

# WP4.4 Pilot Case Studies indicators database for MCA

## Structure of Chalamy decisional tree

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## Summary

### SHORT DESCRIPTION

This document intends to describe the structure of the SESAMO trees project and the MCA application to the Pilot Case Study of Chalamy river.

## Document Control

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## Version Control

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## Summary

The report summarizes the general methodological approach, the criteria and the indicators used to test the multi criteria analysis (MCA) on the Chalamy Pilot Case Study. The report highlights the progression of MCA model development. The main analyzed aspects are:

- Focus on MCA application;
- Criteria, sub-criteria, & Indicators evaluation;
- Layout of the decision tree.

## Structure of Chalamy decisional tree

### The Chalamy river

The Chalamy river is a watercourse characterized by an **high degree of naturalness**, partially included in the **Mont Avic Natural Park**: its basin cover an area of 58 km<sup>2</sup> with an average altitude of 1880 m above sea level.

The river comes at 2560 m from the slopes of Mont Glacier [3185 m] and flows just to confluence with the Dora Baltea river in the Issogne town [365 m].

The high basin of Chalamy river have been declared "**Site of Community Interest**" (**SCI**), included in "**Natura 2000**", the ecological network of the European Union, which intends to ensure the conservation of the habitats and species listed in the EU directives 79/409 and 92/43. The Chalamy river collects the contribution of **many minor tributaries**, including 7 from the left side, characterized by a quick development and high slopes, and 5 from the right side, with more development and lower slopes.

The **hydrological regime**, characterized by **substantial differences in the flow rate**, mainly due to the mainly superficial soils, reaches the **minimum level in the winter** and the **maximum level in the late springtime**.

The considerable and **widespread circulation of underground water** explains the presence of **numerous springs**. The **resurgences** located on the low orographic left side, give rise to particular environmental contrasts, since they are located in basically xeric environments.

### The hydropower plant

The hydropower withdrawal on the Chalamy river is a **steady traverse** in which is fixed the channel who collects also the water of other four small torrents along its way (Covarey, Capiron, Valcrossa e Cretaz).

From the load's pool drops a **penstock** composed of **two pipes** which feed, three groups able to provide an **efficient power of 2.3 MW**, with a **maximum capacity of 0.40 m<sup>3</sup>/sec** and an **hydraulic head of 741 m**. The HP plant is a **run-off plant** with a **catchment area of 28.89 km<sup>2</sup>** and an **average annual production of 15 GWh**. The HP plant was built in 1919, it have been computerized in 1969 and the conduct is automatic stand-alone

### Alternatives description

The alternatives examined with the MCA concern the amount of MIF release. This is in fact the main problem affecting the Chalamy river reach downstream the hydropower withdrawal, because the

current release is not always enough to ensure the presence of flowing water on the entire reach. The Alternatives considered have been 4:

1. **ALTERNATIVE 0** (HISTORICAL MANAGEMENT UNTIL 2008): until 2008 not MIF released.
2. **ALTERNATIVE 1** (20% OF MIF): 20% of the MIF released with the collection of the data referred to each indicator for one year.
3. **ALTERNATIVE 2** (60% OF MIF): 60% of the MIF released with the collection of the data referred to each indicator for one year.
4. **ALTERNATIVE 3** (100% OF MIF): 100% of the MIF released with the collection of the data referred to each indicator for one year.

### The Chalamy river MCA tree

- [-] [ ] ARPA\_VdA\_Chalamy\_tree
  - [-] [ ] ENERGY\_PRODUCTION
    - [-] [ ] Annual\_Energy\_Produced\_[Gwh/year] (F)
    - [-] [ ] Linear\_Annual\_Energy\_Produced\_[Gwh/year] (F)
  - [-] [ ] ECONOMY\_\_Administration\_Level\_[related\_to\_HP\_exploitation]
    - [-] [ ] Economy\_\_Regional\_Level\_[€\_GDP] (F)
  - [-] [ ] ECONOMY\_\_Producer\_Level\_[related\_to\_HP\_exploitation]
    - [-] [ ] Financial\_Outcomes\_\_HP\_Producer\_Level\_[€] (F)
  - [-] [ ] RIVER\_ECOSYSTEM
    - [-] [ ] PHYSICO\_CHEMICAL\_PARAMETERS
      - [+] [ ] Δ\_sub\_LIM\_Escherichiacoli\_UFC/100ml
    - [+] [ ] Δ\_sub\_IBE\_EPT
    - [-] [ ] FISH
      - [+] [ ] Available\_weighted\_Area\_for\_Fish\_\_[IFIM]
      - [-] [ ] Fish\_population\_suitability/potentiality\_index\_[N] (F)
    - [-] [ ] HYDROMORPHOLOGY
      - [+] [ ] Hydrological\_regime
  - [-] [ ] TOURISM\_[and\_other\_river\_fruition]\_[%] (F)
  - [-] [ ] FISHING
    - [+] [ ] Fisherman\_Score
    - [+] [ ] Weightable\_Usable\_Area\_\_IFIM\_\_for\_Adult\_Sizes
  - [-] [ ] LANDSCAPE
    - [-] [ ] Landscape\_Scenary\_Value\_\_Tyrol\_[N] (F)

### SESAMO tree for the Chalamy River Pilot Case Study

## Indicators description – Chalamy River Pilot Case Study

The following section contains the metadata of every indicator used in the Chalamy River Pilot Case Study directly related to MCA SESAMO software.

The structure of the decision tree for the Chalamy river Pilot Case Study considers 7 main branches called **Criteria**:

- **Energy production**
- **Economy at administration level**
- **Economy at producer level**
- **River ecosystem**
- **Tourism**
- **Fishing**
- **Landscape**

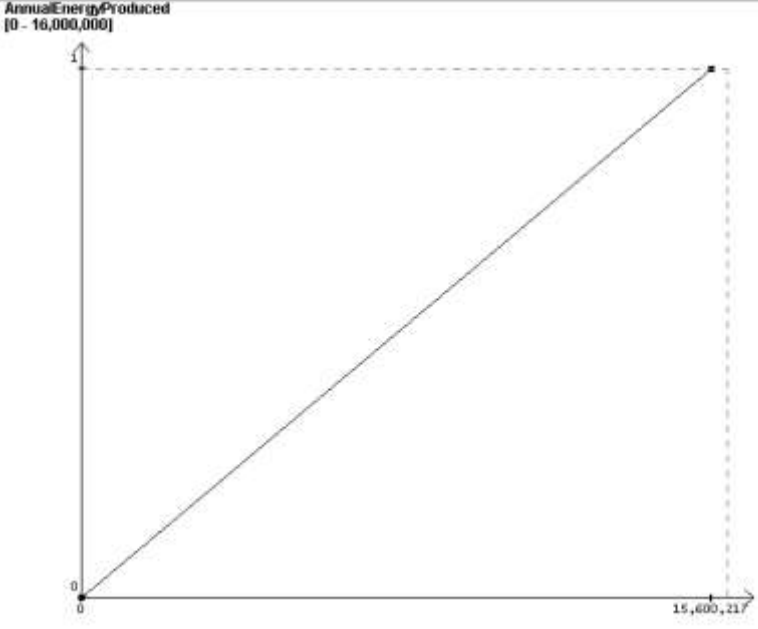
### Energy production

The **Energy production criterion** is divided into **2 indicators**:

- **Annual energy produced**
- **Linear annual energy produced**

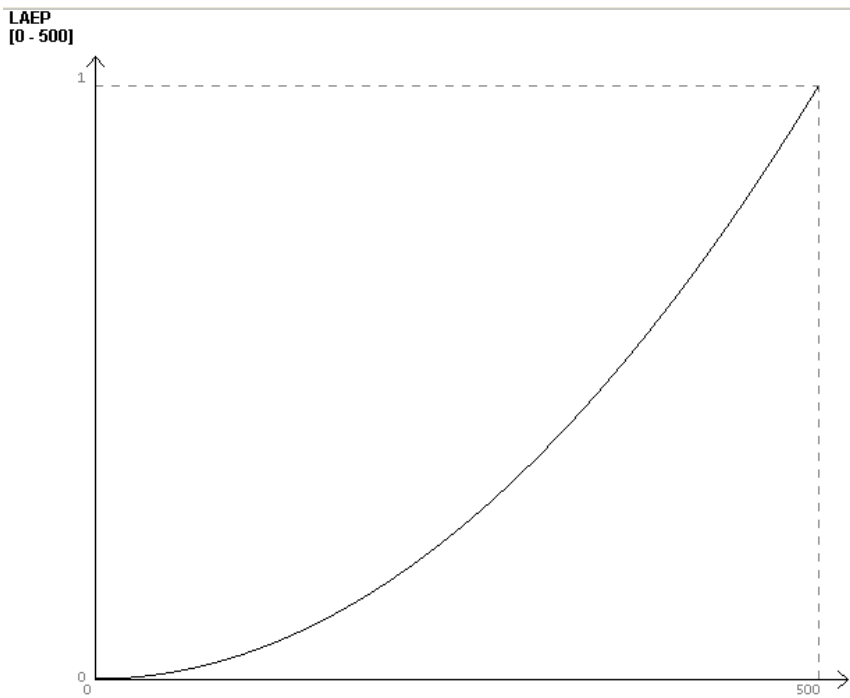
Chalamy tree | ENERGY | Annual energy produced

FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Annual Energy Produced
<b>ACRONYM</b>	/
<b>DPSIR</b>	D (Driving Forces)
<b>DESCRIPTION</b>	This indicator furnishes an evaluation of the annual plant energy production (GWh/year) assessed (for proposed plants not already realized) or measured (for existing plants).
<b>AIM</b>	It furnishes an evaluation of the annual energy production which is the master aim of every HP plant manager
<b>KEY MESSAGE</b>	The HP plant energy produced is the focal aim of every HP plant manager
<b>MEASURE UNIT</b>	GWh/year
<b>REFERENCES</b>	/
FIELD	METHODS AND MONITORING STANDARDS
<b>INDICATOR ELABORATION</b>	This indicator furnishes an evaluation of the annual plant energy production (GWh/year) assessed (for proposed plants not already realized) or measured (for existing plants).
<b>INDICATOR LIMITS</b>	Only data which are provided by the HP plant owner can be used.
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	The Utility Function adopted is LINEAR growing

	
<b>SHARE RELATED INDICATORS</b>	Linear annual energy produced
<b>COUNTRY CODE</b>	IT
<b>WFD HER</b>	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
<b>DATA SOURCE</b>	HP producer
<b>TIME COVER</b>	~ 10 ÷ 1
<b>UPDATE FREQUENCY</b>	Annual
<b>NUT III CODE</b>	ITC20
<b>NORMATIVE REFERENCE</b>	Local
<b>NORMATIVE RELEVANCE</b>	Moderate
<b>SHARE PILOT CASE STUDY</b>	Chalamy river

Chalamy tree | ENERGY | Linear Annual Energy Produced

FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Linear Annual Energy Produced
<b>ACRONYM</b>	/
<b>DPSIR</b>	D (Driving Forces)

<b>DESCRIPTION</b>	This indicator furnishes an evaluation of the annual plant energy production, relative to one length unit of river and to each liter turbined, assessed (for proposed plants not already realized) or measured (for existing plants). The indicator becomes significant when there is two or more alternatives to be appraised in which the points of withdrawal or restitution of the diverted flow are different (where is different therefore the stretch withdrawn) or, in other way, where is set to comparison the productivities of different plants in relation to the unity length of derived river stretch.
<b>AIM</b>	It furnishes an evaluation of the energy production relative to one length unit of river to allow the evaluation of the intrinsically power of each river stretch and allows the comparison between different plants.
<b>KEY MESSAGE</b>	The river energy production related to bypassed river length evaluates the energy river capacity linked to the withdrawal
<b>MEASURE UNIT</b>	GWh/year
<b>REFERENCES</b>	/
<b>FIELD</b>	<b>METHODS AND MONITORING STANDARDS</b>
<b>INDICATOR ELABORATION</b>	The indicator is calculated as the ratio between annual energy produced and river length bypassed by HP for each cubic meter turbined.
<b>INDICATOR LIMITS</b>	/
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	<p>The Utility Function adopted is the following</p>  <p>The graph shows a utility function for LAEP [0 - 500]. The vertical axis (y-axis) is labeled '1' at the top and '0' at the bottom. The horizontal axis (x-axis) is labeled '500' at the right end and '0' at the left end. A dashed line connects the point (500, 1) to the axes. A solid curve starts at the origin (0,0) and rises to the point (500, 1) with a concave-up shape.</p>
<b>SHARE RELATED INDICATORS</b>	Annual power produced
<b>COUNTRY CODE</b>	IT
<b>WFD HER</b>	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>



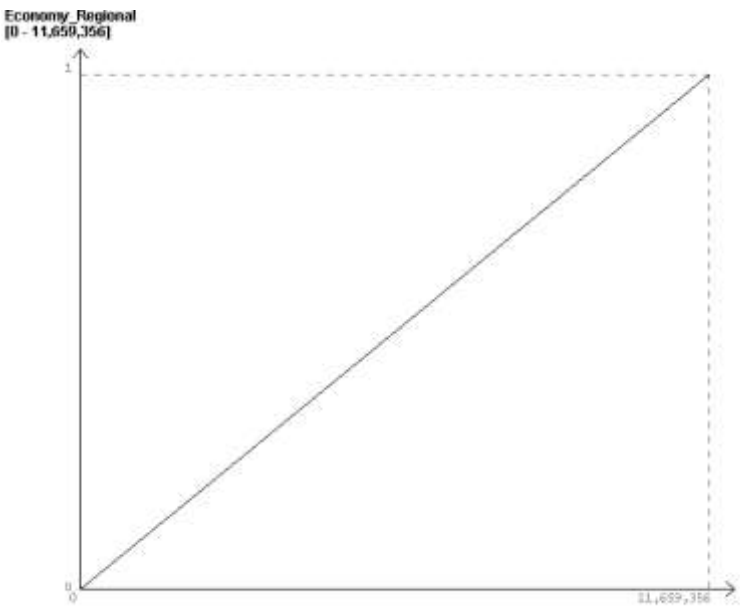
<b>DATA SOURCE</b>	HP producer
<b>TIME COVER</b>	~ 10 ÷ 1
<b>UPDATE FREQUENCY</b>	Annual
<b>NUT III CODE</b>	ITC20
<b>NORMATIVE REFERENCE</b>	Local
<b>NORMATIVE RELEVANCE</b>	Moderate
<b>SHARE PILOT CASE STUDY</b>	Chalamy river

## Economy at administration level

The **Energy at administration level criterion** is detailed by the **Economy regional level indicator**.

Chalamy tree | Economy at administration level | Economy regional level

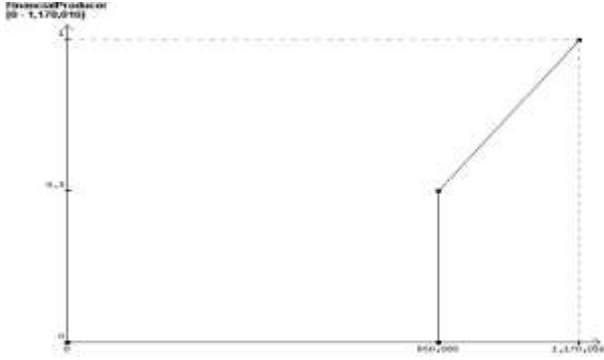
FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Economy - Regional level
<b>ACRONYM</b>	/
<b>DPSIR</b>	P (Pressures)
<b>DESCRIPTION</b>	This indicator furnishes an evaluation of wider direct economic outcomes on the territories in the same administrative region of HP plant location; it assess the degree of satisfaction of regional administrator related to the different management alternatives considered in the MCA. The direct economic outcomes are represented by the fee of derivation concession. If you compare the fee of a single plant to the administration budget it can represent an exiguous percentage to be appreciated and valued; the utility of this indicator can often be represented in the phase of planning on territorial scale where the whole of the new fees related to the new planned plants can have a meaningful weight on the local administration budgets.
<b>AIM</b>	This indicator directly considers the a aims of the public administrator to maximize the economical benefits for local communities.
<b>KEY MESSAGE</b>	The financial outcomes of HP exploitation could / should have an evaluable economic benefit for local communities strictly related to different management alternatives considered in the MCA.
<b>MEASURE UNIT</b>	€ (GDP)
<b>REFERENCES</b>	/
FIELD	METHODS AND MONITORING STANDARDS
<b>INDICATOR ELABORATION</b>	The elaboration has to be shaped on a reasonable assessment on real financial outcomes variability.
<b>INDICATOR LIMITS</b>	The elaboration has to be shaped on a reasonable assessment on real financial outcomes variability.
<b>EVALUATION</b>	/

AVAILABLE UF	YES
UF	The Utility Function adopted is LINEAR growing 
SHARE RELATED INDICATORS	/
COUNTRY CODE	IT
WFD HER	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
DATA SOURCE	HP producer
TIME COVER	~ 10 ÷ 1
UPDATE FREQUENCY	Annual
NUT III CODE	ITC20
NORMATIVE REFERENCE	Local
NORMATIVE RELEVANCE	Bad
SHARE PILOT CASE STUDY	Chalamy river

## Economy at producer level

The **Energy at producer level criterion** is detailed by the **Financial outcomes HP producer level indicator**.

Chalamy tree | Economy at producer level | Financial outcomes HP producer level

FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Financial outcomes - HP producer level
<b>ACRONYM</b>	/
<b>DPSIR</b>	P (Pressures)
<b>DESCRIPTION</b>	This indicator furnishes an evaluation of financial outcomes and degree of satisfaction of HP producer related to the different management alternatives considered in the MCA.
<b>AIM</b>	This indicator directly considers the producer aims that are mainly related to the economics outcomes.
<b>KEY MESSAGE</b>	The financial outcomes are the main aim for investors involved in the HP production: financial conditions strictly shape the different management alternatives considered in the MCA.
<b>MEASURE UNIT</b>	€
<b>REFERENCES</b>	/
FIELD	METHODS AND MONITORING STANDARDS
<b>INDICATOR ELABORATION</b>	The elaboration has to be shaped on a reasonable assessment on real financial outcomes variability.
<b>INDICATOR LIMITS</b>	The economic outcomes of this indicators are related only to the HP producers and not to the territory or the region or the administrative unit.
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	<p>The Utility Function adopted is the following</p> 
<b>SHARE RELATED INDICATORS</b>	/
<b>COUNTRY CODE</b>	IT
<b>WFD HER</b>	INNER ALPS SOUTH
FIELD	DATASOURCES
<b>DATA SOURCE</b>	HP producer

TIME COVER	~ 10 ÷ 1
UPDATE FREQUENCY	Annual
NUT III CODE	ITC20
NORMATIVE REFERENCE	Local
NORMATIVE RELEVANCE	Bad
SHARE PILOT CASE STUDY	Chalamy river

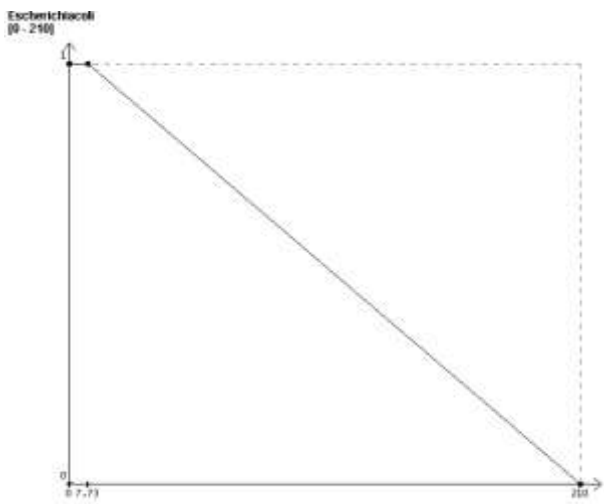
## River ecosystem

The **River ecosystem criterion** is detailed by the **following indicators**:

- $\Delta_{\text{sub LIM}}$  – *Escherichia coli*
- $\Delta_{\text{sub IBE}}$  – EPT taxa
- Available weighted area for fish – IFIM
- Fish population suitability/potentiality index
- Hydrological regime

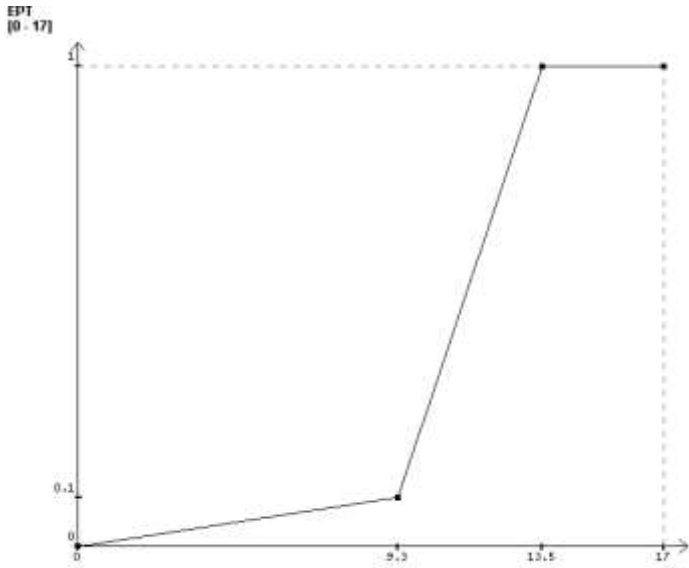
### Chalamy tree | River Ecosystem | $\Delta_{\text{sub LIM}}$ – *Escherichia coli*

FIELD	DESCRIPTION
INDICATOR NAME	$\Delta_{\text{sub LIM}}$ [sub-Livello di Inquinamento da Macrodescrittori] - <i>Escherichia coli</i>
ACRONYM	$\Delta_{\text{sub LIM}}$ - E. coli
DPSIR	P (Pressures)
DESCRIPTION	This indicator furnishes an evaluation of the pollution level due to chemical and microbiological factors through the use of a series of fundamental environmental parameters for the chemical-microbiological characterization of the river: <i>Escherichia coli</i> [UFC/100ml] concentration.
AIM	This indicator furnishes an evaluation of the pollution level due to chemical and microbiological factors through the use of a series of fundamental environmental parameters for the chemical-microbiological characterization of the river: <i>Escherichia coli</i> [UFC/100ml] concentration and total value of Phosphorus [mg/L]. The ratio is referred to the conditions upstream and downstream the point of a water withdrawal point.
KEY MESSAGE	This indicator furnishes an evaluation of the pollution level due to chemical and microbiological factors through the use of a series of fundamental environmental parameters for the chemical-microbiological characterization of the river: <i>Escherichia coli</i> [UFC/100ml] concentration.
MEASURE UNIT	N
REFERENCES	/
FIELD	METHODS AND MONITORING STANDARDS
INDICATOR ELABORATION	It is applied the methodology described for the connected indicators: total Phosphorus (mg / L) and <i>Escherichia coli</i> (UFC/100ml). The index calculation is doing through the attribution of a score to every macro descriptors.
INDICATOR LIMITS	/

EVALUATION	/
AVAILABLE UF	YES
UF	The Utility Function is the following 
SHARE RELATED INDICATORS	/
COUNTRY CODE	IT
WFD HER	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
DATA SOURCE	Eaulogie s.r.l. per CVA trading
TIME COVER	Since 2008
UPDATE FREQUENCY	Montly
NUT III CODE	ITC20
NORMATIVE REFERENCE	National
NORMATIVE RELEVANCE	Poor
SHARE PILOT CASE STUDY	Chalamy river

 Chalamy tree | River Ecosystem |  $\Delta_{sub\ IBE} - EPT\ taxa$ 

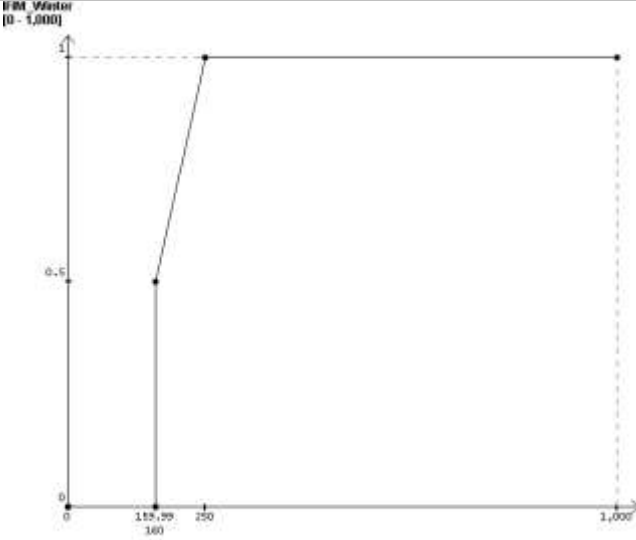
FIELD	DESCRIPTION
INDICATOR NAME	$\Delta_{sub\ IBE}$ [sub-Indice Biotico Estesio]
ACRONYM	$\Delta_{sub\ IBE} - EPT\ taxa$
DPSIR	P (Pressures)
DESCRIPTION	Macrobenthic index founded upon the analysis of the macroinvertebrates community structure that colonizes the different river typologies. The index appraises how the

	<p>present macroinvertebrates community is far from the attended one. This sub-indicator allows to express a water quality judgment on the base of modifications on the macroinvertebrates groups composition [EPT, ...]</p>
<b>AIM</b>	<p>This indicator expresses a quality judgment of a river environment on the base of the macroinvertebrates community composition modifications, induced from factors of pollution of the waters and the sediments or from meaningful physical and morphological alterations of the bankfull.</p>
<b>KEY MESSAGE</b>	<p>This indicator allows to express judgments of quality in river environments on the base of the modifications in the macroinvertebrates community composition</p>
<b>MEASURE UNIT</b>	N
<b>REFERENCES</b>	/
<b>FIELD</b>	<b>METHODS AND MONITORING STANDARDS</b>
<b>INDICATOR ELABORATION</b>	<p>It is carried out the taxa presence/absence analysis of the benthos samples used for the IBE index calculation; from this dataset it's considered a selection of taxa [EPT] and its relative auto-ecological parameters [feeding groups, trophic groups, ...]</p>
<b>INDICATOR LIMITS</b>	<p>The IBE index is not applicable in transitional waters or in extreme situations. This index could be able to underestimate the pollution consequential from organic load.</p>
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	<p>The Utility Function is the following</p> 
<b>SHARE RELATED INDICATORS</b>	/
<b>COUNTRY CODE</b>	IT
<b>WFD HER</b>	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
<b>DATA SOURCE</b>	Eaulogie s.r.l. per CVA trading
<b>TIME COVER</b>	Since 2008
<b>UPDATE FREQUENCY</b>	Seasonal
<b>NUT III CODE</b>	ITC20
<b>NORMATIVE REFERENCE</b>	Regional

<b>NORMATIVE RELEVANCE</b>	Poor
<b>SHARE PILOT CASE STUDY</b>	Chalamy river

Chalamy tree | River Ecosystem | Available Weighted Area for Fish [IFIM]

FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Available Weighted Area for Fish - downstream stretch
<b>ACRONYM</b>	ADP
<b>DPSIR</b>	P (Pressures)
<b>DESCRIPTION</b>	This indicator estimates the amount of habitat available in different stretches of a river for one or more target species, depending on the flow flowing out in bed. It comes from the method of IFIM. In particular, on the basis of morpho-hydraulic information, allows to predict how the environmental typology of the riverbed changes as a function of several discharges. These changes are evaluated in relation with the relative availability of suitable areas of the stream for the biological cycle of a fish species, identified as target species (brown trout and trout in Aosta Valley).
<b>AIM</b>	"IFIM is based on the analysis of habitat for stream-dwelling organisms under alternative management treatments. One could logically question why habitat was chosen as the decision variable in IFIM when there are so many other factors (such as stream productivity or fishing mortality) that can potentially influence fish populations. The simplest reason for basing the analysis on habitat is that IFIM was designed to quantify environmental impacts, and impacts to habitat are the most direct and quantifiable." (Stalnaker et al., 1995, p. 16).
<b>KEY MESSAGE</b>	/
<b>MEASURE UNIT</b>	% N
<b>REFERENCES</b>	/
FIELD	METHODS AND MONITORING STANDARDS
<b>INDICATOR ELABORATION</b>	See IFIM methodology
<b>INDICATOR LIMITS</b>	/
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	The Utility Function is the following

	
<b>SHARE RELATED INDICATORS</b>	/
<b>COUNTRY CODE</b>	IT
<b>WFD HER</b>	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
<b>DATA SOURCE</b>	Eaulogie s.r.l. per CVA trading
<b>TIME COVER</b>	2008
<b>UPDATE FREQUENCY</b>	Annual
<b>NUT III CODE</b>	ITC20
<b>NORMATIVE REFERENCE</b>	Local
<b>NORMATIVE RELEVANCE</b>	Moderate
<b>SHARE PILOT CASE STUDY</b>	Chalamy river

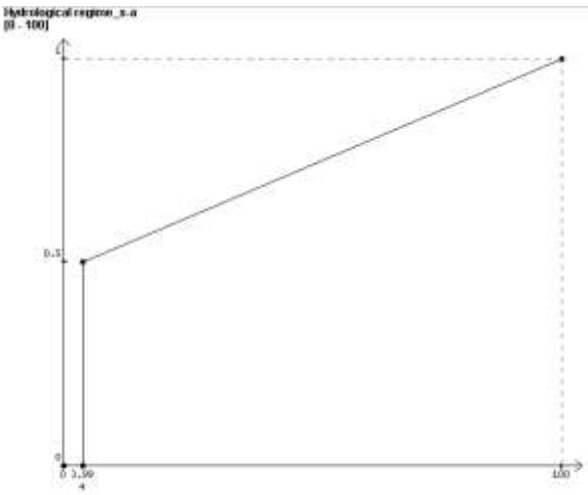
### Chalamy tree | River Ecosystem | Fish population suitability/potentiality index

FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Fish population suitability/potentiality index
<b>ACRONYM</b>	/
<b>DPSIR</b>	S (State)
<b>DESCRIPTION</b>	Indicator designed specifically for the Aosta Valley situation, elaborated from the drafts in the Interreg project "Truites Autochtones" and the "Guidelines for the preparation of new HP project under the PTA." It consists of two sub-indices: 1. Estimation of the population present at the time of sampling. 2. Suitability of fish, as estimated by applying the IFF 2007 (reference no. 10), supported by expert opinion.



<b>AIM</b>	The purpose of this indicator is classified in a simple way the the Aosta Valley streams, and their treats, according to suitability and presence of fish populations.										
<b>KEY MESSAGE</b>	Assessing of the biological condition of the fish population resident in Aosta Valley streams.										
<b>MEASURE UNIT</b>	N										
<b>REFERENCES</b>	/										
<b>FIELD</b>	<b>METHODS AND MONITORING STANDARDS</b>										
<b>INDICATOR ELABORATION</b>	See IFIM methodology										
<b>INDICATOR LIMITS</b>	/										
<b>EVALUATION</b>	/										
<b>AVAILABLE UF</b>	YES										
<b>UF</b>	<p>The Utility Function is the following</p> <table border="1"> <caption>Data points for the Utility Function</caption> <thead> <tr> <th>Fish population (x)</th> <th>Utility Function (y)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> </tr> <tr> <td>2</td> <td>0.75</td> </tr> <tr> <td>3</td> <td>0.5</td> </tr> <tr> <td>4</td> <td>0.25</td> </tr> </tbody> </table>	Fish population (x)	Utility Function (y)	1	1	2	0.75	3	0.5	4	0.25
Fish population (x)	Utility Function (y)										
1	1										
2	0.75										
3	0.5										
4	0.25										
<b>SHARE RELATED INDICATORS</b>	/										
<b>COUNTRY CODE</b>	IT										
<b>WFD HER</b>	INNER ALPS SOUTH										
<b>FIELD</b>	<b>DATASOURCES</b>										
<b>DATA SOURCE</b>	Eaulogie s.r.l. per CVA trading										
<b>TIME COVER</b>	2008										
<b>UPDATE FREQUENCY</b>	Annual										
<b>NUT III CODE</b>	ITC20										
<b>NORMATIVE REFERENCE</b>	Local										
<b>NORMATIVE RELEVANCE</b>	Moderate										
<b>SHARE PILOT CASE STUDY</b>	Chalamy river										

## Chalamy tree | River Ecosystem | Hydrological regime

FIELD DESCRIPTION	
INDICATOR NAME	Hydrological regime
ACRONYM	/
DPSIR	S (State)
DESCRIPTION	Purpose of the hydrological regime indicator is to describe how much the river water regime is far from the natural one, without considering the effects on the biological ecosystem components, but only because peculiar characteristic of a river.
AIM	The aim of this indicator is to describe the "form" of natural discharges, appraising how much these are far from those of the reference status.
KEY MESSAGE	Purpose of the hydrological regime indicator is to describe how much the river water regime is far from the natural one.
MEASURE UNIT	%
REFERENCES	/
FIELD METHODS AND MONITORING STANDARDS	
INDICATOR ELABORATION	The indicator is calculated as percentage of natural discharge available on the river bed.
INDICATOR LIMITS	/
EVALUATION	/
AVAILABLE UF	YES
SHARE RELATED INDICATORS	The Utility Function is the following 
SHARE RELATED INDICATORS	----
COUNTRY CODE	IT
WFD HER	INNER ALPS SOUTH
FIELD DATASOURCES	
DATA SOURCE	/
TIME COVER	/
UPDATE FREQUENCY	/
NUT III CODE	ITC20

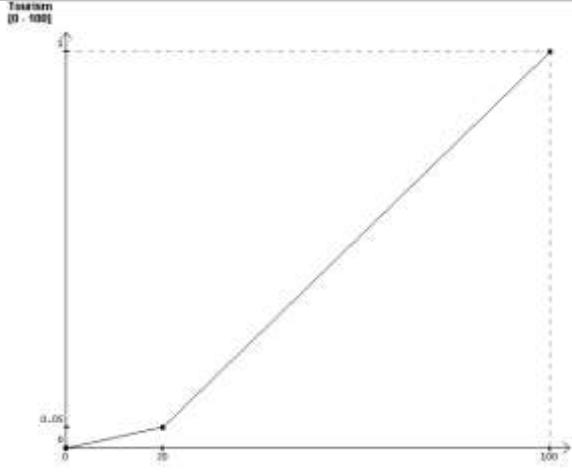
<b>NORMATIVE REFERENCE</b>	/
<b>NORMATIVE RELEVANCE</b>	Poor
<b>SHARE PILOT CASE STUDY</b>	Chalamy river

## Tourism and other river fruition

The **Tourism and other river fruition criterion** is detailed by the **Tourism and other river fruition indicator**.

Chalamy tree | Tourism and other river fruition | Tourism and other river fruition

FIELD	DESCRIPTION
<b>INDICATOR NAME</b>	Tourism and other river fruition
<b>ACRONYM</b>	/
<b>DPSIR</b>	I (Impacts)
<b>DESCRIPTION</b>	It is a simple indicator to assess the satisfaction of tourism sector for different percentage of water flowing out in river bed.
<b>AIM</b>	The indicator aims to assess the satisfaction of tourism sector for different percentage of water flowing out in river bed.
<b>KEY MESSAGE</b>	The indicator assess the satisfaction of tourism sector for different percentage of water flowing out in river bed.
<b>MEASURE UNIT</b>	%
<b>REFERENCES</b>	/
FIELD	METHODS AND MONITORING STANDARDS
<b>INDICATOR ELABORATION</b>	/
<b>INDICATOR LIMITS</b>	/
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	The Utility Function is the following

	
SHARE RELATED INDICATORS	/
COUNTRY CODE	IT
WFD HER	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
DATA SOURCE	/
TIME COVER	Once
UPDATE FREQUENCY	/
NUT III CODE	ITC20
NORMATIVE REFERENCE	/
NORMATIVE RELEVANCE	Bad
SHARE PILOT CASE STUDY	Chalamy river

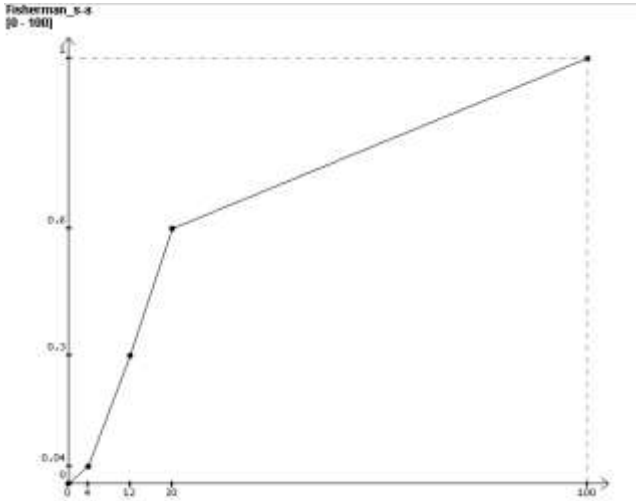
## Fishing

The **Fishing criterion** is detailed by the **two indicators**:

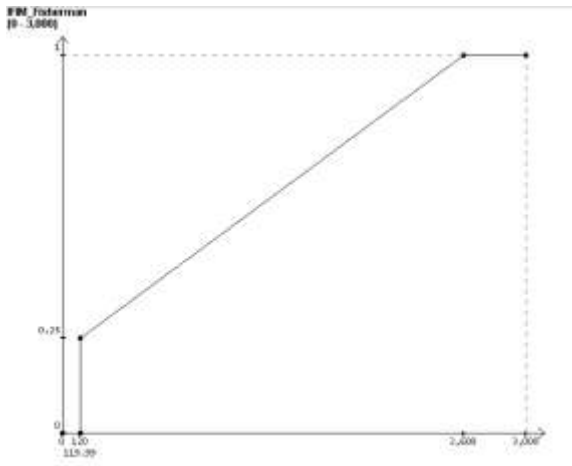
- **Fisherman score**
- **Weightable usable area [IFIM] for adult sizes**

[Chalamy tree](#) | [Fishing](#) | [Fisherman score](#)

FIELD	DESCRIPTION
INDICATOR NAME	Fisherman score
ACRONYM	/
DPSIR	I (Impacts)
DESCRIPTION	It is a simple indicator to assess the satisfaction of fishermen sector for different percentage of water flowing out in river bed.
AIM	The indicator aims to assess the satisfaction of fishermen sector for different percentage of water flowing out in river bed.

<b>KEY MESSAGE</b>	The indicator assess the satisfaction of fishermen sector for different percentage of water flowing out in river bed.
<b>MEASURE UNIT</b>	%
<b>REFERENCES</b>	/
<b>FIELD</b>	<b>METHODS AND MONITORING STANDARDS</b>
<b>INDICATOR ELABORATION</b>	/
<b>INDICATOR LIMITS</b>	/
<b>EVALUATION</b>	/
<b>AVAILABLE UF</b>	YES
<b>UF</b>	<p>The Utility Function is the following</p> 
<b>SHARE RELATED INDICATORS</b>	/
<b>COUNTRY CODE</b>	IT
<b>WFD HER</b>	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
<b>DATA SOURCE</b>	/
<b>TIME COVER</b>	/
<b>UPDATE FREQUENCY</b>	Once
<b>NUT III CODE</b>	ITC20
<b>NORMATIVE REFERENCE</b>	/
<b>NORMATIVE RELEVANCE</b>	Bad
<b>SHARE PILOT CASE STUDY</b>	Chalamy river

## Chalamy tree | Fishing | Weightable usable area [IFIM] for adult sizes

FIELD	DESCRIPTION										
INDICATOR NAME	Weightable usable area [IFIM] for adult sizes										
ACRONYM	/										
DPSIR	I (Impacts)										
DESCRIPTION	Starting from the application of IFIM methodology, this indicator estimates the amount of habitat available in different stretches of a river for the adults of target species, depending on the flow flowing out in bed. In particular, on the basis of morpho-hydraulic information, allows to predict how the environmental typology of the riverbed changes as a function of several discharges. These changes are evaluated in relation with the relative availability of suitable areas of the stream for the adult size of brown trout and trout in Aosta Valley.										
AIM	“IFIM is based on the analysis of habitat for stream-dwelling organisms under alternative management treatments. One could logically question why habitat was chosen as the decision variable in IFIM when there are so many other factors (such as stream productivity or fishing mortality) that can potentially influence fish populations. The simplest reason for basing the analysis on habitat is that IFIM was designed to quantify environmental impacts, and impacts to habitat are the most direct and quantifiable.” (Stalnaker et al., 1995, p. 16).										
KEY MESSAGE	The indicator measures the weightable wetted area of a stream and its suitability for use by adult fishes.										
MEASURE UNIT	% N										
REFERENCES	/										
FIELD	METHODS AND MONITORING STANDARDS										
INDICATOR ELABORATION	See IFIM methodology										
INDICATOR LIMITS	/										
EVALUATION	/										
AVAILABLE UF	YES										
UF	<p>The Utility Function is the following</p>  <table border="1"> <caption>Data points for the Utility Function (UF)</caption> <thead> <tr> <th>IFIM Value</th> <th>UF Value</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> </tr> <tr> <td>120</td> <td>0.25</td> </tr> <tr> <td>2,400</td> <td>1</td> </tr> <tr> <td>3,000</td> <td>1</td> </tr> </tbody> </table>	IFIM Value	UF Value	0	0	120	0.25	2,400	1	3,000	1
IFIM Value	UF Value										
0	0										
120	0.25										
2,400	1										
3,000	1										
SHARE RELATED INDICATORS	/										
COUNTRY CODE	IT										

WFD HER	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
DATA SOURCE	Eaulogie s.r.l. per CVA trading
TIME COVER	2008
UPDATE FREQUENCY	Once
NUT III CODE	ITC20
NORMATIVE REFERENCE	Local
NORMATIVE RELEVANCE	Moderate
SHARE PILOT CASE STUDY	Chalamy river

## Landscape

The **Landscape criterion** is detailed by the **Landscape Scenery Value for Tyrol indicator**.

### Chalamy tree | Landscape | Landscape Scenery Value for Tyrol

FIELD	DESCRIPTION
INDICATOR NAME	Landscape Scenery Value for Tyrol
ACRONYM	/
DPSIR	S (State)
DESCRIPTION	This indicator has been developed and applied in Tyrol (AT) to assessing the HP facilities impact on the landscape. This indicator is fully described on the document "Bewertung der Wasserkraft in Tirol - Kriterienkatalog Version 3.0".
AIM	This indicator aims to assess the HP facilities impact on the landscape.
KEY MESSAGE	This indicator assess the HP facilities impact on the landscape.
MEASURE UNIT	N
REFERENCES	/
FIELD	METHODS AND MONITORING STANDARDS
INDICATOR ELABORATION	<p>The assessment conducted on the qualitative parameters: Visibility Diversity/ Uniqueness/ Beauty for:</p> <ul style="list-style-type: none"> <li>- Origin of the landscape elements</li> <li>- Uniqueness</li> <li>- Representativity</li> <li>- Recreational Value</li> </ul> <p>The final value is the sum of the sub-criteria (parameter) Visibility, Origin of the landscape elements, Uniqueness, Representativity and Recreational Value. The indicator is articulated in 5 different quality classes (from 1 - high, to 5 - bad).</p>
INDICATOR LIMITS	/
EVALUATION	/
AVAILABLE UF	YES
UF	The Utility Function is the following

	
SHARE RELATED INDICATORS	/
COUNTRY CODE	IT
WFD HER	INNER ALPS SOUTH
<b>FIELD</b>	<b>DATASOURCES</b>
DATA SOURCE	"Bewertung der Wasserkraft in Tirol - Kriterienkatalog Version 3.0"
TIME COVER	/
UPDATE FREQUENCY	Once
NUT III CODE	ITC20
NORMATIVE REFERENCE	/
NORMATIVE RELEVANCE	Bad
SHARE PILOT CASE STUDY	Chalamy river

## Weights assignment

The weights ( $W$ ) assigned to the different criteria are shown in the following table.

CRITERIA	WEIGHT	INDICATORS	WEIGHT
Energy production	0.1	Annual energy produced	0.25
		Linear annual energy produced	0.75
Economy at administration level	0.06	Economy at regional level	1
Economy at producer level	0.06	Financial outcomes	1
River ecosystem	0.25	$\Delta_{\text{sub LIM}} - \textit{Escherichia coli}$	2
		$\Delta_{\text{sub IBE}} - \text{EPT taxa}$	2
		Fish	48
		Hydrological regime	48
Tourism and other river fruition	0.15	Tourism and other river fruition	1
Fishing	0.17	Fisherman score	75



		Weightable usable area [IFIM] for adult sizes	25
Landscape	0.21	Landscape Scenary value for Tyrol	1

## Evaluation of alternatives performance

Calculations have been made for four different Alternatives regarding MIF release. The score of the indicators for the Alternatives explanation are showed in the following table.

CRITERIA	ALT. 0	ALT. 1	ALT. 2	ALT. 3
	HISTORICAL MANAGEMENT UNTIL 2008	20% OF THE MIF	60 % OF THE MIF	100 % OF THE MIF
Annual Energy Produced [GWh/year]	0.025	0.023	0.015	0.011
Linear Annual Energy Produced [GWh/year]	0.071	0.061	0.022	0.013
Economy at regional level [€ GDP]	0.06	0.06	0.06	0.06
Economy at producer level [€]	0.06	0.051	0	0
$\Delta_{\text{sub LIM Escherichia coli}}$ [N]	0.004	0.005	0.003	0.004
$\Delta_{\text{sub IBE EPT taxa}}$ [N]	0.003	0.002	0.002	0.003
Available Weighted Area for Fish [IFIM] [% N]	0.004	0.009	0	0.01
Fish population suitability/potentiality index [N]	0	0	0	0
Hydrological regime [%]	0	0.032	0.04	0.047
Tourism and other river fruition [%]	0	0.002	0.004	0.008
Fisherman Score [%]	0	0.005	0.031	0.066
Weightable Usable Area [IFIM] for Adult Sizes [% N]	0.004	0.01	0	0.008
Landscape Scenary Value Tyrol [N]	0	0	0	0.052