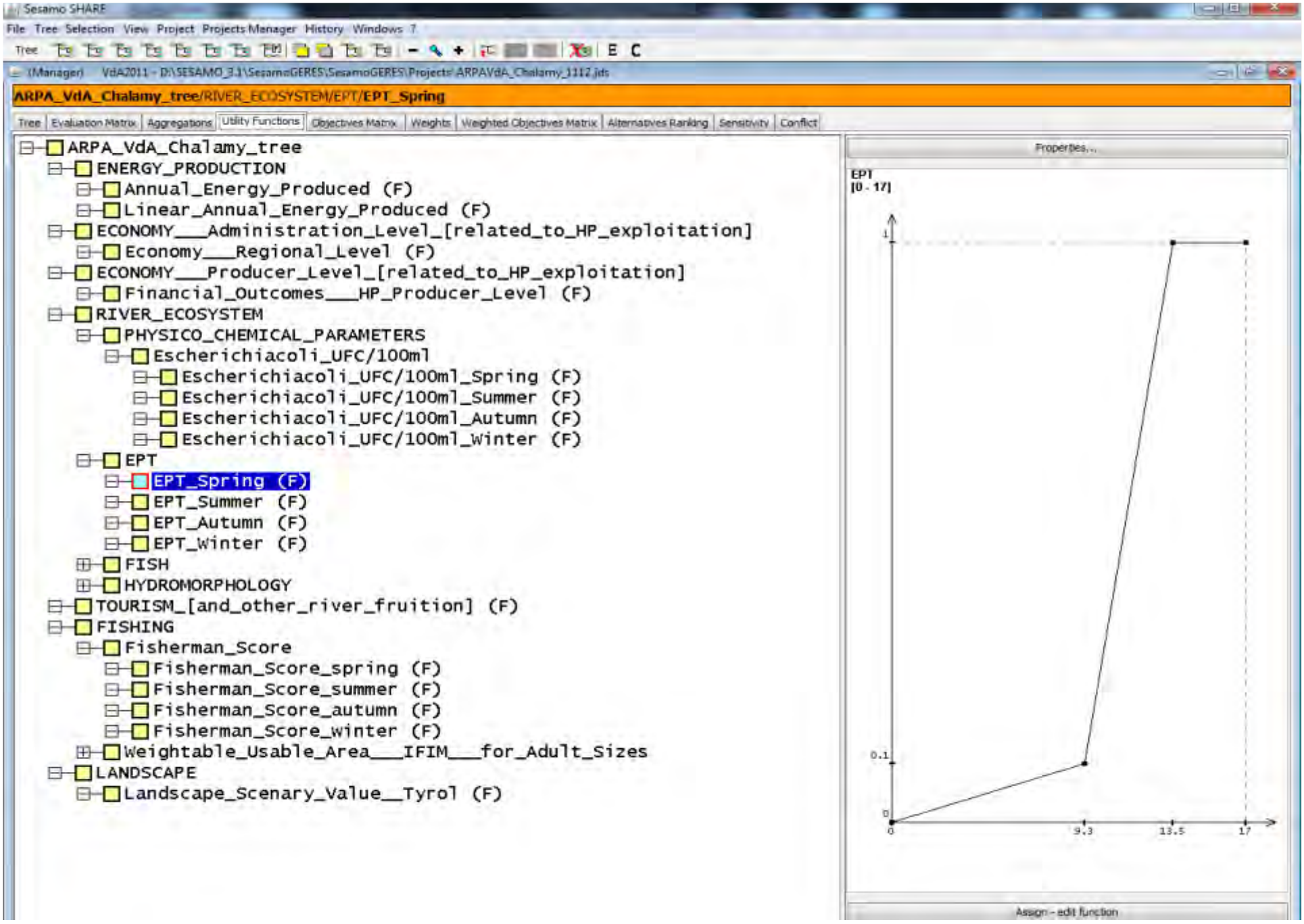
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Linear_Annual_Energy_Produced (F)
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PHYSICO_CHEMICAL_PARAMETERS
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Escherichiacoli_UFC/100ml_Spring (F)
Escherichiacoli_UFC/100ml_Summer (F)
Escherichiacoli_UFC/100ml_Autumn (F)
Escherichiacoli_UFC/100ml_Winter (F)
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EPT_Summer (F)
EPT_Autumn (F)
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HYDROMORPHOLOGY
TOURISM_[and_other_river_fruition] (F)
FISHING
Fisherman_Score
Fisherman_Score_spring (F)
Fisherman_Score_summer (F)
Fisherman_Score_autumn (F)
Fisherman_Score_winter (F)
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Landscape_Scenary_Value__Tyrol (F)
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9.3
13.5
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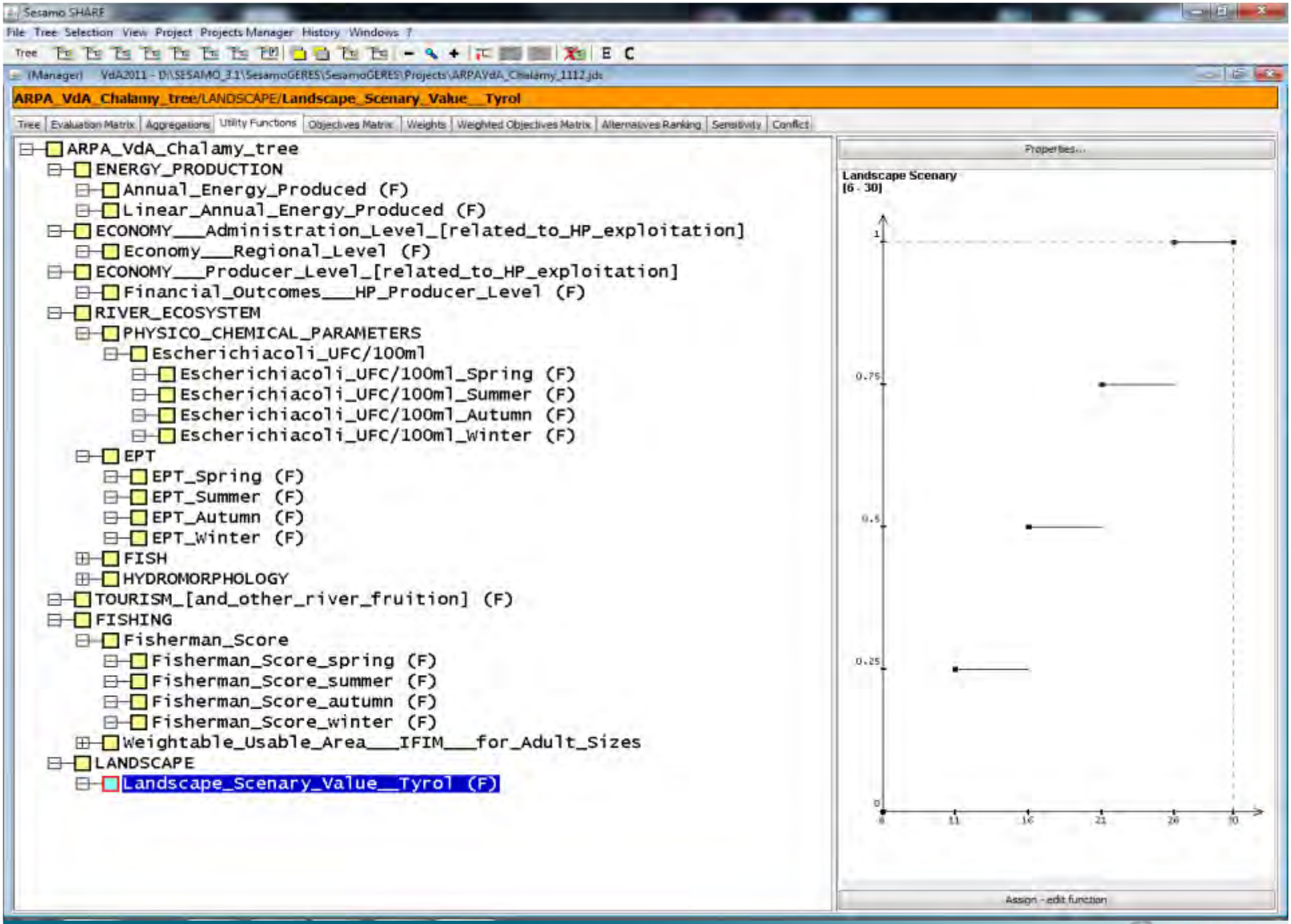
Assign - edit function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Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
ARPA_VdA_Chalamy_tree
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Annual_Energy_Produced (F)
Linear_Annual_Energy_Produced (F)
ECONOMY___Administration_Level_[related_to_HP_exploitation]
Economy___Regional_Level (F)
ECONOMY___Producer_Level_[related_to_HP_exploitation]
Financial_Outcomes___HP_Producer_Level (F)
RIVER_ECOSYSTEM
PHYSICO_CHEMICAL_PARAMETERS
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Escherichiacoli_UFC/100ml_Spring (F)
Escherichiacoli_UFC/100ml_Summer (F)
Escherichiacoli_UFC/100ml_Autumn (F)
Escherichiacoli_UFC/100ml_Winter (F)
EPT
EPT_Spring (F)
EPT_Summer (F)
EPT_Autumn (F)
EPT_Winter (F)
FISH
HYDROMORPHOLOGY
TOURISM_[and_other_river_fruition] (F)
FISHING
Fisherman_Score
Fisherman_Score_spring (F)
Fisherman_Score_summer (F)
Fisherman_Score_autumn (F)
Fisherman_Score_winter (F)
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0.5
0.25
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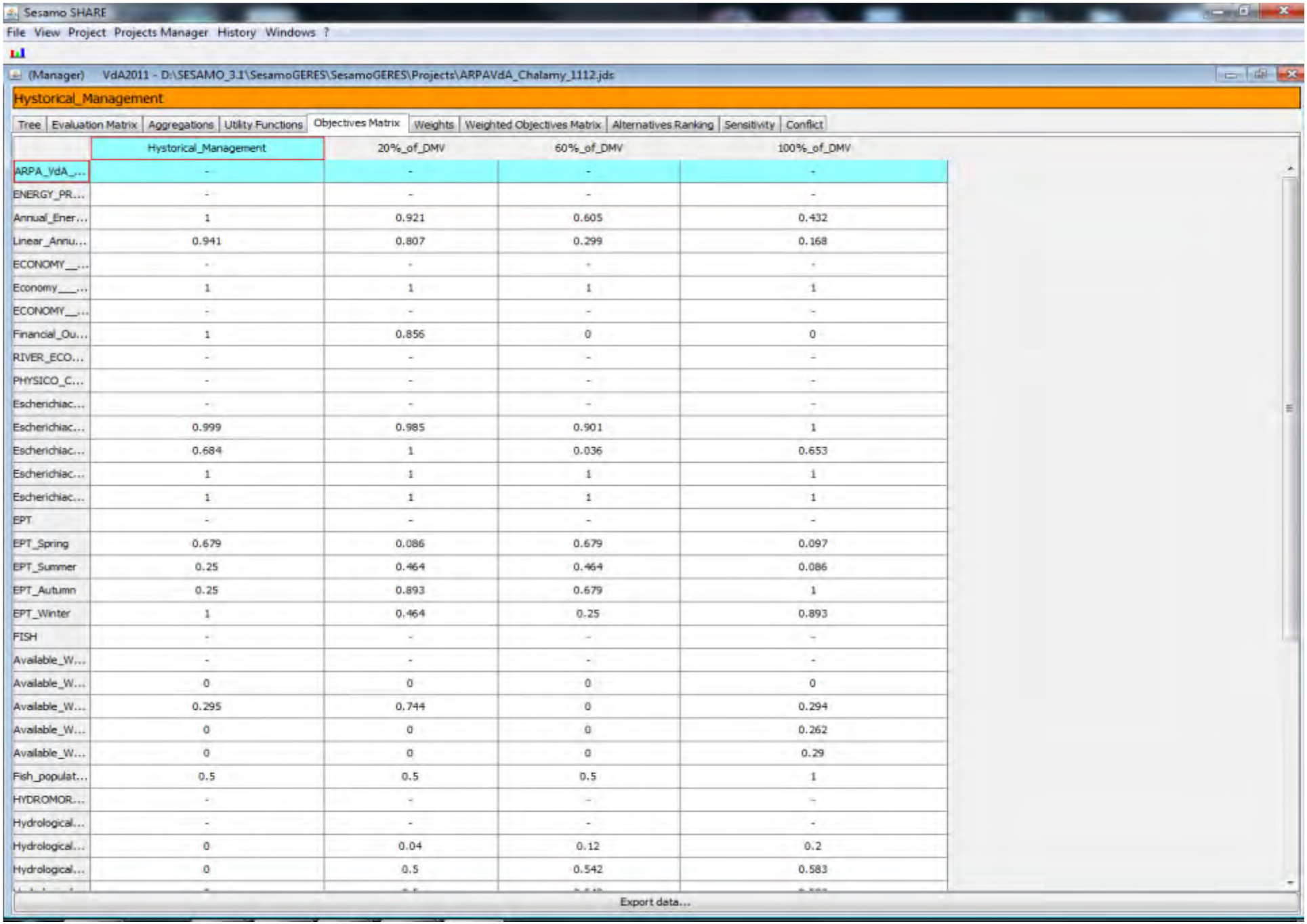
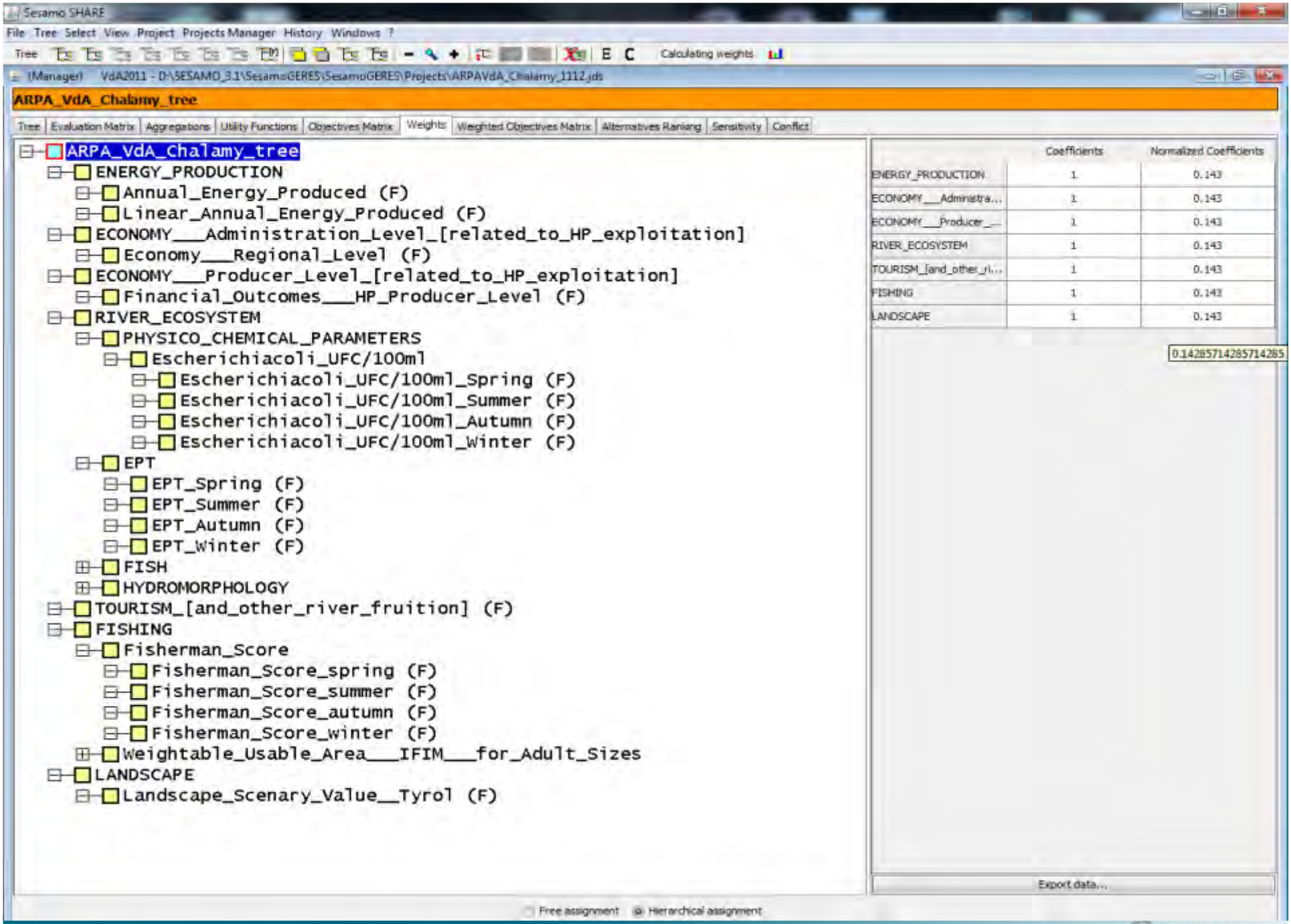
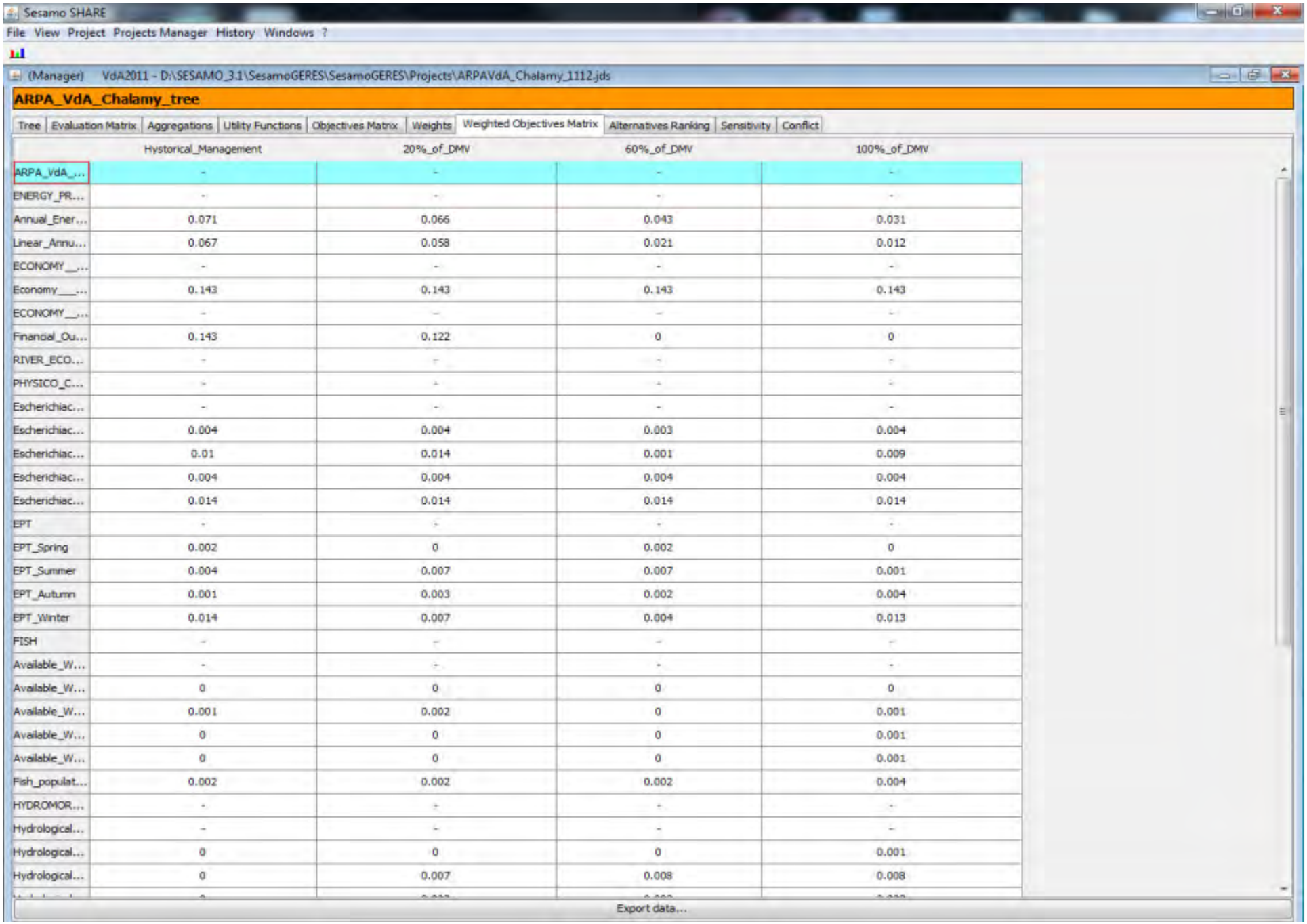
16
21
26
30
Assign - edit function

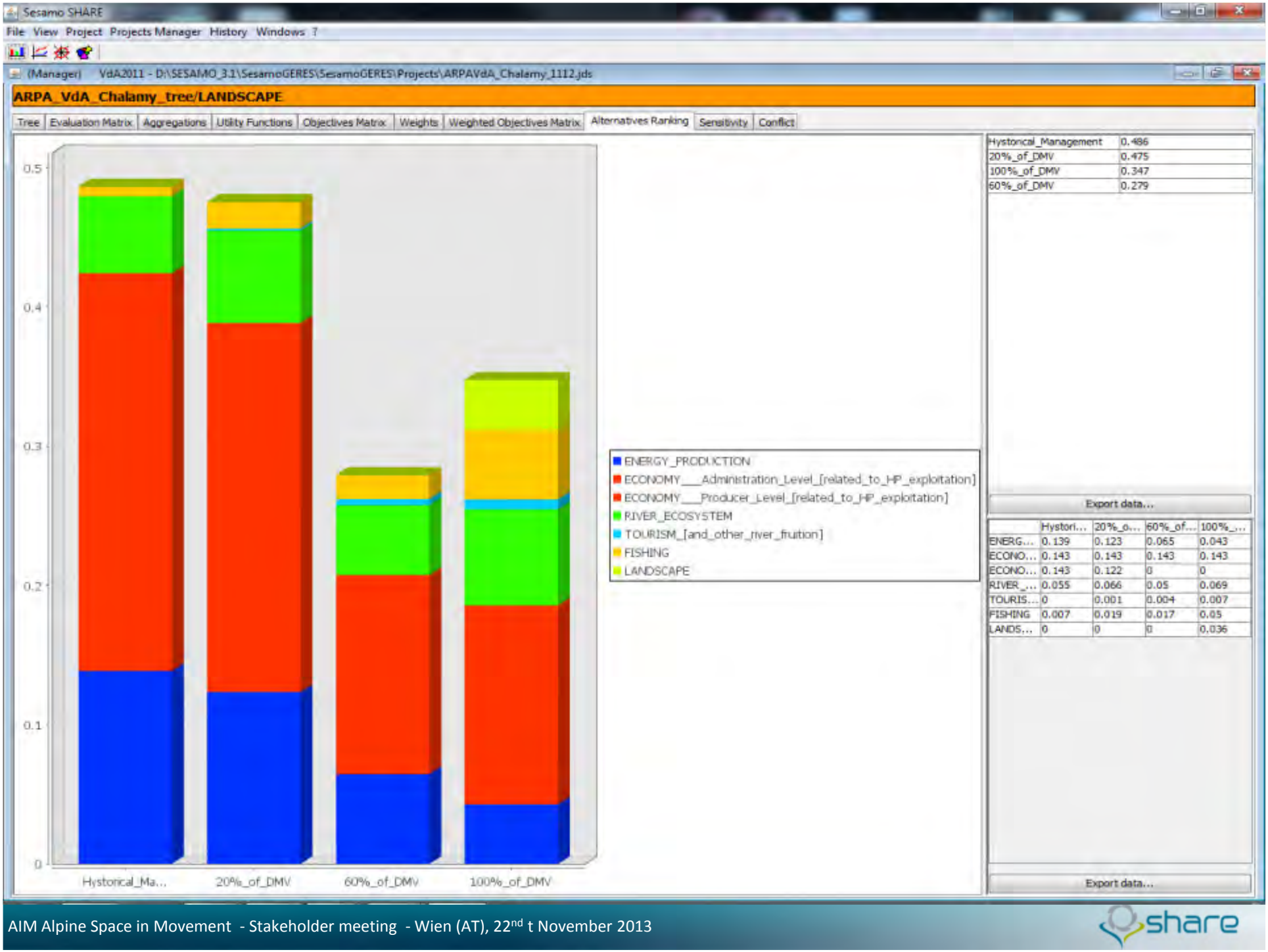


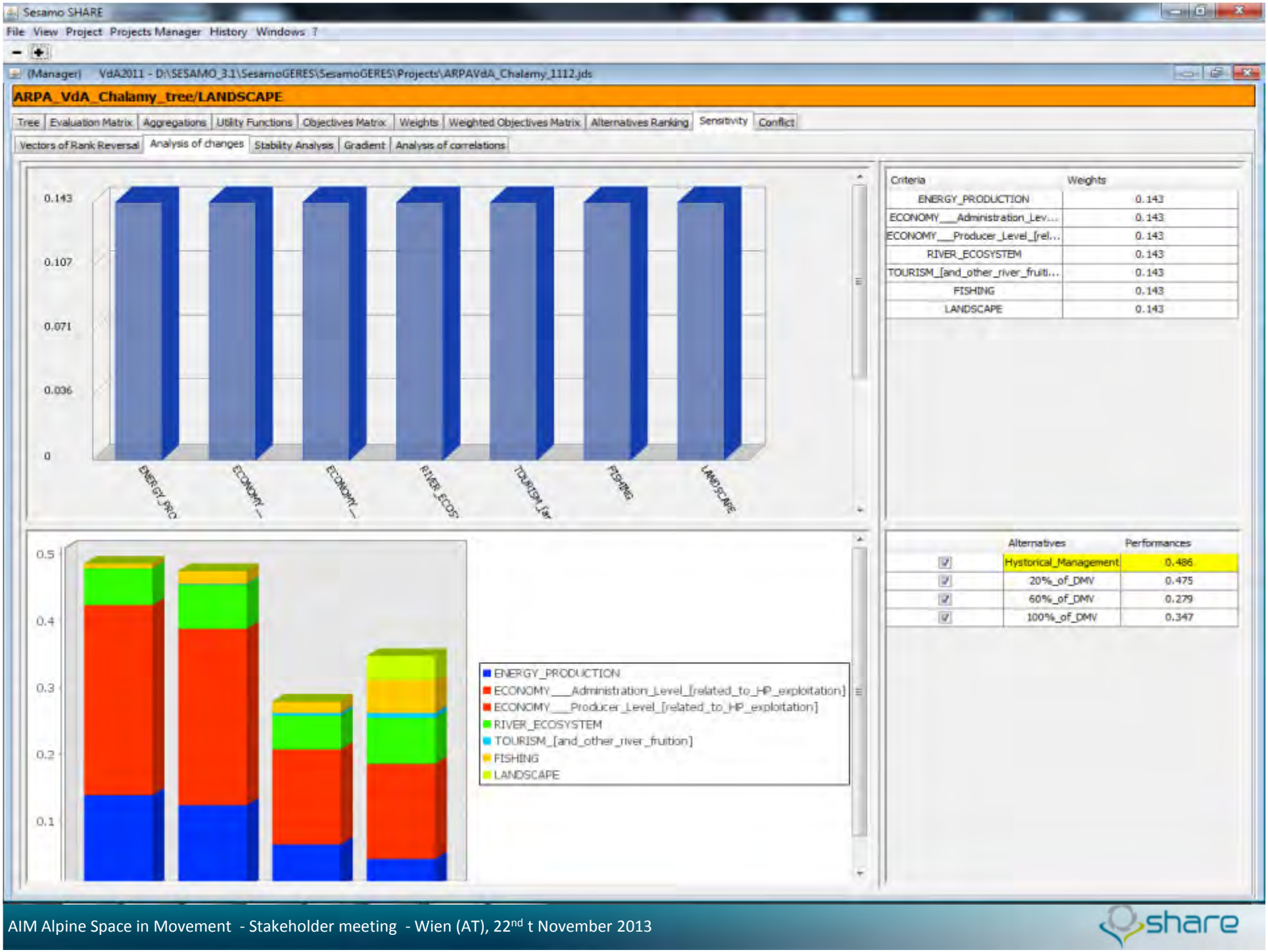
	Hystorical_Management	20%_of_DMV	60%_of_DMV	100%_of_DMV
ARPA_VdA_...	-	-	-	-
ENERGY_PR...	-	-	-	-
Annual_Ener...	1	0.921	0.605	0.432
Linear_Annu...	0.941	0.807	0.299	0.168
ECONOMY__...	-	-	-	-
Economy___...	1	1	1	1
ECONOMY__...	-	-	-	-
Financial_Ou...	1	0.856	0	0
RIVER_ECO...	-	-	-	-
PHYSICO_C...	-	-	-	-
Escherichiac...	-	-	-	-
Escherichiac...	0.999	0.985	0.901	1
Escherichiac...	0.684	1	0.036	0.653
Escherichiac...	1	1	1	1
Escherichiac...	1	1	1	1
EPT	-	-	-	-
EPT_Spring	0.679	0.086	0.679	0.097
EPT_Summer	0.25	0.464	0.464	0.086
EPT_Autumn	0.25	0.893	0.679	1
EPT_Winter	1	0.464	0.25	0.893
FISH	-	-	-	-
Available_W...	-	-	-	-
Available_W...	0	0	0	0
Available_W...	0.295	0.744	0	0.294
Available_W...	0	0	0	0.262
Available_W...	0	0	0	0.29
Fish_populat...	0.5	0.5	0.5	1
HYDROMOR...	-	-	-	-
Hydrological...	-	-	-	-
Hydrological...	0	0.04	0.12	0.2
Hydrological...	0	0.5	0.542	0.583

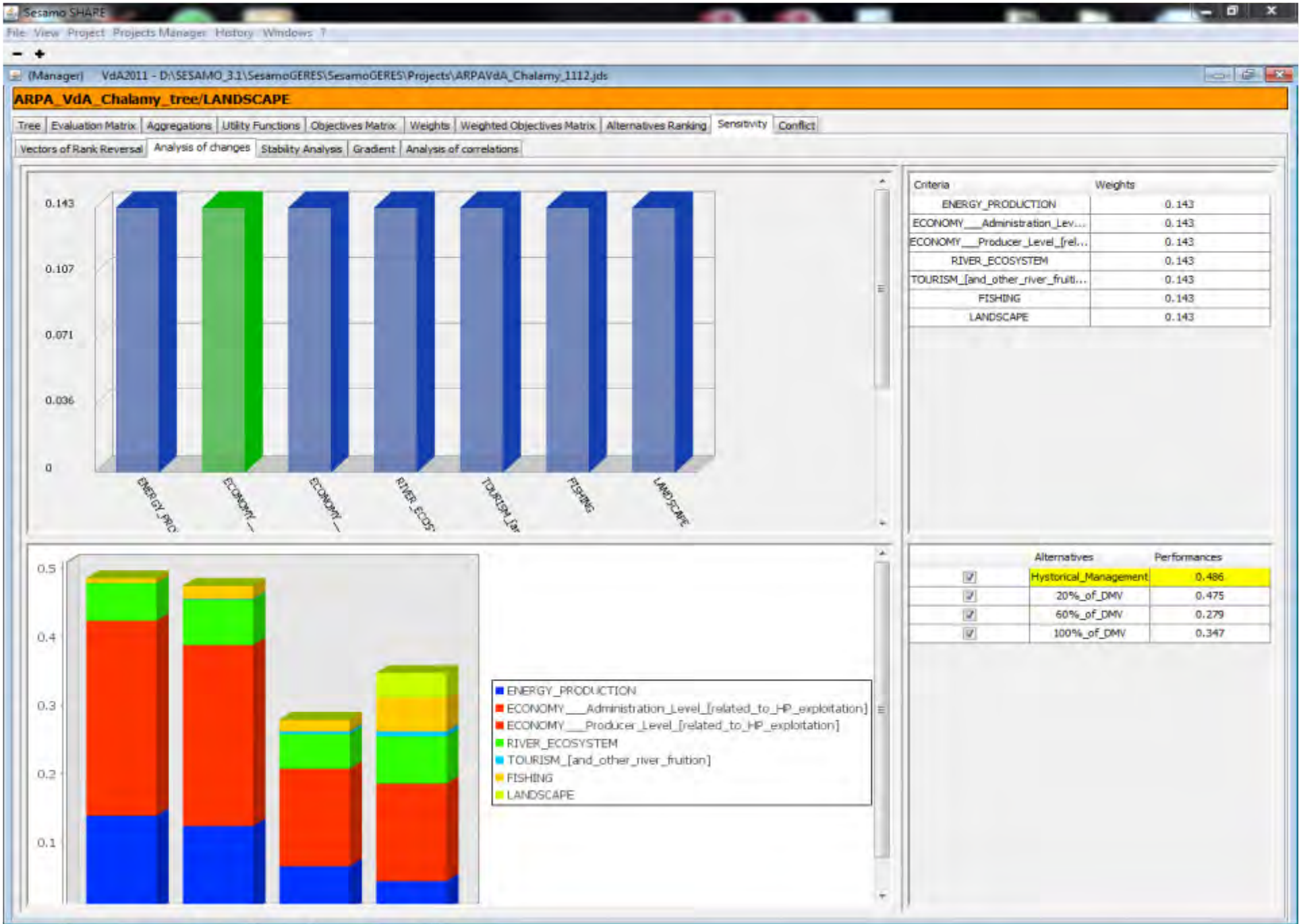

Sesamo SHARE
File Tree Select View Project Projects Manager History Windows ?
Tree
Calculating weights
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
ARPA_VdA_Chalamy_tree
ENERGY_PRODUCTION
Annual_Energy_Produced (F)
Linear_Annual_Energy_Produced (F)
ECONOMY___Administration_Level_[related_to_HP_exploitation]
Economy___Regional_Level (F)
ECONOMY___Producer_Level_[related_to_HP_exploitation]
Financial_Outcomes___HP_Producer_Level (F)
RIVER_ECOSYSTEM
PHYSICO_CHEMICAL_PARAMETERS
Escherichiacoli_UFC/100ml
Escherichiacoli_UFC/100ml_Spring (F)
Escherichiacoli_UFC/100ml_Summer (F)
Escherichiacoli_UFC/100ml_Autumn (F)
Escherichiacoli_UFC/100ml_Winter (F)
EPT
EPT_Spring (F)
EPT_Summer (F)
EPT_Autumn (F)
EPT_Winter (F)
FISH
HYDROMORPHOLOGY
TOURISM_[and_other_river_fruition] (F)
FISHING
Fisherman_Score
Fisherman_Score_spring (F)
Fisherman_Score_summer (F)
Fisherman_Score_autumn (F)
Fisherman_Score_winter (F)
Weightable_Usable_Area___IFIM___for_Adult_Sizes
LANDSCAPE
Landscape_Scenary_Value__Tyrol (F)
Coefficients
Normalized Coefficients
ENERGY_PRODUCTION 1 0.143
ECONOMY___Administra... 1 0.143
ECONOMY___Producer_... 1 0.143
RIVER_ECOSYSTEM 1 0.143
TOURISM_[and_other_ri... 1 0.143
FISHING 1 0.143
LANDSCAPE 1 0.143
0.14285714285714285
Export data...
Free assignment
Hierarchical assignment

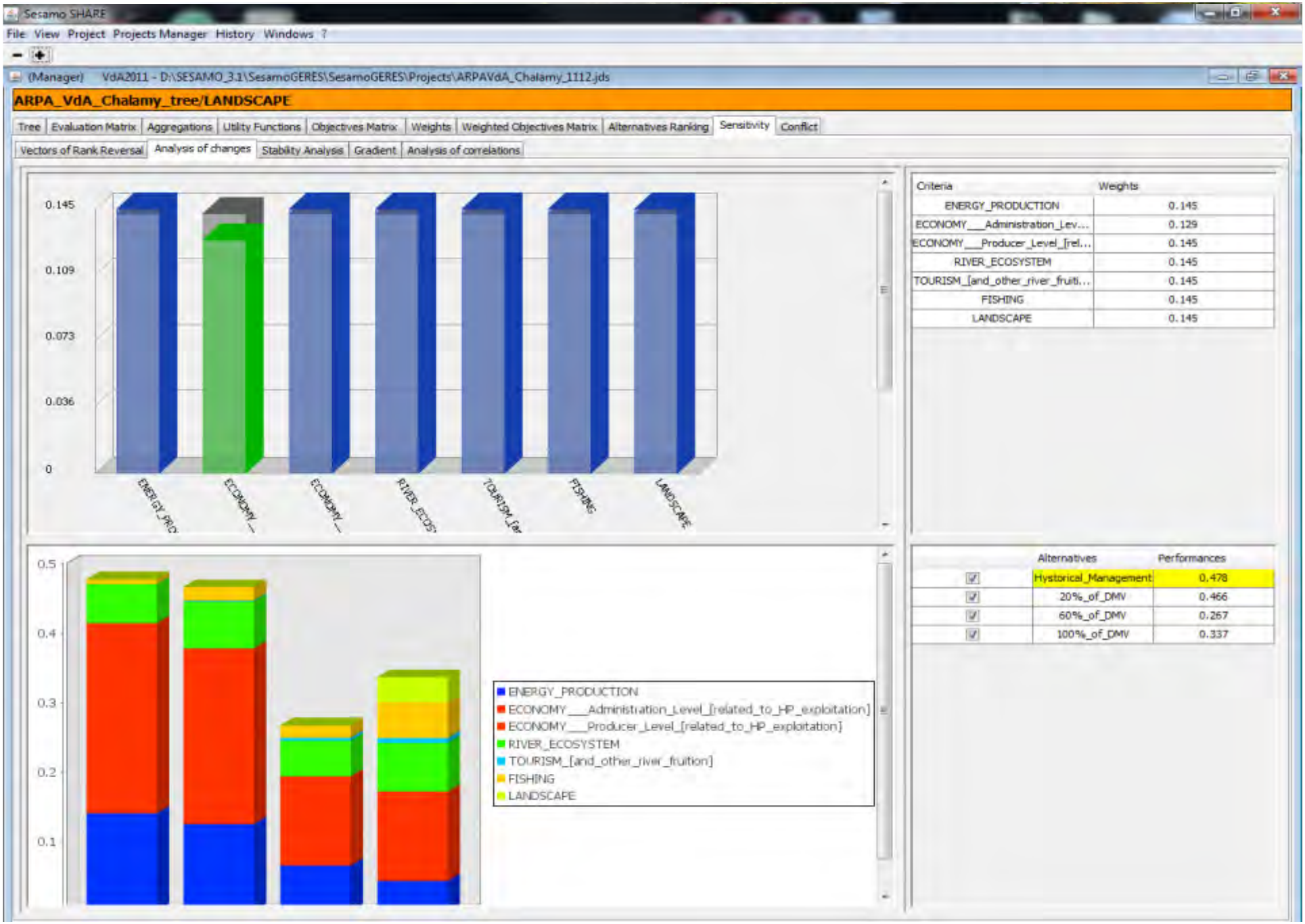


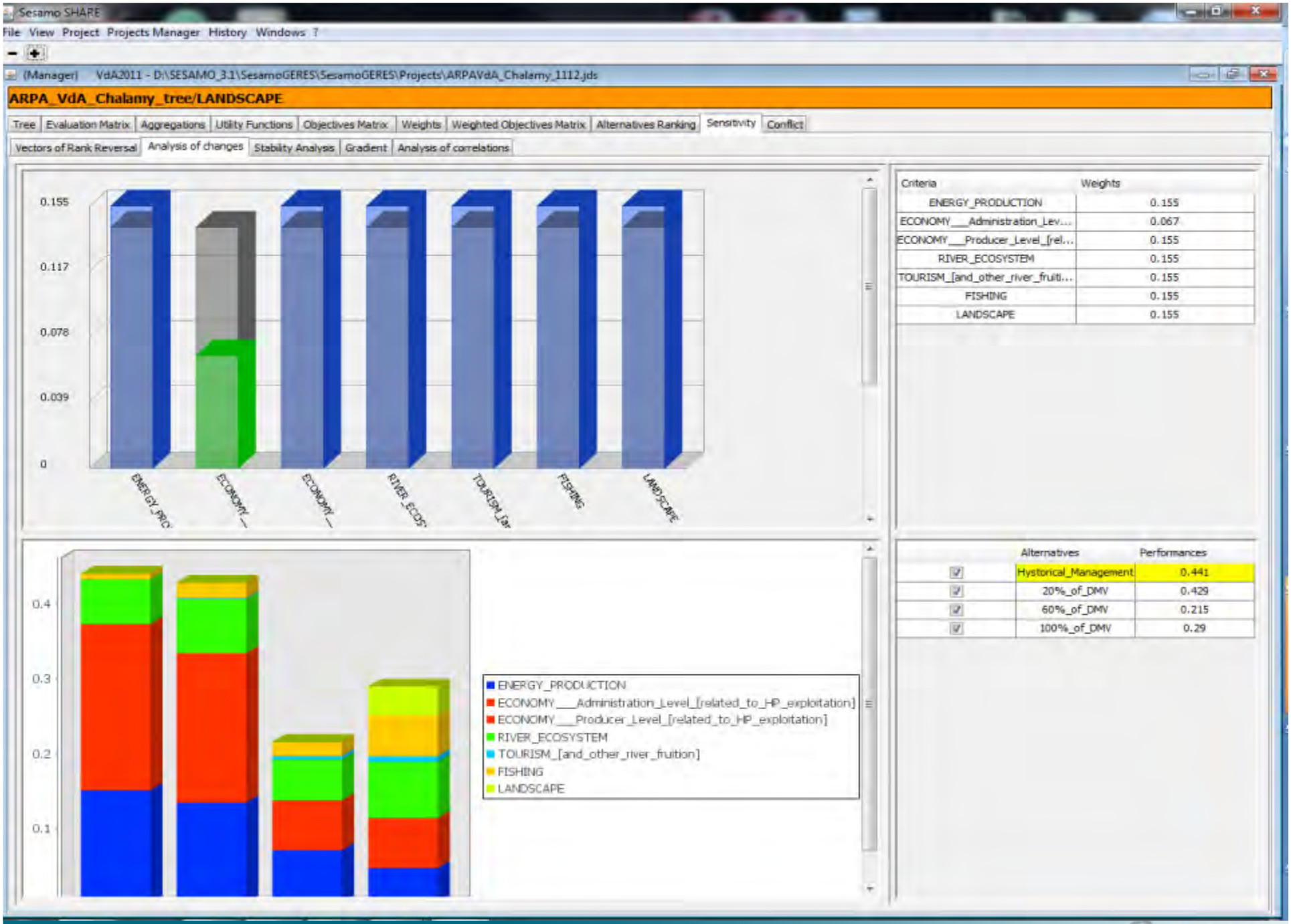
	Hystorical_Management	20%_of_DMV	60%_of_DMV	100%_of_DMV
ARPA_VdA_...	-	-	-	-
ENERGY_PR...	-	-	-	-
Annual_Ener...	0.071	0.066	0.043	0.031
Linear_Annu...	0.067	0.058	0.021	0.012
ECONOMY__...	-	-	-	-
Economy___...	0.143	0.143	0.143	0.143
ECONOMY__...	-	-	-	-
Financial_Ou...	0.143	0.122	0	0
RIVER_ECO...	-	-	-	-
PHYSICO_C...	-	-	-	-
Escherichiac...	-	-	-	-
Escherichiac...	0.004	0.004	0.003	0.004
Escherichiac...	0.01	0.014	0.001	0.009
Escherichiac...	0.004	0.004	0.004	0.004
Escherichiac...	0.014	0.014	0.014	0.014
EPT	-	-	-	-
EPT_Spring	0.002	0	0.002	0
EPT_Summer	0.004	0.007	0.007	0.001
EPT_Autumn	0.001	0.003	0.002	0.004
EPT_Winter	0.014	0.007	0.004	0.013
FISH	-	-	-	-
Available_W...	-	-	-	-
Available_W...	0	0	0	0
Available_W...	0.001	0.002	0	0.001
Available_W...	0	0	0	0.001
Available_W...	0	0	0	0.001
Fish_populat...	0.002	0.002	0.002	0.004
HYDROMOR...	-	-	-	-
Hydrological...	-	-	-	-
Hydrological...	0	0	0	0.001
Hydrological...	0	0.007	0.008	0.008

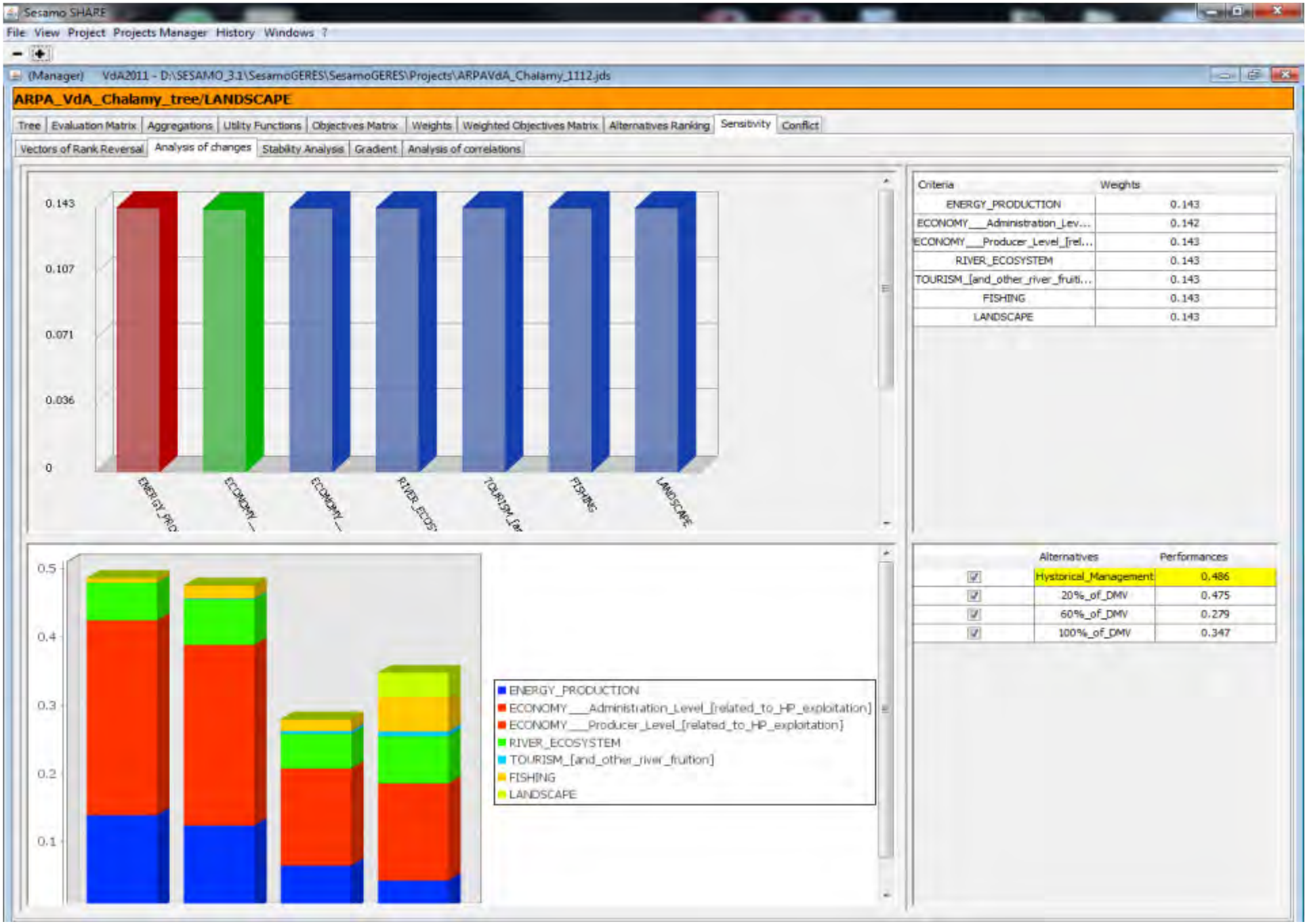

Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree
Evaluation Matrix
Aggregations
Utility Functions
Objectives Matrix
Weights
Weighted Objectives Matrix
Alternatives Ranking
Sensitivity
Conflict
0.5
0.4
0.3
0.2
0.1
0
Hystorical_Ma...
20%_of_DMV
60%_of_DMV
100%_of_DMV
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Hystorical_Management 0.486
20%_of_DMV 0.475
100%_of_DMV 0.347
60%_of_DMV 0.279
Export data...
Hystori... 20%_o... 60%_of... 100%_...
ENERG... 0.139 0.123 0.065 0.043
ECONO... 0.143 0.143 0.143 0.143
ECONO... 0.143 0.122 0 0
RIVER_... 0.055 0.066 0.05 0.069
TOURIS... 0 0.001 0.004 0.007
FISHING 0.007 0.019 0.017 0.05
LANDS... 0 0 0 0.036
Export data...

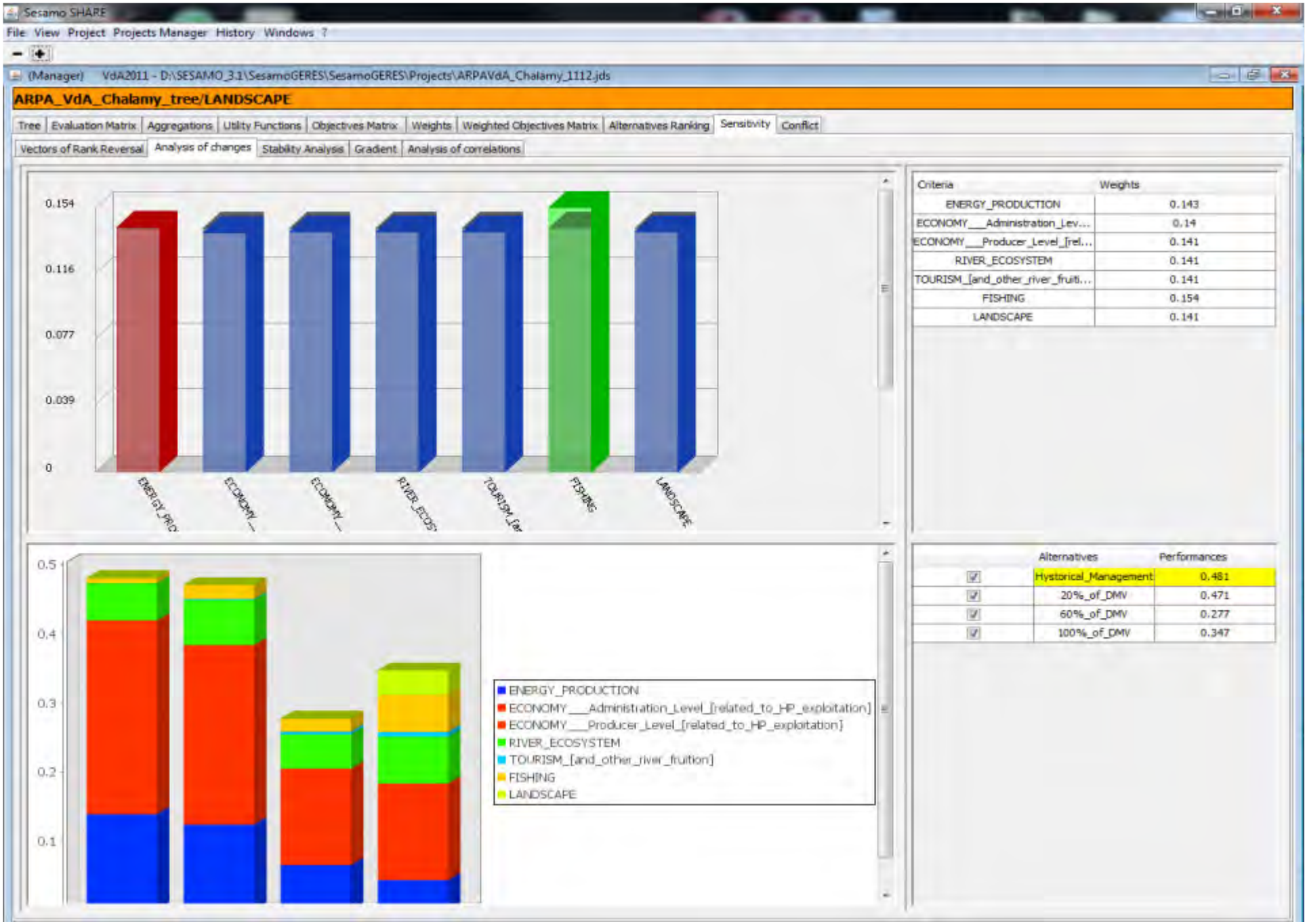

Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.143
0.107
0.071
0.036
0
Criteria Weights
ENERGY_PRODUCTION 0.143
ECONOMY___Administration_Lev... 0.143
ECONOMY___Producer_Level_[rel... 0.143
RIVER_ECOSYSTEM 0.143
TOURISM_[and_other_river_fruiti... 0.143
FISHING 0.143
LANDSCAPE 0.143
0.5
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.486
20%_of_DMV 0.475
60%_of_DMV 0.279
100%_of_DMV 0.347

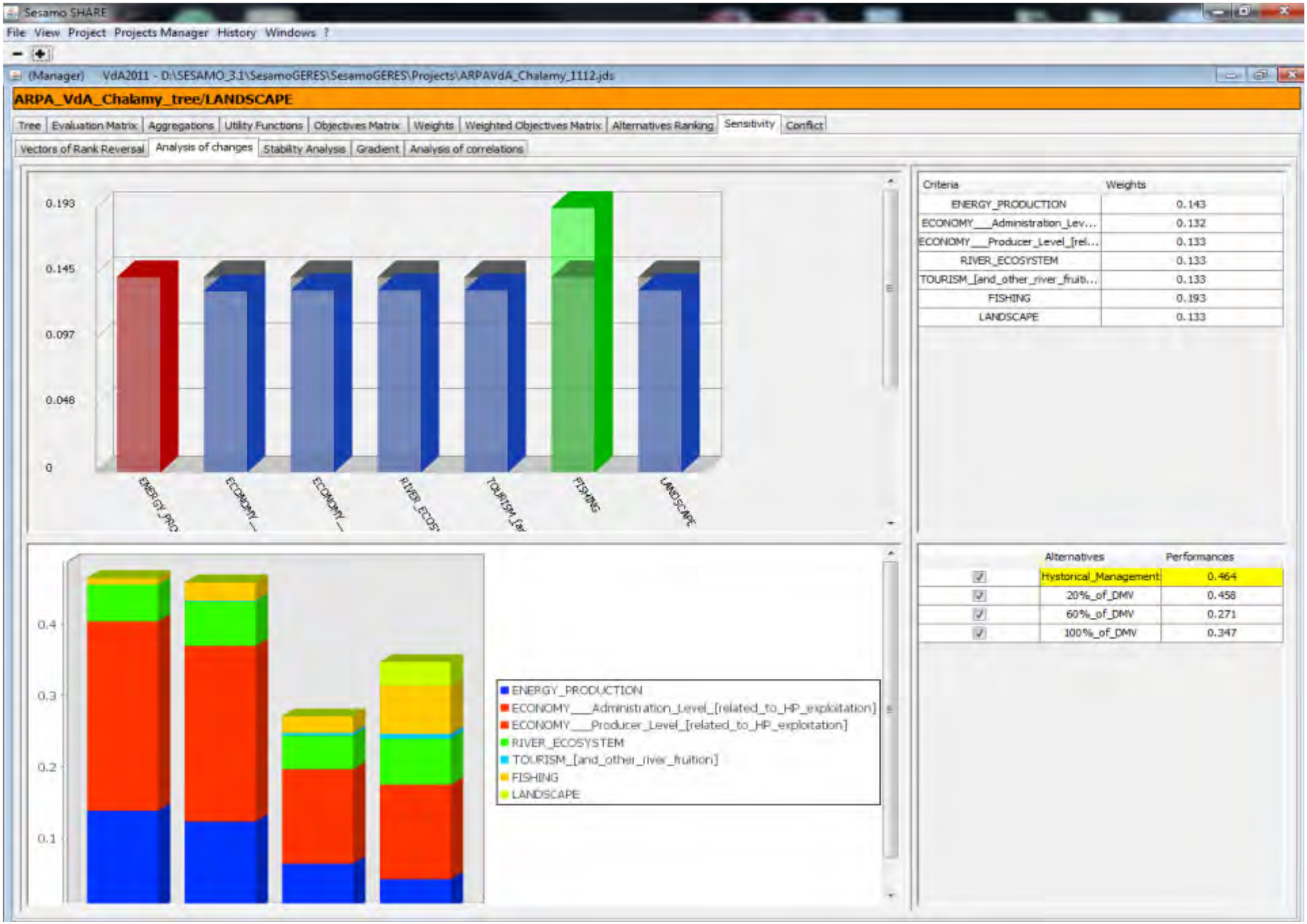

Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.143
0.107
0.071
0.036
0
ENERGY_PRO
ECONOMY_
ECONOMY_
RIVER_ECOS
TOURISM_[a
FISHING
LANDSCAPE
Criteria Weights
ENERGY_PRODUCTION 0.143
ECONOMY___Administration_Lev... 0.143
ECONOMY___Producer_Level_[rel... 0.143
RIVER_ECOSYSTEM 0.143
TOURISM_[and_other_river_fruiti... 0.143
FISHING 0.143
LANDSCAPE 0.143
0.5
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.486
20%_of_DMV 0.475
60%_of_DMV 0.279
100%_of_DMV 0.347


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.145
0.109
0.073
0.036
0
Criteria Weights
ENERGY_PRODUCTION 0.145
ECONOMY___Administration_Lev... 0.129
ECONOMY___Producer_Level_[rel... 0.145
RIVER_ECOSYSTEM 0.145
TOURISM_[and_other_river_fruiti... 0.145
FISHING 0.145
LANDSCAPE 0.145
0.5
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.478
20%_of_DMV 0.466
60%_of_DMV 0.267
100%_of_DMV 0.337


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.155
0.117
0.078
0.039
0
Criteria Weights
ENERGY_PRODUCTION 0.155
ECONOMY___Administration_Lev... 0.067
ECONOMY___Producer_Level_[rel... 0.155
RIVER_ECOSYSTEM 0.155
TOURISM_[and_other_river_fruiti... 0.155
FISHING 0.155
LANDSCAPE 0.155
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.441
20%_of_DMV 0.429
60%_of_DMV 0.215
100%_of_DMV 0.29


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.143
0.107
0.071
0.036
0
Criteria Weights
ENERGY_PRODUCTION 0.143
ECONOMY___Administration_Lev... 0.142
ECONOMY___Producer_Level_[rel... 0.143
RIVER_ECOSYSTEM 0.143
TOURISM_[and_other_river_fruiti... 0.143
FISHING 0.143
LANDSCAPE 0.143
0.5
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.486
20%_of_DMV 0.475
60%_of_DMV 0.279
100%_of_DMV 0.347


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.154
0.116
0.077
0.039
0
Criteria Weights
ENERGY_PRODUCTION 0.143
ECONOMY___Administration_Lev... 0.14
ECONOMY___Producer_Level_[rel... 0.141
RIVER_ECOSYSTEM 0.141
TOURISM_[and_other_river_fruiti... 0.141
FISHING 0.154
LANDSCAPE 0.141
0.5
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.481
20%_of_DMV 0.471
60%_of_DMV 0.277
100%_of_DMV 0.347


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.193
0.145
0.097
0.048
0
Criteria Weights
ENERGY_PRODUCTION 0.143
ECONOMY___Administration_Lev... 0.132
ECONOMY___Producer_Level_[rel... 0.133
RIVER_ECOSYSTEM 0.133
TOURISM_[and_other_river_fruiti... 0.133
FISHING 0.193
LANDSCAPE 0.133
0.4
0.3
0.2
0.1
ENERGY_PRODUCTION
ECONOMY___Administration_Level_[related_to_HP_exploitation]
ECONOMY___Producer_Level_[related_to_HP_exploitation]
RIVER_ECOSYSTEM
TOURISM_[and_other_river_fruition]
FISHING
LANDSCAPE
Alternatives Performances
Hystorical_Management 0.464
20%_of_DMV 0.458
60%_of_DMV 0.271
100%_of_DMV 0.347


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.486
0.475
0.279
0.347
Hystorical_Management
20%_of_DMV
60%_of_DMV
100%_of_DMV
C0 C1 C2 C3 C4 C5 C6
Objectives Normalized wei...
Hystorical_Management
C0 ENERGY_PRODUCTION 0.97 0.143
C1 ECONOMY___Administ... 1 0.143
C2 ECONOMY___Produce... 1 0.143
C3 RIVER_ECOSYSTEM 0.386 0.143
C4 TOURISM_[and_other... 0 0.143
C5 FISHING 0.047 0.143
C6 LANDSCAPE 0 0.143
20%_of_DMV
C0 ENERGY_PRODUCTION 0.864 0.143
C1 ECONOMY___Administ... 1 0.143
C2 ECONOMY___Produce... 0.856 0.143
C3 RIVER_ECOSYSTEM 0.464 0.143
Export


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.566
0.557
0.391
0.449
Hystorical_Management
20%_of_DMV
60%_of_DMV
100%_of_DMV
C0 C1 C2 C3 C4 C5 C6
Objectives
Normalized wei...
Hystorical_Management
C0 ENERGY_PRODUCTION 0.97 0.121
C1 ECONOMY___Administ... 1 0.276
C2 ECONOMY___Produce... 1 0.121
C3 RIVER_ECOSYSTEM 0.386 0.121
C4 TOURISM_[and_other... 0 0.121
C5 FISHING 0.047 0.121
C6 LANDSCAPE 0 0.121
20%_of_DMV
C0 ENERGY_PRODUCTION 0.864 0.121
C1 ECONOMY___Administ... 1 0.276
C2 ECONOMY___Produce... 0.856 0.121
C3 RIVER_ECOSYSTEM 0.464 0.121
Export


Sesamo SHARE
File View Project Projects Manager History Windows ?
(Manager) VdA2011 - D:\SESAMO_3.1\SesamoGERES\SesamoGERES\Projects\ARPAVdA_Chalamy_1112.jds
ARPA_VdA_Chalamy_tree/LANDSCAPE
Tree Evaluation Matrix Aggregations Utility Functions Objectives Matrix Weights Weighted Objectives Matrix Alternatives Ranking Sensitivity Conflict
Vectors of Rank Reversal Analysis of changes Stability Analysis Gradient Analysis of correlations
0.657
0.650
0.519
0.565
Hystorical_Management
20%_of_DMV
60%_of_DMV
100%_of_DMV
C0 C1 C2 C3 C4 C5 C6
Objectives
Normalized wei...
Hystorical_Management
C0 ENERGY_PRODUCTION 0.97 0.095
C1 ECONOMY___Administ... 1 0.429
C2 ECONOMY___Produce... 1 0.095
C3 RIVER_ECOSYSTEM 0.386 0.095
C4 TOURISM_[and_other... 0 0.095
C5 FISHING 0.047 0.095
C6 LANDSCAPE 0 0.095
20%_of_DMV
C0 ENERGY_PRODUCTION 0.864 0.095
C1 ECONOMY___Administ... 1 0.429
C2 ECONOMY___Produce... 0.856 0.095
C3 RIVER_ECOSYSTEM 0.464 0.095
Export

MCA approach

- For each alternative it is calculated a TOTAL PERFORMANCE SCORE starting from the assessment of effects of each management alternative on the specific river system

- Decision makers are helped to IDENTIFY THE MORE SUSTAINABLE ALTERNATIVE using an **interrelated set of weighted indicators** tailored on each specific situation requirements

"THE MCA IS A TOOL THAT HELPS DECISION MAKING BUT IT DOESN'T TAKE THE RIGHT DECISIONS BY ITSELF"

MCA approach

1. SYNTHESIS: it allows to summarize complex information
2. RATIONALITY: it organizing data in a structured way
3. PARTICIPATION: it help the dialogue on concrete parameters
4. MULTIOBJECTIVE: it allows to considers several alternatives (single HP plant sustainability >>< restoration actions location)
5. TRANSPARENCY: the weights ad the values are explicit
6. FLEXIBILITY: it can be tailored *from local scale to strategic planning*
7. REPEATABILITY: the MCA process can be totally done backwards and forwards enhancing decisions quality
8. FREE: the tools for the MCA application are free
9. EX-ANTE & EX-POST: it's a tool useable both for planning and for management
10. NORMATIVE COMPLIANT

SHARE pilot case studies

PCS	Ex ante – ex post	N° indicators	HP installed power (MW)
Dora Baltea	5 existent plants	13 (+ 24 sub-ind.)	La Salle (Champagne II) 27.0 MW Nus (Saint-Clair) 31.0 MW Saint Clair (Montjovet) 50.0 MW Montjovet (Hone I) 18.5 MW Bard (Bard) 3.2 MW
Chalamy	1 existent plant	13 (+ 24 sub-ind.)	Champdepraz 2.3 MW
Chisone	1 existent plant	15 (+ 19 sub-ind.)	Pourrières 17.0 MW
Cordon	1 existent plant + 1 planned plant	14 (+ 4 sub-ind.)	0.19 MW
Astico	1 existent plant	11 (+ 5 sub-ind.)	Bessè 2.88 MW
Kokra	1 planned plant	6 (+ 11 sub-ind.)	1.0 MW
Mur	4 existent plants	11 (+ 6 sub-ind. + 3 sub-sub-ind.)	Bodendorf 7.0 MW St. Georgen 6.0 MW Murau 4.4 MW Untzmarkt 4.6 MW
Inn	1 existent plant	6 (+ 10 sub-ind. + 8 sub-sub-ind.)	Kirchbichl 24.0 MW
Arc-Isère	big existent HP plants system	28 (+ 20 sub-ind. + 10 sub-sub-ind.)	2520.0 MW
Var	micro - HP plants existent	15	< 1.0 MW
Lech	1 existent plant	5 (+ 10 sub-ind.)	Dessau 10.3 MW

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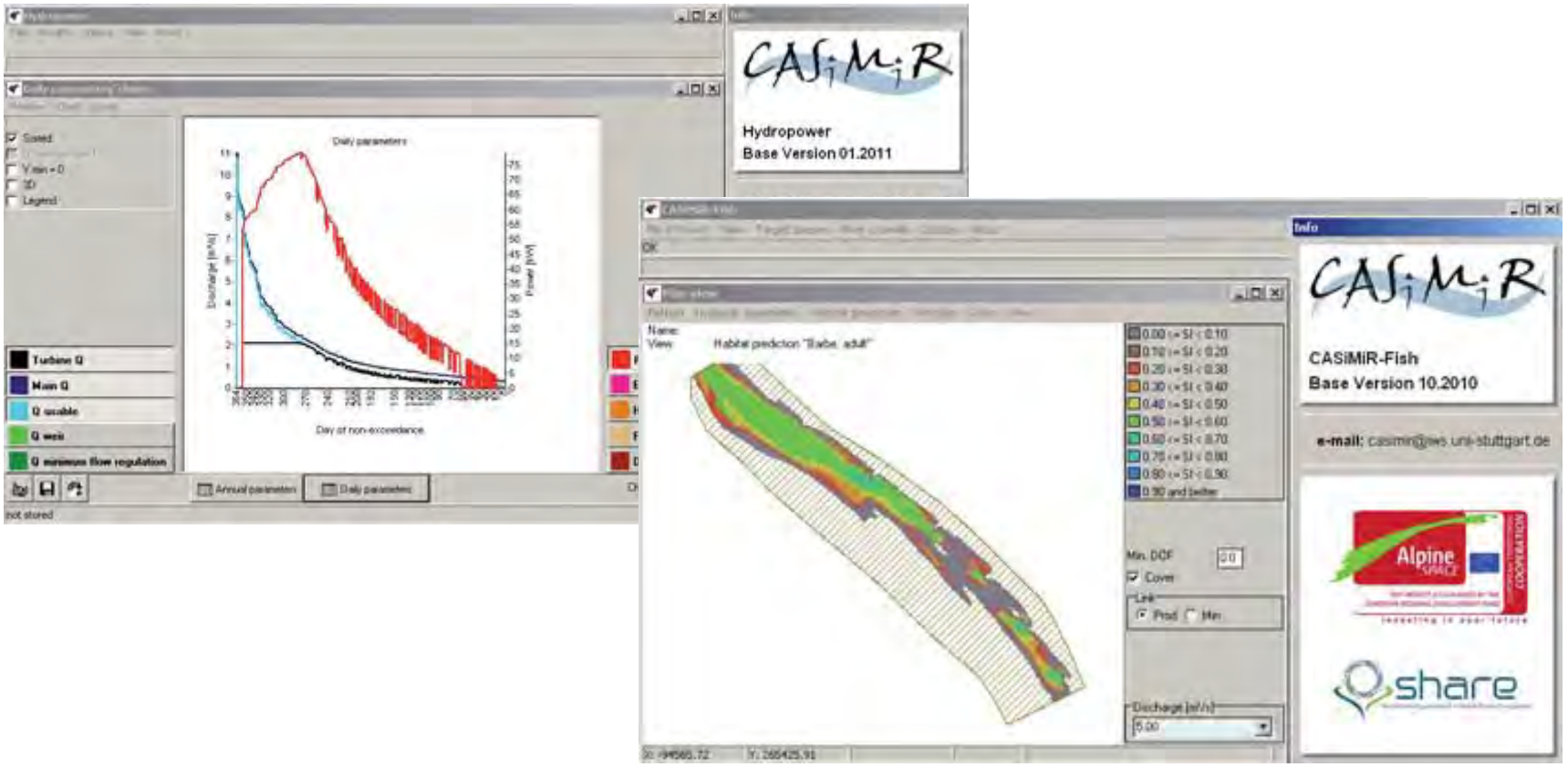
SHARE toolkit for stakeholders

- a user friendly MCA methodology supported by a dedicated software (SESAMO-SHARE) focused on HP & river issues

SHARE toolkit for stakeholders

- a customized software (CASiMiR) to assess habitat conditions along the river channel and bank areas with a specific module for evaluation of economic effects for hydropower production.



SHARE toolkit for stakeholders

- a set of customized software to assess HP residual potential and financial feasibility of HP plants (VAPIDRO ASTE and SMART Mini-Idro)

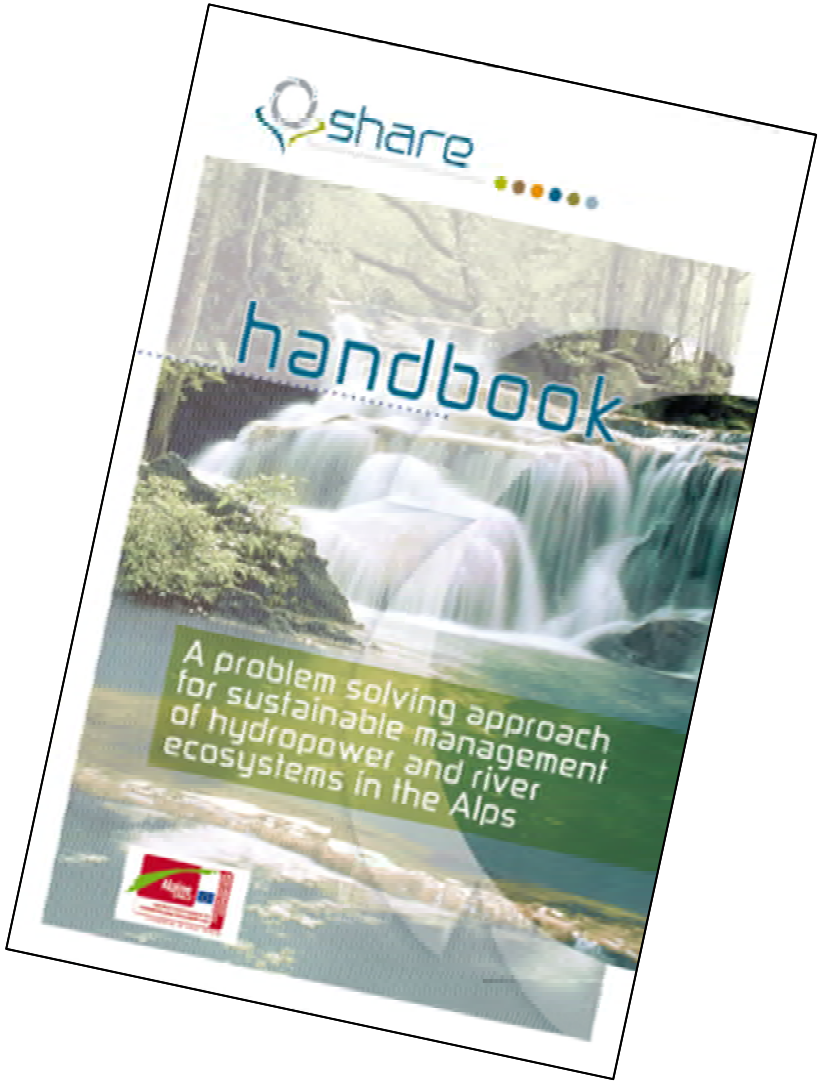
SHARE toolkit for stakeholders

- 11 Pilot Case Studies monographs, alternatives description and decisional trees on which SHARE approach has been tested

SHARE toolkit for stakeholders

- 2 **short videos** "MCA in plain English“ (*Problem to be solved* & *SHARE solution*)
- a MCA tutorial kit with **online seminars and training activities** to *translate & simplify* MCA approach to stakeholders
- an **indicators database** to evaluate HP and HP effects on mountain water bodies
- **Technical reports** to:
  - assess **natural capital** exposed to HP pressure
  - main **pressure elements** on ecosystem components due to general HP schemes
  - define & map **river typologies more vulnerable** to HP pressure (“vulnerability check-list”)
  - **MIF & discharge estimations methods**
  - **HP potential mapping and financial feasibility**
- **Guidelines** to integrate MCA procedures in local normative
- SHARE **handbook**

SHARE toolkit for stakeholders




We can do it!


Thank you for your attention!