IDES

Improving water quality in the Danube River and its tributaries by integrative floodplain management based on Ecosystem Services

DTP3-389-2.1 – IDES

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O T2.2 Water quality management concepts in five pilot areas

Compiled by UB-RCSES, responsible for work package T2

Dr. Mihai Adamescu, Dr. Relu Giuca, Dr. Constantin Cazacu (UB-RCSES) & Corina Gheorghiu (WWF)

with support of the entire IDES partnership

CONTENT

SUMMARY

In WP T2 sustainable and effective water quality management actions in five pilot areas have been identified during two local stakeholder workshops (OT2.1).

Two stakeholder workshops with all relevant stakeholders (agriculture, forestry, fishery), local authorities, regional authorities (nature conservation, water management, drinking water, tourism), NGOs, sectoral agencies) were held in each of the five pilot areas in AT, HU, SI, RS and RO.

In the first workshops the stakeholders were informed about the necessity to improve water quality, but also about the wide variety of ecosystem services offered by rivers and floodplains to the benefit of society. Stakeholders of the pilot areas developed a fuzzy cognitive model (FCM) on the relations between ecosystem services (ES), pressures and measures for their area. In a second workshop stakeholders used the results of the ES assessment of the status quo based on spatial data and the FCM to discuss the effects of different management scenarios on water quality and on ES. They discussed and identified the best possible solutions to improve water quality and co-created water quality management concepts.

All workshops followed a common design. The various management options regarding water quality were introduced and discussed according to the local situation. The workshops enabled the stakeholders to emphasize their needs, suggestions and the supposed conflicts. The stakeholders outline the usage and the potentials of water quality related ES in different pilot areas. The outcomes of these workshops identify practical water quality management solutions in floodplains of the pilot areas.

1. INTRODUCTION

The output covers the result of the two stakeholders' workshops addressing the water quality management concepts and application of IDES tool in the five pilot areas. As the results of the first workshop were presented in the output *O T2.3 Implementation of the IDES tool in five pilot areas* we are here presenting only the results of the second workshop focusing on the scenarios development and the identification of effective water quality management actions in all pilot areas.

In 01/04/2021 University of Bucharest and WWF Romania prepared the first guide for the IDES partners on the identification of DPSIR (Drivers-Pressures-State-Impact-Response) and ES (Ecosystem Services) by the stakeholders in each of the five pilot areas.

The document was made available to the project partners and discussed as guiding document for the partners in the assessment of the ES and DPSIR during their meetings with the main stakeholders. The document proposed a framework for the involvement of stakeholders using a series of methods: 1. Questionnaires; 2. Polls; 3. Group debate and 4. Voting. Using the "Guide" we proposed also meeting's agenda and different questionnaire forms for: Drivers; Pressures; ES; Impact and Responses. During the second stakeholder workshop we proposed partners to identify (together with the stakeholders) the optimal scenarios for each pilot area (local defined scenario) to improve water quality which represents the water management concept. Based on the inputs from the stakeholders a series of measures to improve the water quality and quantity were selected. During this interactions between different stakeholders holding interests and having different ideas about the way the systems is functioning allowed scientists and local community to better understand the relationships between ES and Pressures.

2. METHODS

Working with the results from the first workshop, the best scenario for improving water quality in each pilot area was created for each of the pilot areas during the second workshop (see O T2.1). In fact, the development of the scenarios was a stepwise process involving the stakeholders and the adaptation/optimisation of the Fuzzy cognitive model (FCM) developed under the first workshop. For this we have used a series of concepts; i) the

ES and the linkages developed by the stakeholders – the FCM model; ii) the drivers; iii) pressures and iv) measures for each pilot area identified/developed by the stakeholders; v) the idea of "optimisation" based on the interaction between stakeholders in a social learning environment; and finally the concept of baseline/status quo for each of the ES identified and mapped in the FCM model.

Step 1: Analysis of the status quo

The stepwise process was composed in the **first step** by a presentation of the way the FCM is working (with practical examples on the FCM model developed for each of the pilot areas) and by defining the baseline/status quo based on the results of the application of the IDES tool (using spatial data); then the relationships between measures, pressures and ES was presented: In figure 1 we have exemplarily selected pressure posed by the nutrients, that was decreased to the value to -1, so that all stakeholders to notice the positive impact on all ES and a negative impact on some of the pressures.

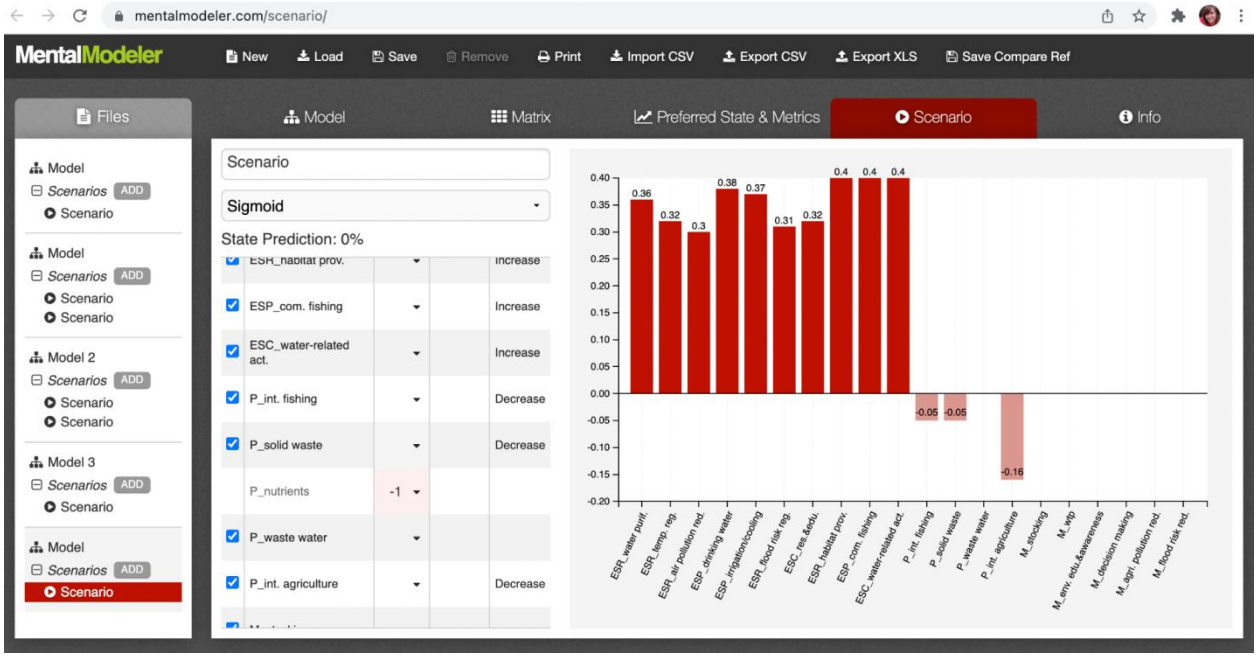

Figure 1 The effect of decreasing the pressure of nutrients on the other ES using the FCM developed by the stakeholders

The relationships between different ES, pressures and measures were further experimented by the stakeholders so that they can have a clear understanding of the implications and strong relationships between variables.

In step 1 stakeholders learned

- how to reverse the process and select a different pressure or add more pressures;
- identified which pressure has the biggest impact on ES and which has the lowest impact (by observing the relative value of ES when P is modified);
- compare with the same pressure in a different site, see the differences in the way ES and P were linked;
- observe that the maximum positive impact on ES occurred when all the pressures are reduced to -1;
- identified the pressures that have impact on water quality;
- agree on the value of each pressure, in the [-1, +1] range;
- find in the FCM the measures selected to decrease the pressures.

Step 2: Discussion on possible measures

The stakeholders had to debate the arguments for the measures identified in step 1, based using the FCM. In this step the stakeholders were asked to present arguments for choosing a measure over another one. They were invited to write down the arguments in presenting their argument they had to use criteria like: timeframe, feasibility, financial resources, technology, and know-how.

Step 3: Co-creation of water quality management concepts

In the last step the stakeholders had to agree on a set of combination of measures, select the optimal ones based on the criteria listed above in order to improve water quality. The role of the moderator was to direct the discussion to water quality and then get an agreement between the participants. Further discussions on how to implement the selected measures, who can implement the measures, funds needed, timeframe for implementation and identification of the barriers were also addressed during the second meeting.

3. RESULTS

3.1 Sustainable and effective water quality management actions in Donauauen Nationalpark (Austria)

Stakeholders' analysis

The second workshop was held on 31 May 2022 with representants from different actors, mainly from different local, national and sectoral agencies (table 3.1.1) with different interests ((table 3.1.2). They identified the realtionships between different actors but also ES, and the main pressure, drivers and also measures (Figure 3.1.1).

Table 3.1.1 Number of participants in the Austrian pilot area

		No of participants in each category						
Country	**No participants**	**local public authority**	**regional public authority**	**national public authority**	**sectoral agency**	**interest groups including NGOs**	**higher education and research**	**Small & Medium Enterprise**
AT	4	1	-	1	2	-	-	-

Table 3.1.2 Type of stakeholder in the Austrian pilot area

Sector	agriculture, silviculture, navigation, administration, tourism
Specific interest	conservation, use of ES; specify what ES: regulation, provisioning, cultural

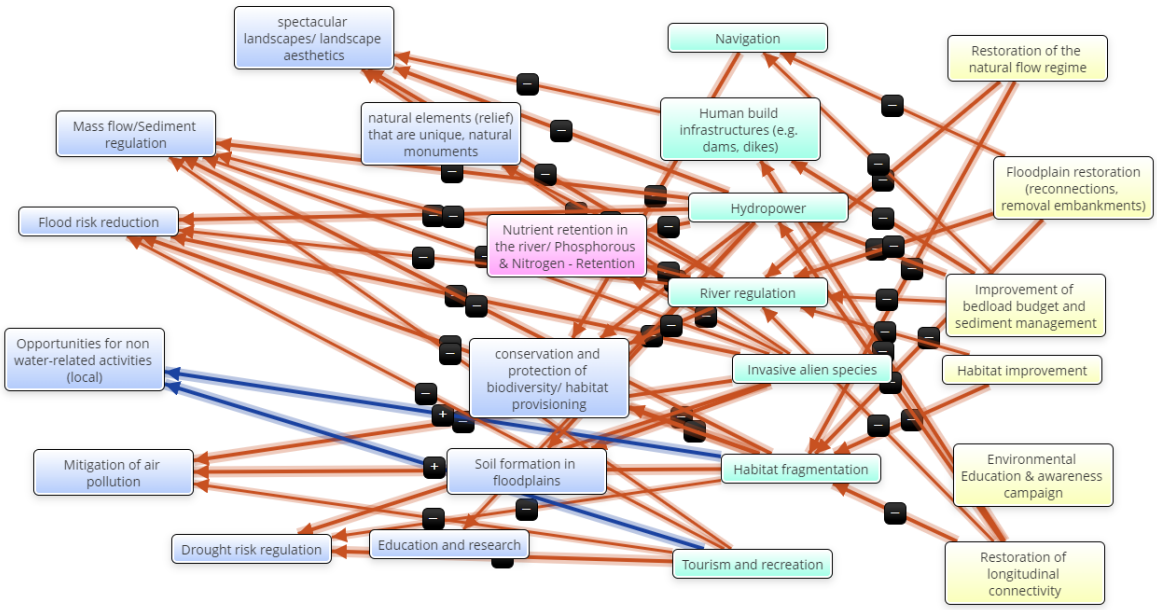

Figure 3.1.1 The model of the Austrian FCM (mmp, xls) used in the workshop (English version)

A number of pressures have been selected to be reduced in a realistic manner that in the end conducted to reaching a realistic scenario for the Austrian pilot area.

Table 3.1.3 is presenting the relative values of decreasing (or increasing) different pressures. From the total number of 7 pressures the stakeholders decided to diminish 4 of them, 2 were not changed and one, in the opinion of the stakeholders will increase in time (invasive alien species).

*Table 3.1.3 The selected pressures in the Austrian pilot area and the value of each pressure from -1 to +1 (*The value of each pressure from -1 to +1 is the result of the changed measures agreed by the stakeholders and applied in the local FCM)

No.	Pressure	Score
1	Navigation	-0.2
2	Invasive alien species	0.2
3	Human infrastructure	-0.2

4	Habitat fragmentation	-0.5
5	Tourism and recreation	0
6	Hydropower	0
7	River regulation	-0.3

Table 3.1.4 is presenting the measures that could be implemented to reduce the pressure in the Austrian pilot area

Pressure	**Selected measures for the Water quality management concept**
Navigation	- reduce speed or increase distance to shore; - ban/quota on Twin City liner; - in emissions there will be significant improvement; - in waste entering the Danube there will/has been much improvement; - in negative impacts of river regulations there will also be improvement; - research on fish fauna, habitat quality, migration information; - creation of spawning habitats for fish fauna; - ships will become more environmentally friendly; - better capacity utilization with better conditions in the waterway.
Invasive alien species	- higher riparian dynamics; - removal of rip-raps.
Human infrastructure	- footpaths will be shortened; - paths will be significantly reduced; -in the lower Lobau many paths have been dismantled; - constant visitor numbers.
Habitat fragmentation	- all major side arms should be reconnected to the Danube; - bed load management.
Tourism and recreation	- efficient visitor guidance; - more intensive forms of use can be kept outside the NP through targeted measures; - measures aim at keeping the numbers at the current level.

Hydropower	- fish ladders; - adding 215,000 m^3/year of bedload.
River regulation	- major deconstruction programme; - river regulation for navigation will be rebuilt to reduce negative ecological impacts; - everything that does not add value will be removed.

Stakeholders' arguments for the selection of measures

Each measure was discussed and the stakeholders had the possibility to present their positions. This was followed by the development of scenarios and the selection of the optimal (agreed scenario) for the Austrian pilot area. In the area navigation was considered to have a great influence on the status of the ecosystems. So many of the measures are linked with the identified pressure. Other pressures are invasive alien species, the development of the human infrastructure, habitat fragmentation, tourism and recreation, the development of hydropower and river regulation. As for the river regulation many of the measures are in fact reconstruction measures.

The optimal scenario for the Austrian pilot area

In the final scenario, agreed between the actors, the biggest positive impact is on biodiversity with a medium effect on water quality variables and the negative impact on the tourism and local recreation. One important aspect mentioned was the need to address this trade-off between different ecosystem services, including ideas of providing compensation for the ES that were lost in the process.

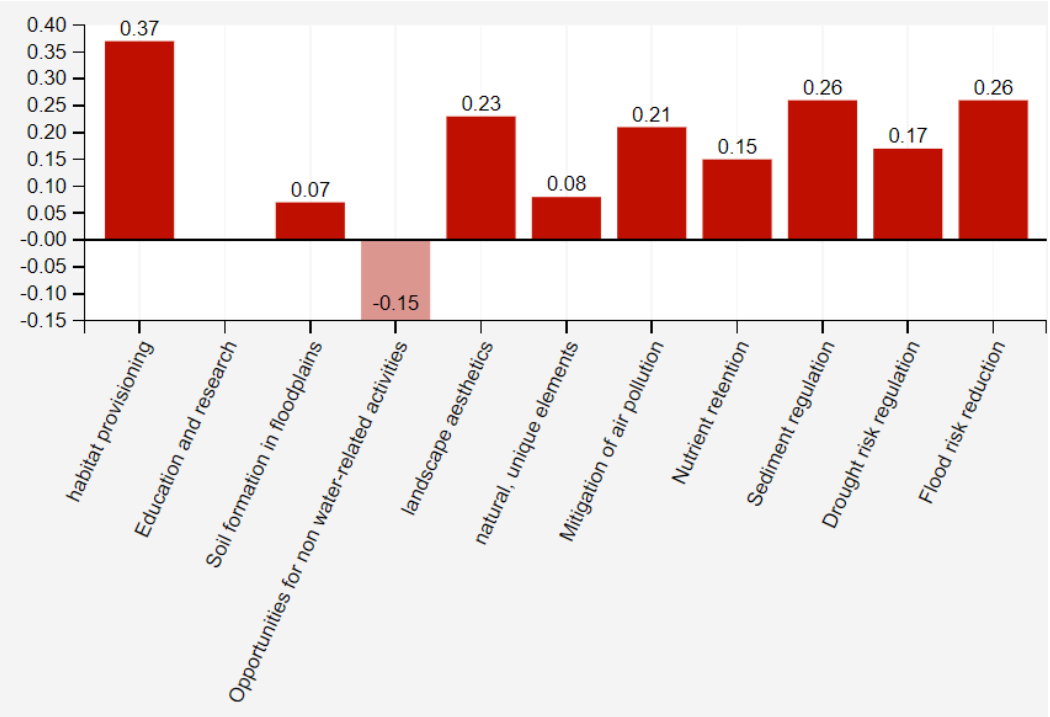

Figure 3.1.2. The optimal scenario / water management concept for the Austrian pilot area

3.2 Sustainable and effective water quality management actions in Special Nature Reserve "Koviljsko-Petrovaradinski Rit" (Serbia)

Stakeholders' analysis

The Serbian workshop took place also on 31 May 2022 in the Special Nature Reserve Koviljsko-petrovaradinski rit. Here a large number of participants took part in the meeting covering almost all types of stakeholders and interests (table 3.2.1& 3.2.2)

Table 3.2.1 Number of participants in the Sebian pilot area

		No of participants in each category						
Country	**No participants**	**local public authority**	**regional public authority**	**national public authority**	**sectoral agency**	**interest groups including NGOs**	**higher education and research**	**Small & Medium Enterprise**
RS	40	2	11	-	10	11	8	-

Table 3.2.2. Type of stakeholder in the Sebian pilot area

Sector	agriculture, silviculture, aquaculture, animal husbandry, administration, tourism, water, water utilities, environment protection, higher education and research, conservation
Specific interest	conservation, use of ES specify what ES: regulation, production, cultural

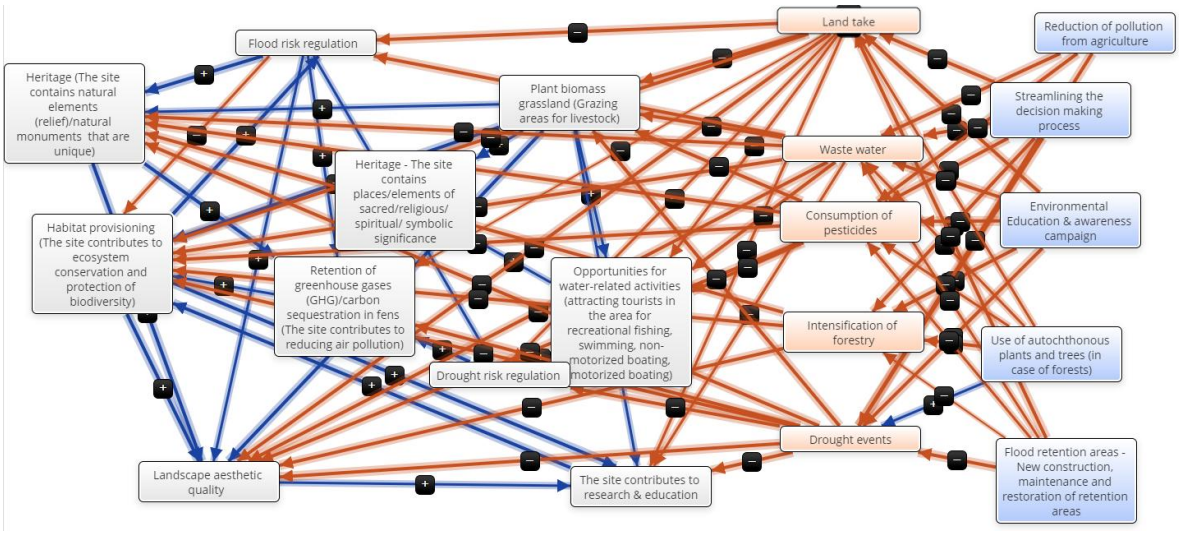

Figure 3.2.1 The model of the Serbian FCM (mmp, xls) used in the workshop (English version)

From the 5 pressures identified by the stakeholders during the second workshop only 3 have been selected to be changed (table 3.2.3) and a series of measures have been discussed and agreed upon during the meeting.

*Table 3.2.3 The selected pressures in the Sebian pilot area and the value of each pressure from -1 to +1 (*The value of each pressure from -1 to +1 is the result of the changed measures agreed by the stakeholders and applied in the local FCM)

No.	Pressure	Score
1	waste water	-0.25
2	land take	-0.75
3	intensification of forestry	-0.25
4	drought events	0
5	consumption of pesticides	0

Table 3.2.4. The measures selected to reduce the pressure *in the Sebian pilot area*

Selected measures for the Water quality management concept
Construction or upgrades of wastewater treatment plants
Reduction of pollution from agriculture
Establishment of buffer zones
Floodplain restoration
Restoration of longitudinal connectivity
Habitat improvement
Prevention or control of the adverse impacts of invasive species
Prevention or control of the adverse impacts of recreation
Flood risk reduction on agricultural land
Environmental Education & awareness campaign
Policy changes
Streamlining the decision making process

Stakeholders' arguments for the selection of measures

In the nearby settlement Kovilj there is a waste water treatment plant (WWTP) and sewage system to which 95% of households is connected, but there is still a possibility to connect

the remaining 5%. Moreover, concerning future plans for development of a new industrial zone – planning of a sewer network and accompanying WWTP is essential.

The pollution from agriculture could be mitigated by establishing protective belts/buffer zones composed of natural vegetation along drainage canals.

Wetland areas represent the core of the biodiversity, and therefore preservation and measures leading to it have absolute priority.

Regarding the restoration of longitudinal connectivity, some stakeholders have opposite opinion about the importance of this measure. All believe that renewing old bypasses is required, especially for water related fauna (fishes, turtles, lizards etc.).

The habitat is in relatively good condition, therefore future measure could be conducted just in order to maintain it.

Preserving native biodiversity is quite important. Exceptions are only plantation of hybrid poplars which are planted and managed in a controlled manner. All other allochthonous and invasive species are not desired. In case of some future initiatives in tourism and recreation expansion – extensive planning and assessment of the number of people and specifying recreational activities have to be developed and adopted by authorities and subsequently accordingly implemented.

The optimal scenario for the Serbian pilot area

The optimal scenario / water management concept for the pilot area was discussed among the actors and agreed upon during this second workshop. As a result of the reduction of the main pressures identified by the stakeholders (waste water, land take, and intensification of forestry) the changes occurred showed a relative improvement of the habitat provisioning 0.31, improvement of the plant biomass in the grassland and also an increase in the flood risk regulation 0.28. Other ES are also improving due to the applied measures (figure 2.3).

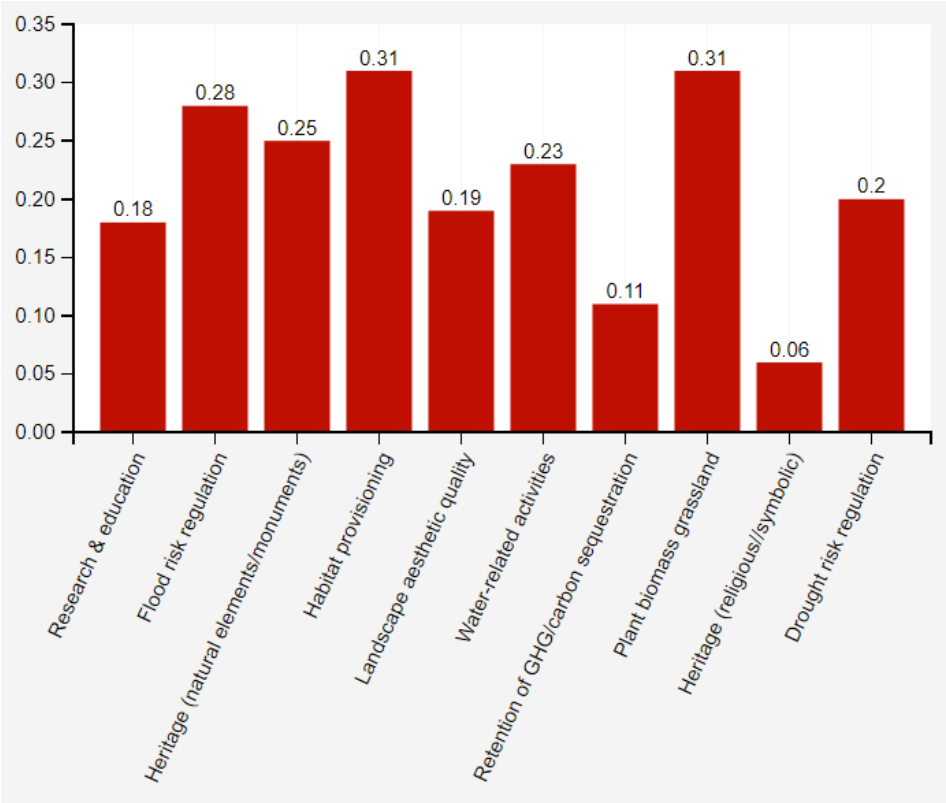

Figure 3.2.3 The optimal scenario / water management concept for the Serbian pilot area

3.3 Sustainable and effective water quality management actions in Braila Islands (Romania)

Stakeholders' analysis

The second workshop took place on 10.06.2022 in Braila in the LTSER site Braila Islands. Here 25 participants (Table 3.3.1) took part in the second workshop dedicated to the development of optimal scenario for water management.

Table 3.3.1 Number of participants (without UB-RCSES and WWF) in the Romanian pilot area

		No of participants in each category						
Country	**No participants**	**local public authority**	**regional public authority**	**national public authority**	**sectoral agency**	**interest groups including NGOs**	**higher education and research**	**Small & Medium Enterprise**
RO	25	3	-	2	10	2	7	-

+1 participant from a local newspaper (Observatorul de Braila)

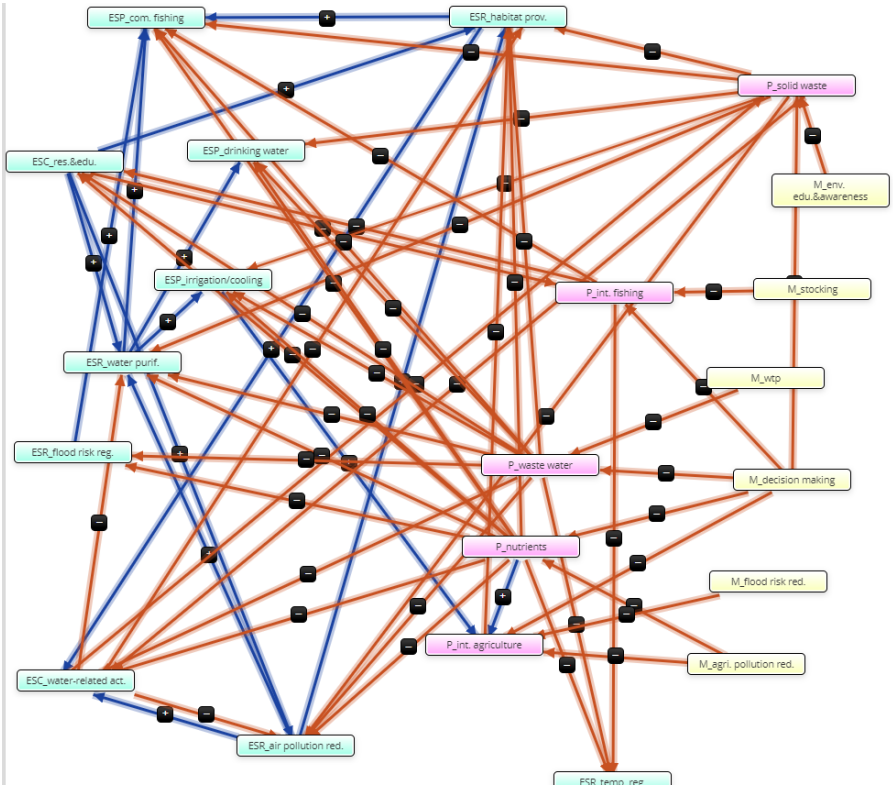

Figure 3.3.1 The model of the Romanian FCM (mmp, xls) used in the workshop (English version)

Table 3.3.2 Type of stakeholder in the Romanian pilot area

Sector	agriculture, silviculture, aquaculture, administration, water, water utilities, environment protection, higher education and research, conservation
Specific interest	conservation, use of ES specify what ES: regulation (R), production (P), cultural (C)

*Table 3.3.3 The selected pressures in the Romanian pilot area and the value of each pressure from -1 to +1 (*The value of each pressure from -1 to +1 is the result of the changed measures agreed by the stakeholders and applied in the local FCM)

No.	Pressure	Score	Comments
1	Intensive fishing	-0.17	- no intervention, there is no fishing in the strictly protected area, the fishing is scientifically regulated (related to maximum catch, fishing effort) - see the relation between water level and fish populations - stimulation of aquaculture and fish repopulation
2	Solid waste (plastics, dredging waste)	-0.47	- this can be done only by consistent application of legislation and through education and advocacy
3	Nutrients inputs	-0.22	- we exceed now the limits because the good practices are not followed (but if we reduce the amount of nutrients the agricultural production will be reduced) - we can promote subsidizing / stimulating nitrogen-fixing crops (soybeans, peas, beans, lucerne), crop rotation, cover crop - to reduce the use of synthetic nutrients, the use of biofertilizers, bioherbicides (with N and P fixing bacteria), new technologies. - start from the beginning with updated courses in university/ practical schools - change of consumption habit (the consumer to choose eco products with less impact on environment)
4	Intensification of agriculture	0.07	- In the new geopolitical context (the war in Ukraine) the pressures on food, energy and transport will increase
5	Waste water	-0.25	- 3rd stage of the treatment plant is missing, N and P are nor retained - all the villages, cities have sewage and treatment plants - the reduction should be in accordance with the basin management plan

Table 3.3.4. The measures selected to reduce the pressure in the Romanian pilot area

Selected measures for the Water quality management concept
Stocking
Reduction of pollution from agriculture
Construction or upgrades of wastewater treatment plants
Environmental Education & awareness campaign

Stakeholders' arguments for the selection of measures

Discussions have focused on reducing nutrient use, directly related to water quality and taking into account an increase in intensive agriculture in the future. There were some detailed measures proposed within the stakeholders like:

- promote subsidizing / stimulating nitrogen-fixing crops (soybeans, peas, beans, lucerne), crop rotation, cover crop - to reduce the use of synthetic nutrients, the use of biofertilizers, bioherbicides (with N and P fixing bacteria), new technologies.
- updated courses in university/ practical schools, where using new technologies, biofertilizers or permaculture are promoted;
- change the habit of consumption (the consumer will choose eco products with less impact on environment).

Regarding waste and wastewater, the simple compliance with the legislation would lead to a reduction of the impact, going hand in hand with institutional strengthening and reduction of corruption in the system. Given the current situation, the upgrading of the existing WWTP is also needed to improve water quality.

The optimal scenario for the Romanian pilot area

The optimal scenario / water management concept for the Romanian pilot area was the result of an intense negotiation process. The changes observed as a result of the reduction of the main pressures identified by the stakeholders (Intensive fishing, solid waste, nutrient

inputs, land take, and intensification of forestry) showed a relative improvement of the habitat provisioning 0.49). Other ES are also improving due to the applied measures (figure 3.3.3).

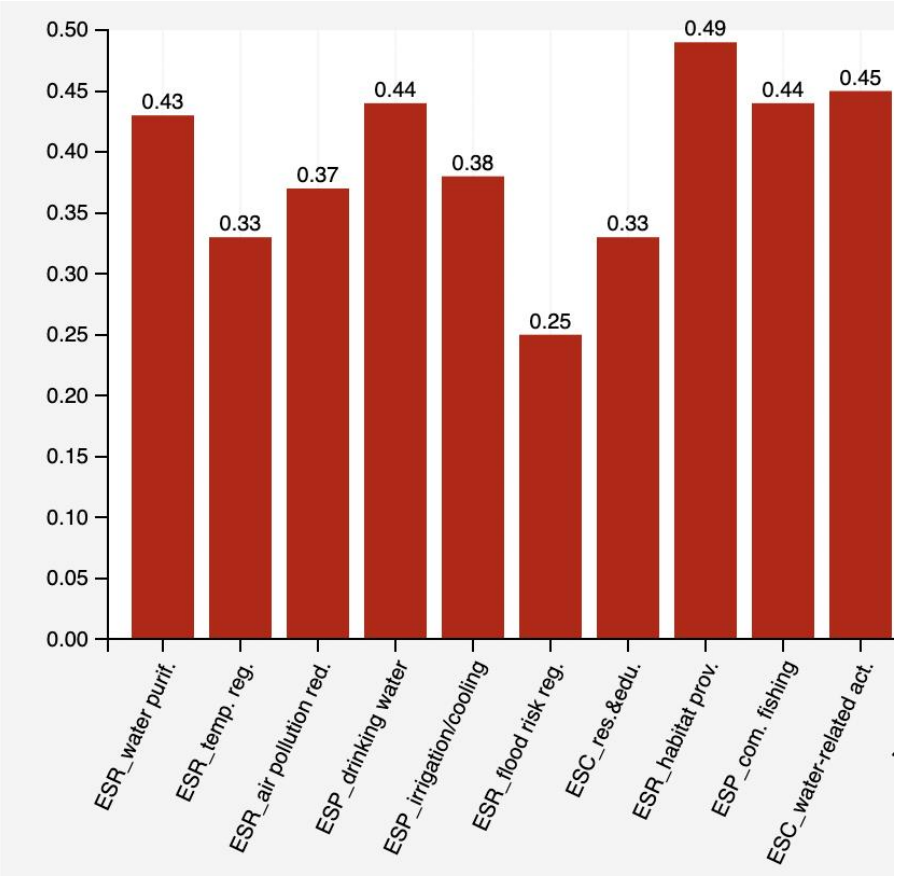

Figure 3.3.3 The optimal scenario / water management concept for the Romanian pilot area

3.4 Sustainable and effective water quality management actions in Tisza near Szolnok (Hungary)

Stakeholders' analysis

The second workshop took place in Szolnok on 30.06.2022. Here 17 participants took part in the second workshop dedicated to the development of optimal scenario for water management.

Table 3.4.1. Number of participants in the Hungarian pilot area

		No of participants in each category						
Country	**No participants**	**local public authority**	**regional public authority**	**national public authority**	**sectoral agency**	**interest groups including NGOs**	**higher education and research**	**Small & Medium Enterprise**
HU	17	-	11	-	-	1	2	3

Table 3.4.2. Type of stakeholder in the Hungarian pilot area

Sector	regional public authority, water utilities, education, private sector
Specific interest	conservation, use of ES specify what ES: regulation (R), production (P), cultural (C)

*Table 3.4.3. The selected pressures in the Hungarian pilot area and the value of each pressure form -1 to +1 (*The value of each pressure from -1 to +1 is the result of the changed measures agreed by the stakeholders and applied in the local FCM)

No.	**Pressure**	**Score**
1	Flood	-1
2	Drought	-1
3	Extreme natural events	-0.7
4	Land use change	-0.3
5	Invasive species	-0.4

Table 3.4.4. The measures selected to reduce the pressure in the Hungarian pilot area

Selected measures for the Water quality management concept

Water retention
Floodplain restoration
Dyke relocation
Reduction of agricultural pollution

Stakeholders' arguments for the selection of measures

Drought and floods are considered the most significant pressures in the region. According to the participants, the other three pressures can strengthen these two. The participants agreed that these two pressures should be reduced the most. The weather in the region has become more extreme in the last decades. This can cause even more severe water shortages or floods. Invasive species reduce the water conveyance capacity of the active floodplains, which could increase the flood risk.

The values for the selected pressures have been discussed with the participants. The selected methods should allow the reduction of the flood risk and water scarcity/drought. According to the participants, the best solution is to expand the floodplain by moving the dykes, and there should also be water retention there. For this, it is necessary to assess the areas where dyke relocation is possible and water retention may occur after a flood event. The participants agreed that this would bring benefits from the landscape point of view and as well as of culture.

The optimal scenario for the Hungarian pilot area

The optimal scenario / water management concept for the Hungarian pilot area was the result of an intense negotiation process. As a result of the reduction of the main pressures identified by the stakeholders (Floods, drought, extreme natural events etc) the occurring changes showed a relative improvement of the arable crop production as provisioning service and an improvement of the plant biomass. Other ES are also improving due to the applied measures (figure 3.4.3).

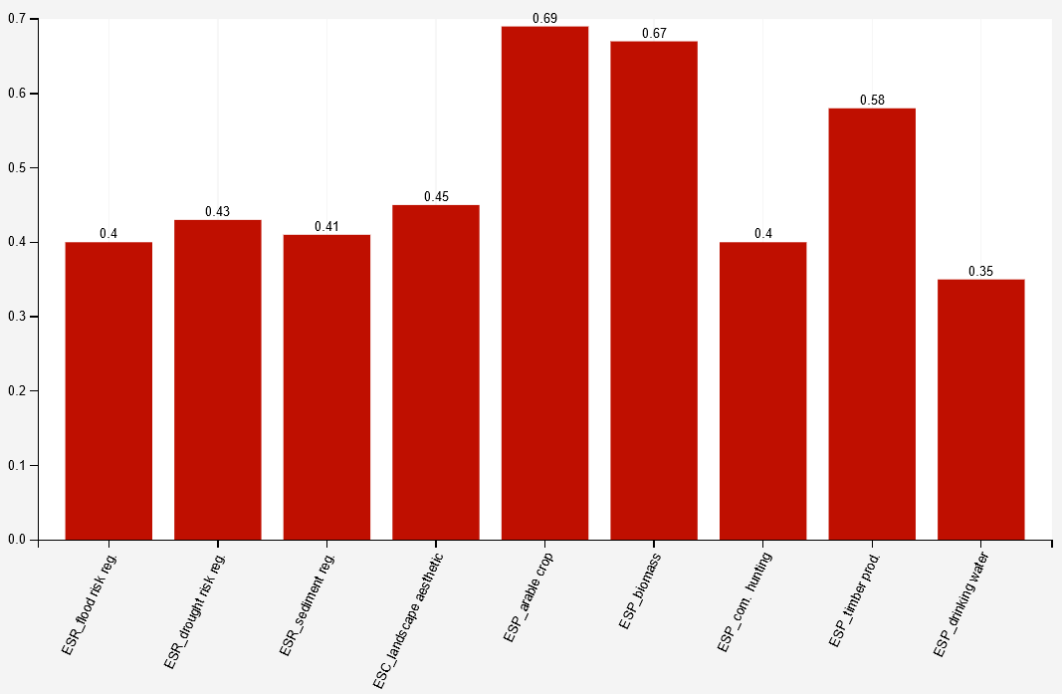

Figure 3.4.3 The optimal scenario / water management concept for the Hungarian pilot area

3.5 Sustainable and effective water quality management actions in Mura River Kučnica Mura Petajnci – Gibina (Slovenia)

Stakeholders' analysis

The second workshop took place in Radenci on 19.05.2022 where 15 participants took part and debated the optimum scenarios for the Slovenian pilot area.

Tabel 3.5.1 Number of participants in the Slovenian pilot area

		No of participants in each category						
Country	**No participants**	**local public authority**	**regional public authority**	**national public authority**	**sectoral agency**	**interest groups including NGOs**	**higher education and research**	**Small & Medium Enterprise**
SL	15	1	2	-	5	2	-	5

Table 3.5.2. Type of stakeholder in the Slovenian pilot area

Sector	silviculture, aquaculture, administration, tourism, water utilities
Specific interest	conservation, use of ES specify what ES: regulation (R), production (P), cultural (C)

The model of the FCM (mmp, xls) used in the workshop (English version, use the "code" column for ES, P, M)

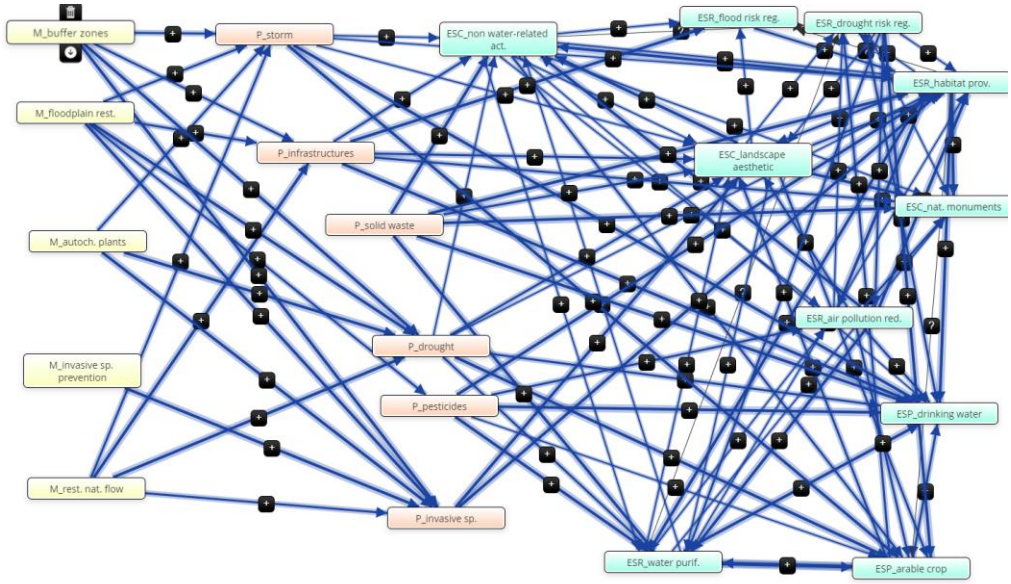

Figure 3.5.1. Mental model used for developing scenarios in the Slovenian pilot area

Using the building blocks identified in the first meeting and the model developed the stakeholders worked to create a scenario that is maximising the benefits for all of them, addressing the water related concepts.

*Table 3.5.3. The selected pressures in the Slovenian pilot area and the value of each pressure form -1 to +1 (*The value of each pressure from -1 to +1 is the result of the changed measures agreed by the stakeholders and applied in the local FCM)

No.	Pressure	Score
1	Invasive alien species	-0.3
2	Human build infrastructure	0.1
3	Consumption of pesticides	-0.2
4	Storms/ extreme natural events	0.2
5	Solid waste (plastics, dredging waste)	-0.2

Table 3.5.4. The measures selected to reduce the pressure in the Slovenian pilot area

Selected measures for the Water quality management concept
Use of autochthonous plants and trees (in case of forests)
Prevention or control of the adverse impacts of invasive species
Establishment of buffer zones
Restoration of the natural flow regime
Floodplain restoration

Stakeholders agreed that **use of autochthonous plants and trees** is one of the most important measures. With use of autochthonous plants and trees, we decrease the influence of alien plant species (which is one of the biggest pressures in the pilot area Mura). Local plants are better adapted to local climate and conditions and therefore have positive connectivity with improvement of biodiversity. Use of autochthonous plants is also defined in Slovenian legislation.

Obstacle to implement this measure in whole pilot area is land ownership, fragmentation of land and in many cases also accessibility. Private owners are in many cases living abroad as descendants and do not know about having the land here (or do not bother managing it). Due to higher level of aggressiveness of growth of alien plant species, they often prevail. Owners need to invest more time into removal of alien species and artificial regeneration and promotion of autochthonous plants. Additional costs and financial resources are therefore also needed. Slovenia Forest Service is preparing forest management plans for whole state, also for private owners. Owners also get the guidance and expert knowledge from district foresters about how and which local species to use. Stakeholders agreed that state funding and financial encouragements are needed to help forest owners to invest into autochthonous plants and exterminate invasive ones. The prevention or control of the adverse impacts of invasive species goes hand-in-hand with previous measure. We did not debate much about this measure, since promotion of autochthonous plants and trees is needed to prevent/control impacts of invasive species.

The **creation of buffer zones** was recognised as one of the most important measures. Revitalisation of riparian areas with autochthonous plants will help with better water retention and filtration of minerals. This has positive effects on the resilience of autochthonous plants and is decreasing the appearance of alien plant species. It also has positive effects on water temperature regulation. Setback and obstacles how to implement this measure, costs and timeframe are again quite similar to measure "Use of autochthonous plants and trees (in case of forests)."

The **restoration of the natural flow regime** was recognised as one of the vital measures for pilot area Mura River. Stakeholders presented the arguments that restoration of the natural flow regime is important to increase the quantity of flow and decrease of extreme events. This also increases the self-cleaning capabilities of Mura River. It also has positive effect on increasing the farmland areas in order to insure higher level of food self-sufficiency. Stakeholders also expressed that no matter what kind of measures Slovenian stakeholders would take regarding the restoration of natural flow regime, this cannot be done in full aspect. Austria has built over 30 hydropower plants on Mura River on their territory. Natural

flow regime is therefore compromised and the only way to restore it completely is to remove all dams from Mura River. Stakeholders assessed that there are practically no chances that this will happen – especially at current climate situation where needs for electricity are increasing and demands to abandoning coal (and other high-pollutant energy resources) are higher than ever.

Stakeholders also expressed that if we really want to completely restore the natural regime on Mura River, also flood protection dykes alongside Mura river in Slovenia should be removed. But this is unimaginable due to the damage this would cause to agriculture, economy and human infrastructure and to a lot of residents and stakeholders along Mura. Nevertheless, several actions can still be taken on local level in order to improve natural flow regime – e.g. with restoration of oxbow lakes and side arms. On several location this is already in progress.

The floodplain restoration is one of the measures that stakeholders did not identify as one of the most important ones. They agreed that floodplain restoration is important for removal and limitation of spreading of alien plant species. Floodplain restoration also means that the degree of agricultural land use will decrease which will have a positive effect on water quality due to the reduction of pesticides use. Nutrient retention will also increase. There would be less infrastructural development works located inside this area.

The stakeholders agreed that the three most needed measures to improve water quality in Mura River are: use of autochthonous plants and trees (in case of forests), creation of buffer zones, restoration of the natural flow regime.

All three measures are very much connected and are supporting each-other in terms of increasing the overall resilience of the pilot area Mura. All measures are directed towards straightening the biodiversity, selfcleaning capabilities of the river and reducing climate change risk on local level. We need to point out that Mura river is not only a Slovenian river. Every action that happens upstream is therefore reflected somewhere. Good cooperation

model between different stakeholders on national and transnational level is therefore needed in order to improve water quality and implement proposed measures.

The optimal scenario for the Slovenian pilot area

The optimal scenario / water management concept for the Slovenian pilot area was the result of an intense negotiation process. As a result of the reduction of the main pressures identified by the stakeholders (invasive alien species, human build infrastructure, consumption of pesticides, storms/ extreme natural events, Solid waste (plastics, dredging waste) the changes occurred showed a relative improvement of the drinking water; improvement of the habitat provisioning. Other ES are also improving due to the applied measures (figure 5.3).

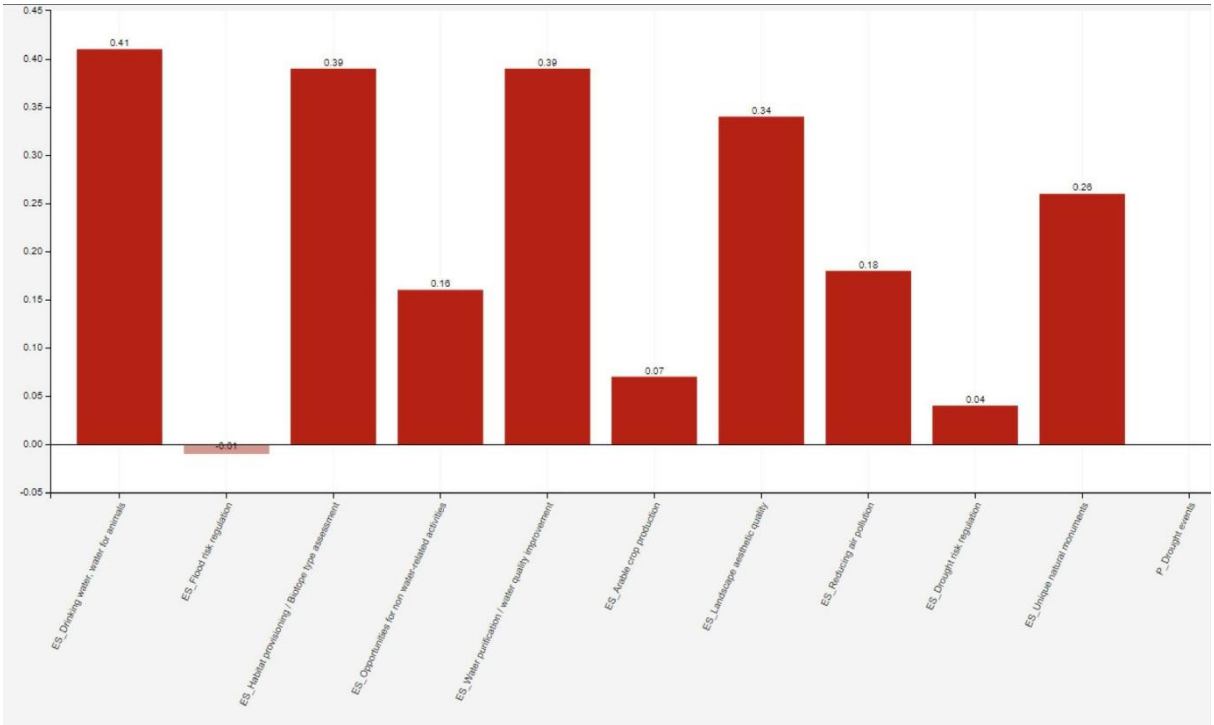

Figure 3.5.3 The optimal scenario / water management concept for the Slovenian pilot area

4. CONCLUSIONS

During discussions at different pilot areas the stakeholders used the FCM to derive optimal (for the participating stakeholders) futures, taken into consideration the interest expressed and supported by those actors. Somebody can argue that the list of actors does not reflect the entire spectrum of possible actors with interest in the ES provided by the area. But it has to be acknowledged that at the meetings we have invited all the interested parties and the response to the invitation is in fact reflecting the interest in establishing and discussing those futures (scenarios). The strengths of the developed scenarios are nevertheless depending on the number, involvement and ability to negotiate different positions (decreasing of different pressures, implementation of different measures) and convince the other social partners.

We can argue also that the FCM is a very useful tool to allow the development of scenarios and support the stakeholders' interactions.

Even if pressures appear to be present in all the pilot areas, the measures (beside floodplain restoration) appear to be site specific (they have a lower degree – centrality). This could have the following explanations:

i) specificity of local conditions in selecting measures to address general pressures

ii) insufficient knowledge and missing generalization of measures across pilot areas and stakeholders.

These results demonstrate that developing strategies to improve the water quality and related ES we need to take into account the local specificity and local stakeholders. Even if the problems tend to be similar in all pilot areas, the solutions tend to be site specific. As a consequence, there is a need to integrate local stakeholders in the development of action plans that will have multiple effects on the use of ES and the well-being of local communities. Although there is a limited number of measures (as well as pressures) that could be implemented to increase the water quality, their combinations (or the concrete scenarios) should be based on local knowledge. Tools like FCM could help identify and justify (in terms of local perceptions) the most important measures to improve water quality

and management of multiple ecosystem services, harmonizing different interests among stakeholders at different spatial scales.

Among the most important factors that hinder the implementation of existing strategies and visions aiming to improve water quality and quantity in the river basins, and in particular in the Danube River, include the **ways in which society deals with the various competing societal interests supporting navigation, hydropower, agriculture, nature conservation and tourism,** as well as **flooding, and nutrient and pollutants retention**.

At the same time, **many of the existing ES methodologies and assessments are divergent or have the capacity of producing results with a high degree of variability**. The IDES Tool was developed to tackle the challenge of these insufficiently settled methodological difficulties.

Relying mainly on input from various stakeholders, 'beneficiaries' of the ecosystem services, the IDES Tool uses a simple, quick, relatively low-cost methodology that can support a complex assessment in a relatively short time and for a relatively large number of ecosystem services.

The same ecosystem resource has one value for the local community and a totally different value for the scientific community, or to people from outside the local communities.

The IDES Project **demonstrated that different communities on the Danube floodplain have the same understanding of ES regardless of the country**, but their **relative importance is different from place to place**. The rank of an ES's importance is mostly based on the **interest of the local communities**.

Using pilot areas **facilitated a better harmonization of the concurring societal interests and led to the building of a conceptual framework (management options, ideas, values, and visions) that was co-created with the local stakeholders.**