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# Integral assessment of suitability of main watercourses in the Upper Soča Basin for present water uses

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Coordinated Activities for Management of Isonzo - Soča

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Javni razpis št.03/2011: projekt CAMIS - Usklajene aktivnosti za upravljanje reke Soče / Attivita coordinate per la gestione del fiume Isonzo / Coordinated activities for management of Isonzo

# Needs and challenges

- **Need for comprehensive water management**: good ecological status of water and aquatic ecosystems (river conservation and restoration objectives), flood and erosion risk management, water uses,
- Challenge is **to harmonize crosswise objectives** (e.g. RES – HP vs good ecological status) in the processes of river restoration,
- Need for spatially comprehensive analysis and researches to avoid sporadical and non-systematic water uses or measures planning and to ensure integrated assessment of watercourses by their **suitability for selected water uses** or their **need for conservation or restoration**
- Need for methodological support which is objective, transparent and repetitive,
- Need for active **multi/cross sectoral** stakeholder participation.

- Analysis of legislation in the field of water management,
- Studies of river hydro morfology, hydrologic and hydraulic modelling,
- Spatial modelling of selected water uses to support future development,
- Monitoring of a quality of bathing waters,
- Practices for maintenance of watercourses with connection to the renovation of traditional footbridges,
- Equipment of water entrances for recreational use of Soča river,
- Development planning of Nature Park of Zgornja Idrijca (Upper Idrijca river); renovation of Nature Park of Turjak,
- Development Programme with elaboration of support sectoral studies for spatial planning of selected areas.

# Pilot Area

**Catchment area:**

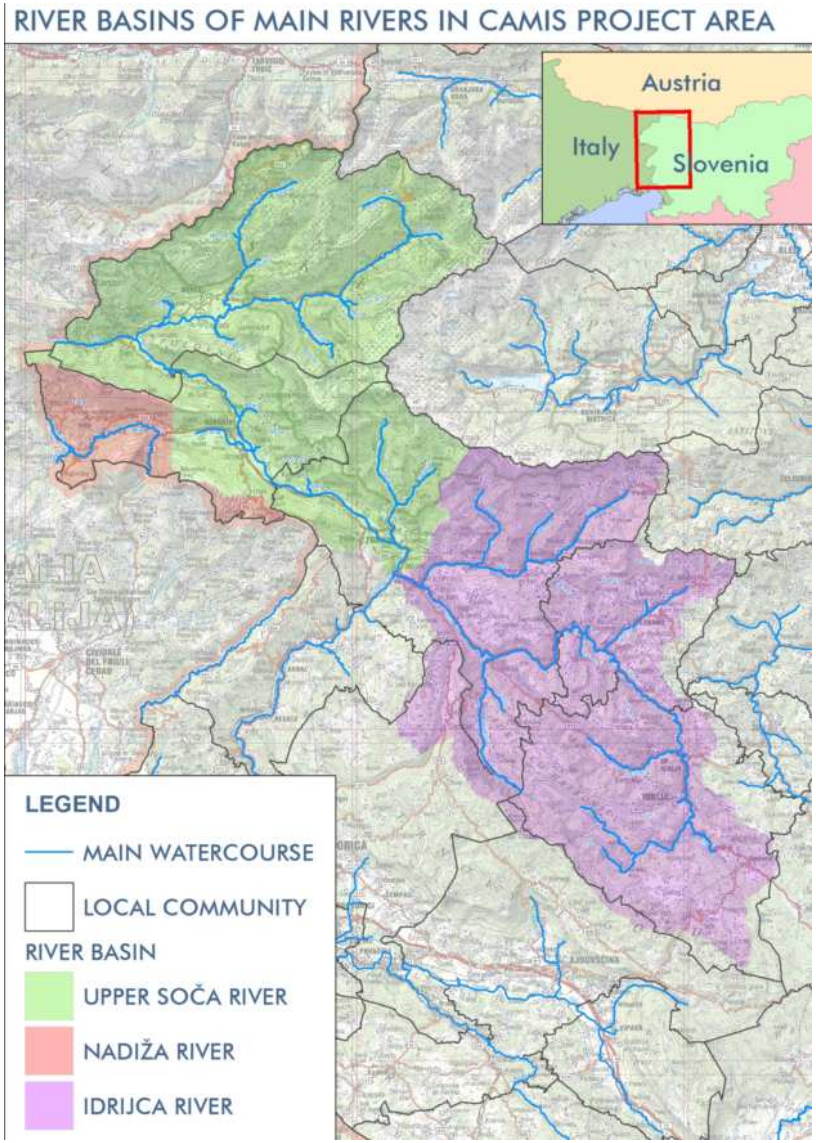
- The upper part of catchment area of the Soča river with its main tributaries Idrijica river and Nadiža river, cca. 1500 km2,
- From spring of The Soča River to the dam of HPP Doblar,
- 5 Local Communities

**Considered watercourses:**

- 37 watercourses with catchment area exceeding 10 $km^2$,
- Total length cca. 300 km.

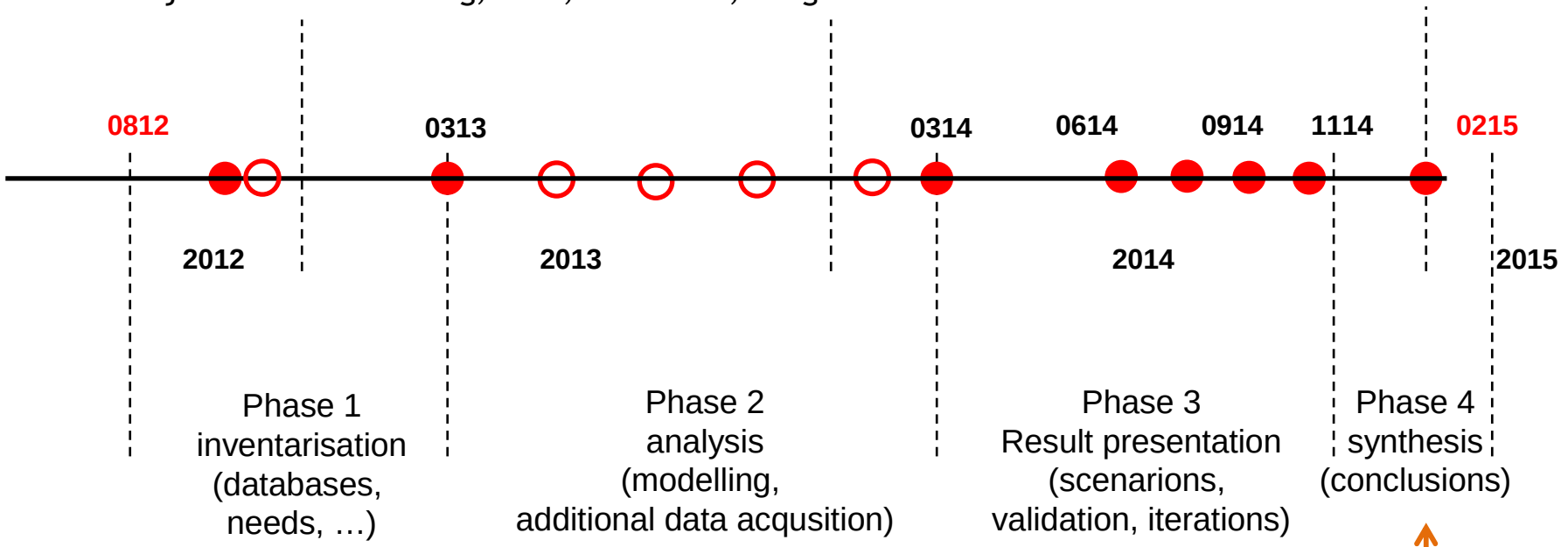
**Modelled water uses:**

- Hydropower, fish farming, bathing areas, fishery (appropriate sites to accesses watercourses)



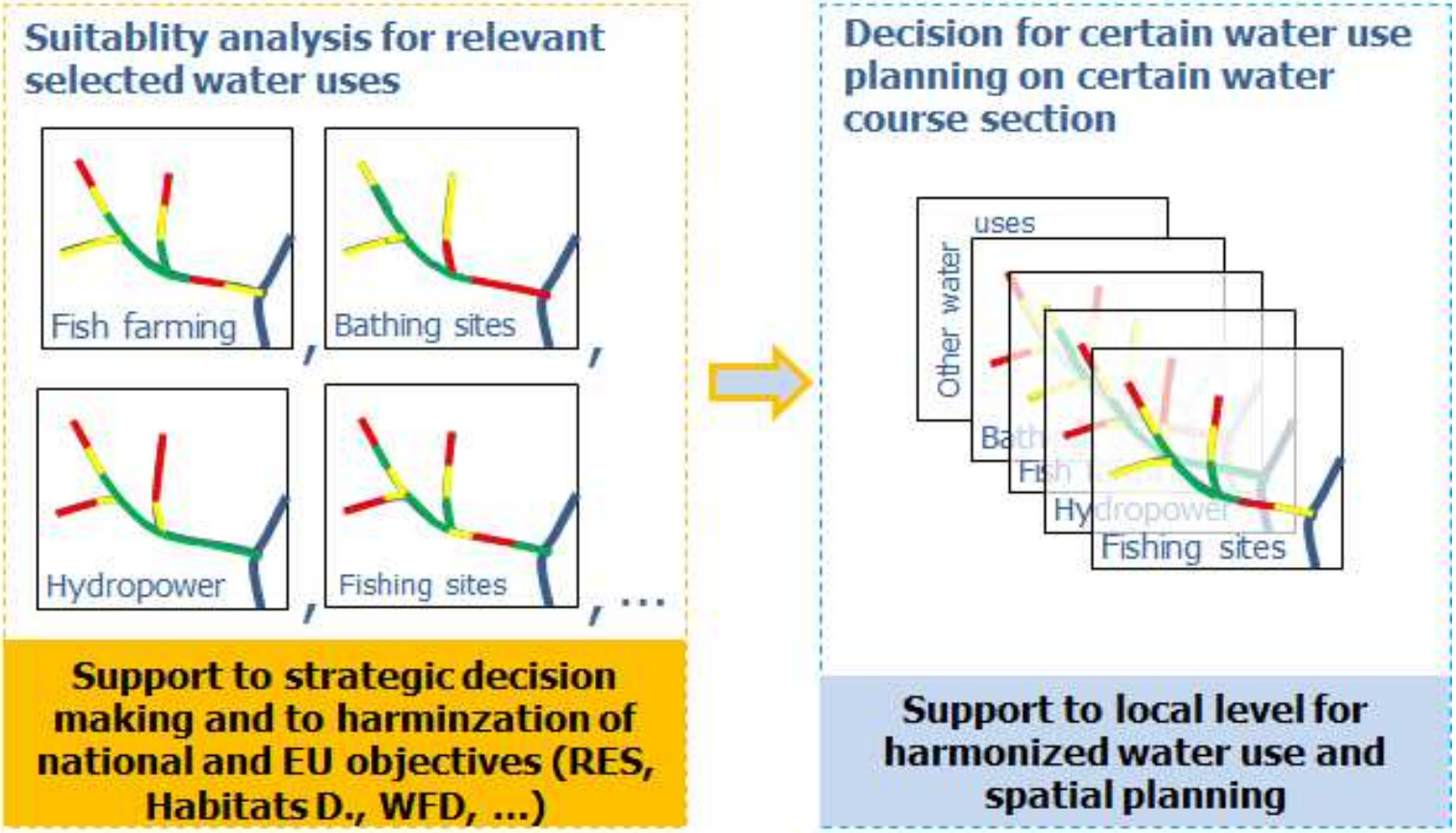
# Stakeholder participation

- Partnership meetings,
- Individual meetings and common workshops with national (water management, nature preservation, fisheries, energy) and local competent authorities or organizations (spatial planning, tourism, hydropower, …) to provide information which water uses should be a subject to the modelling, data, indicators, weights etc.




Final results will support decision making on sectoral strategic level. Objective is to prepare the results to be cross-sectoraly agreed.

# Objective

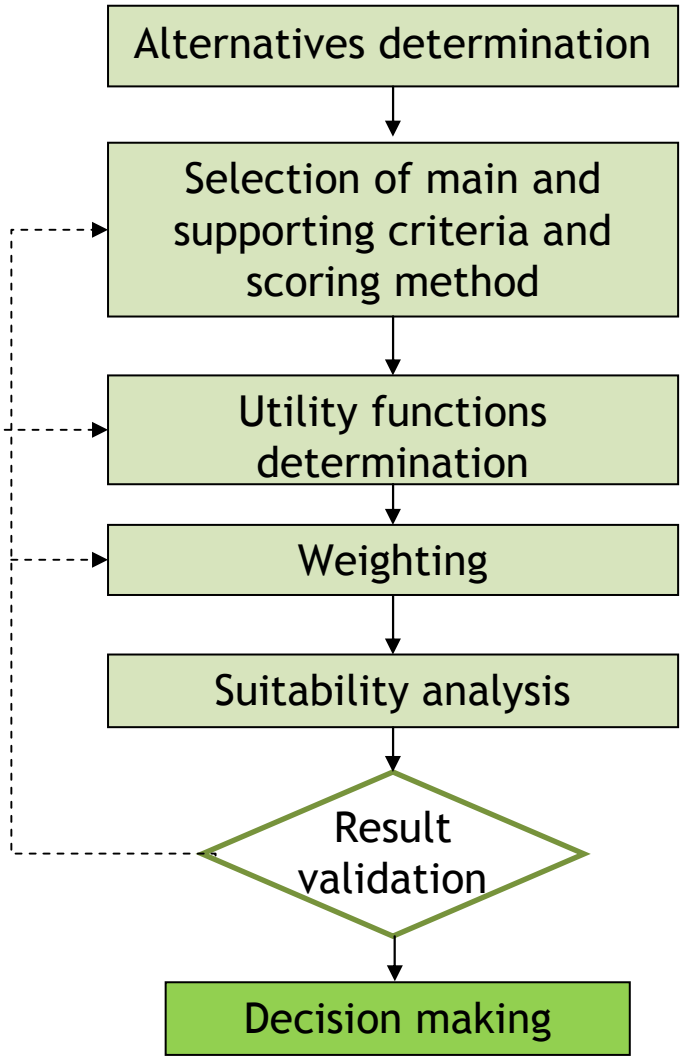



**Fieldwork**
production and verification of data and verification of the results

**Expert work**
data analysis and modeling

**Communication with stakeholders**
at multiple levels:
-Expert support,
-Verification, results presentation

# Basic concept of Multi Criteria Analysis




Segmentation of analysed watercourses into segments with equal length (50m): hydropower; rasters in riparian land (cells 5x5m): fish farming, bathing sites, fishing sites.

Main criteria: attraction for analysed water use, ecology value and landscape value (ICPDR and AS guidances). Sets of supporting criteria. As scoring method summation method with normalization is selected.

Normalized functions (discrete, continuous, linear, non-linear, …).

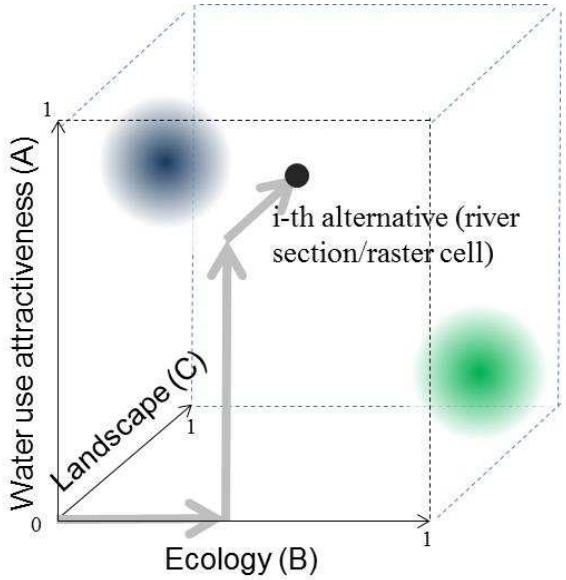
Based on stakeholder questionaires. Normalization.

On the basis of defined parmeters provides information which watercourse sections or areas are more suitable for certain water use On the basis of their attractiveness, ecological and landscape value.

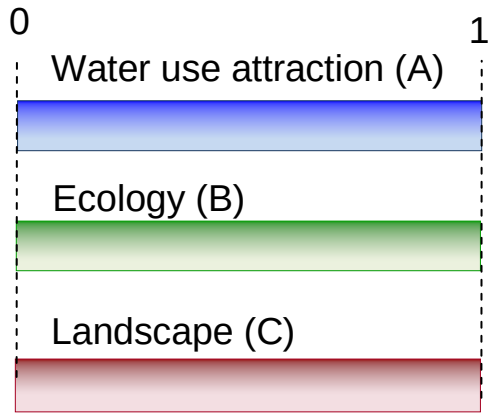
On the basis of mulitple stakeholder discussions results are validated. If agreement can not be reached the process can return to previous steps. E.g. modification of weights and utility functions, selection of additional criteria or modification of scoring method.

# Scoring method

Assessment matrix




Scoring of main criteria




$$A\,(B,C)_i = \sum_{j=1}^{Indicators} \|f_j(x_{ij})\| * \|w_j\|$$

0 — Suitability for analysed water use — 3

$$Suitability_{\,i} = A_i + (1 - B_i) + (1 - C_i)$$

- Three main criteria in comparison to the proposed assesement matrix in ICPDR Guiding Principles for HP development, where assessment of Ecology and Landscape issues are joint.
- Applied colour scale is not so strict: green – conservation or return to a natural state, blue – suitable for water use planning, yellow – not defined yet, uncertainty for water use planning is high).

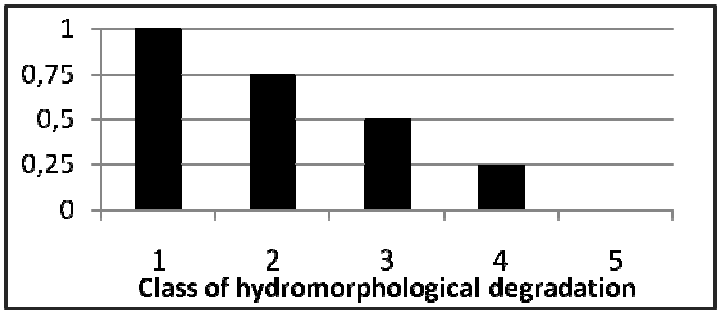
# Scoring method

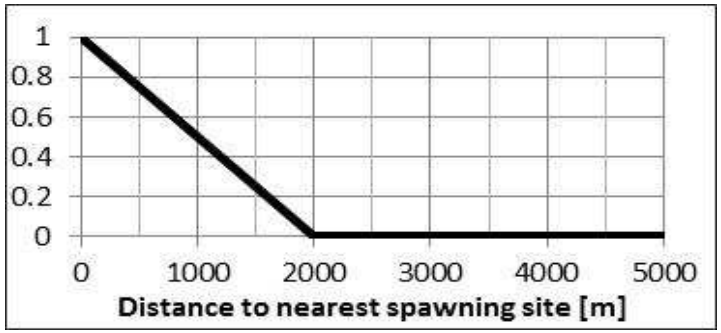
Example of supporting indicators with weight assigment (Ecology - B)

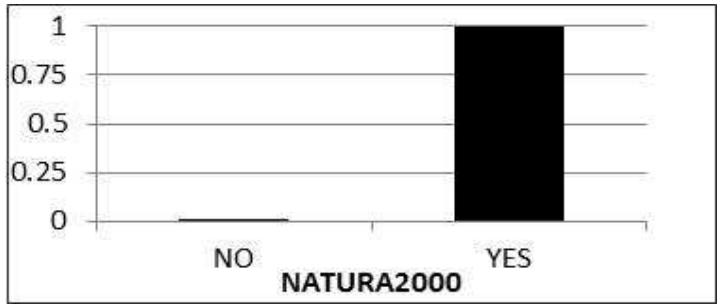
| Supporting indicators | Weight | \|\|weight\|\| |
|---|---|---|
| **Hydromorph. degradation** | 5.0 | 0.227 |
| **Spawning areas** | 6.0 | 0.273 |
| **Natura 2000** | 5.0 | 0.227 |
| **Nature value** | 3.0 | 0.136 |
| **Ecologicaly important areas** | 3.0 | 0.136 |
| **Protected areas** | 3.5 | 0.159 |

$$A\,(B,C)_i = \sum_{j=1}^{Indicators} \|f_j(x_{ij})\| * \|w_j\|$$

Examples of utility functions (each segment or raster cell is evaluated by all selected supporting indicators)

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# Supporting indicators

## Attractiveness (A):

### Hydropower

| Indicator | \|w\| |
|---|---|
| HE potential | 0,32 |
| Existing barriers | 0,0* |
| Existing HP schemes | 0,27 |
| Road access | 0,18 |
| Electric grid access | 0,14 |
| Land slide risk | 0,09 |

### Fish farming

| Indicator | \|w\| |
|---|---|
| Available discharge | 0,33 |
| Road access | 0,33 |
| Electric grid access | 0,33 |
| Land slope < 5 % is an exclusion indicator | |

### Bathing sites

| Indicator | \|w\| |
|---|---|
| Slope | 0,15 |
| Aspect/Orientation | 0,10 |
| Distance from roads | 0,25 |
| Distance from public transport | 0,15 |
| Distance from natural watercourses | 0,10 |
| Land usage | 0,25 |

### Fishing sites

| Indicator | \|w\| |
|---|---|
| Slope | 0,20 |
| Distance from roads | 0,30 |
| Distance from watercourse | 0,10 |
| Distance from fishing districts | 0,25 |
| Land usage | 0,15 |

## Ecology (B) - *weights are given for HP*

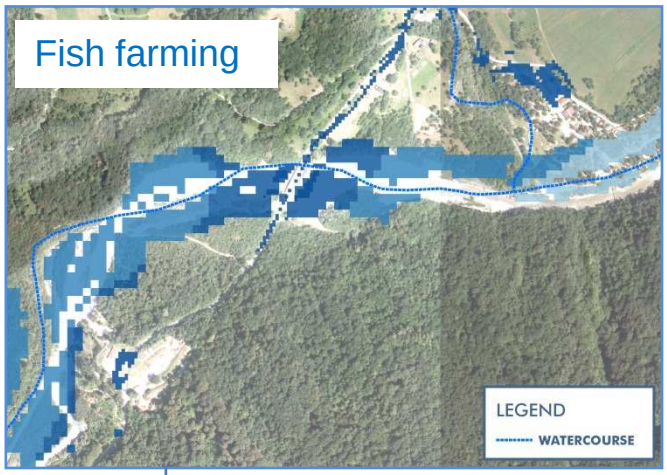
| Indicator | \|w\| |
|---|---|
| Spawning sites | 0,24 |
| Natura 2000 | 0,20 |
| Hydromorphologic degradation – HP *(Non native fish species (Fish farming)* | 0,20 |
| Nature values | 0,11 |
| Ecology important areas | 0,11 |
| Protected areas | 0,14 |

## Landscape (C)

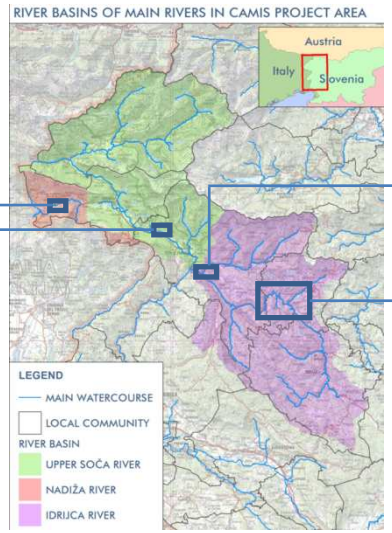
| Indicator | \|w\| |
|---|---|
| Visibility from sightseeing point | 1/6 |
| Visibility from touristic camps | 1/6 |
| Value of landscape unit | 1/6 |
| Outstanding landscape | 1/6 |
| Recognized landscape | 1/6 |
| Visibility from outstanding landscape | 1/6 |

*Guidances to select indicators: Data availability (*), Representativeness, Redundancy*

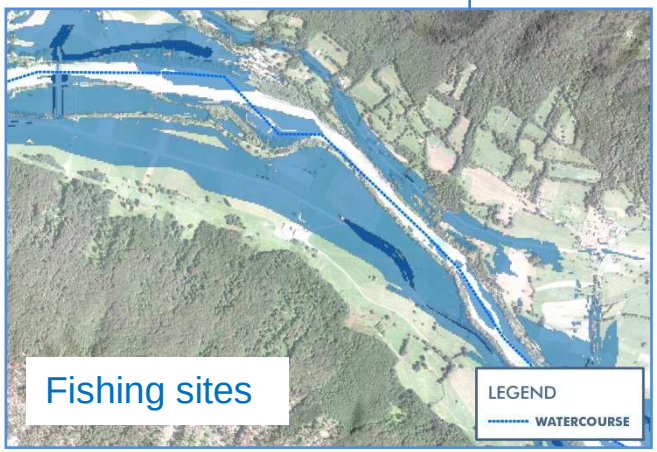
# Preliminary results on the attractiveness

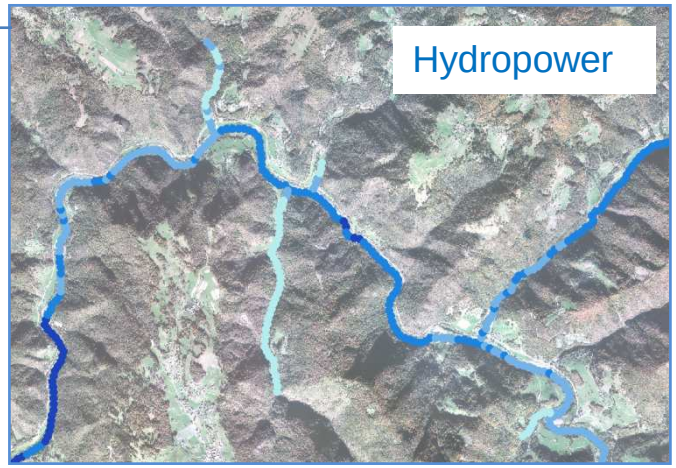



LEGEND
ATTRACTIVENESS
0,0 - 0,2
0,2 - 0,4
0,4 - 0,6
0,6 - 0,8
0,8 - 1,0

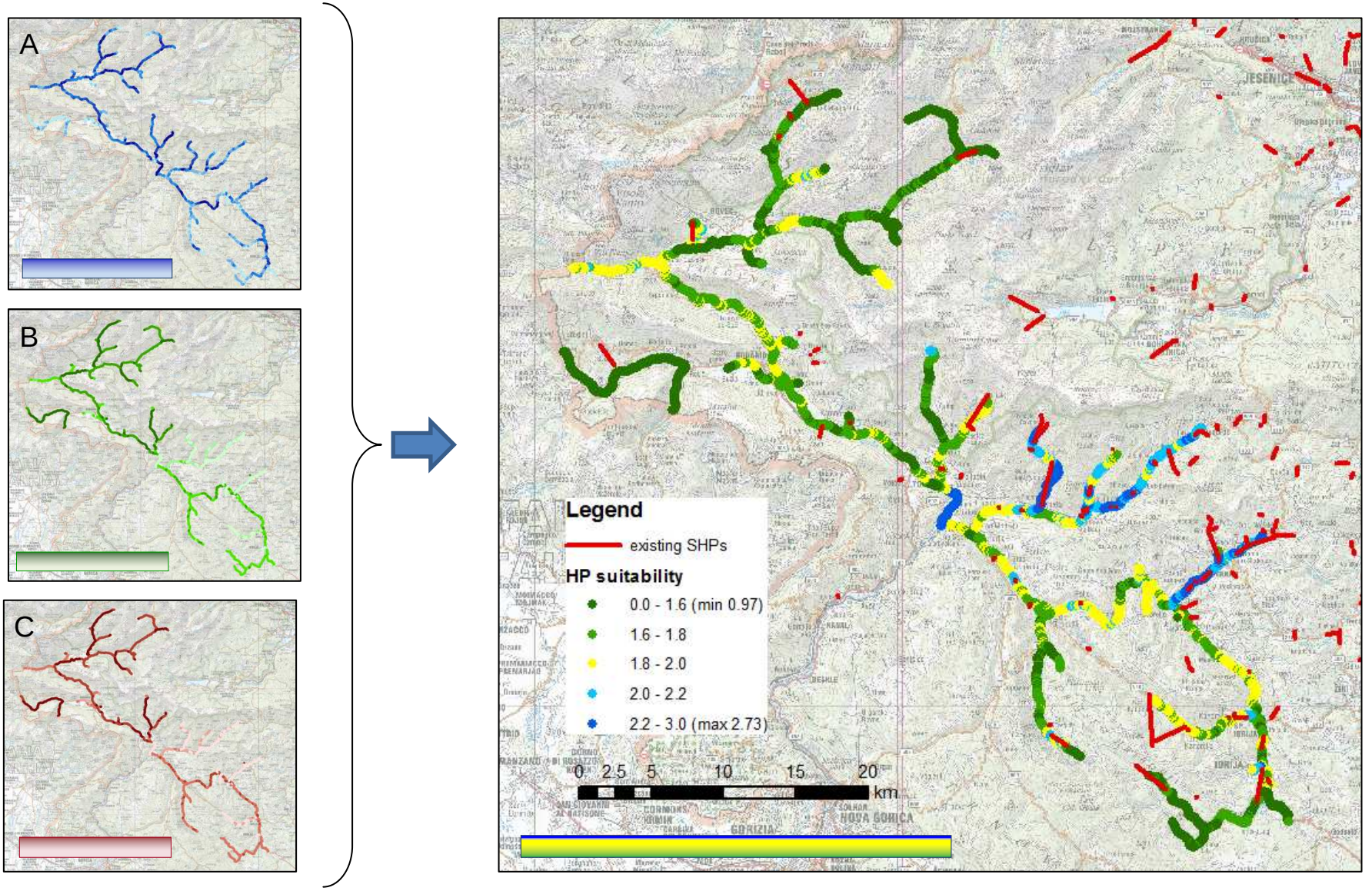






# Preliminary results on the suitability – example for HP



# Some outcomes

- The method (multiple criteria analysis) provides objectivity, transparency and repetitiveness. Determination of classes of suitability is left to decision makers,
- Main challenges in modelling: The accuracy of information on water surface and land slope of the terrain, overlapping of individual data layers in different formats (vector and raster),
- Exclusion areas are not included in the analysis to provide the information for result validation (also watercourses with existing water use). They can be simply included in the method with application of conditioning,
- Many micro HPP are situated on watercourses with catchment size lower then 10 km2 (exclusion zones by RBMP in Slovenia). How to deal with this issue when the concession rights will expire?
- Additional indicators or criteria (in the method or afterwards) could be included in the field of socio – economic issues.

# Some conclusions

- Developed method:
  - is a viable approach for water use suitability analysis and can support decision making on local and national strategic level; validation on larger scale or in other regions should be performed,
  - if applied on regional or national scale it could give a comprehensive framework for the process of justification of the exemptions on the basis of harmonization of local and national objectives (e.g. by Article 4.7 of WFD) on one side and for the process of decision making which areas should be preserved and also restored (e.g. by removing of lateral barriers or existing water use) on the other side,

- To assure results to be mutually (or multisectoraly) agreed **multi/cross sectoral** stakeholder participation is required in the process.

Thank you for your attention.

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