Supplementary Materials

Contents

Documentation of the characterization of water management options

Table S1: Descriptors used to characterize water management options

Attribute	Classes	Description
Water status	Quantity	Option targets the availability of water
	Chemical quality	Option targets the chemical properties of water
	Ecological quality	Option targets biological quality of surface water
	Hydrogeomorphological quality	Option targets hydromorphological quality of the fluvial system
Water bodies	Surface water	Option targets surface water
	Groundwater	Option targets groundwater
River section	Up	Option targets the upper section of the river basin
	Middle	Option targets the middle section of the river basin
	Down	Option targets the down section of the river basin
	River as a whole	Option targets the whole river basin

Target water use sector	Local population	Option targets the water needed or used by residents within the basin
	Tourism	Option targets the water needed or used by the touristic/recreation sector within the basin
	Industry	Option targets the water needed or used by industry within the basin
	Agriculture	Option targets the water needed or used by farmers within the basin
	Forestry	Option targets the water needed or used by trees within the basin
	Energy	Option targets the water needed or used by the energy sector within the basin
	Water management	Option targets authorities responsible for water quantity and quality (e.g. waste treatment, issuing water permits)
	Others	Option targets water use sectors different from the previous *(please specify at the end of the row the specific sector)*
Target land use	Arable land (rainfed)	Land that is being farmed with crops that are sown and harvested within the same agricultural year, relying exclusively or rain water
	Arable land (irrigated)	Land that is being farmed with crops that are sown and harvested within the same agricultural year, relying exclusively irrigation water
	Permanent crops (rainfed)	Land that is being farmed with crops which last for many seasons, rather than being replanted after each harvest, relying exclusively or rain water
	Permanent crops (irrigated)	Land that is being farmed with crops which last for many seasons, rather than being replanted after each harvest, relying exclusively irrigation water
	Grassland	Land that is dominated by grasses or shrubs for grazing or fodder purposes
	Forests	Land that is predominantly covered by trees
	Built-up	Land that is used for housing, industry (incl urban fabric, industrial/commercial areas, transport networks, mineral extraction sites, dump sites, construction sites, etc.)
	Wetlands & deltas	Swamps and marshes, estuaries, deltas and tidal flats, near-shore marine areas and human-made sites such as reservoirs

	Beaches and dunes	Sands and muds from the coasts of the oceans not covered by sea water at low tide
	Other	Land that is used for other purposes
Extreme events	Drought	Option targets droughts
	Flooding	Option targets floodings
	Storm	Option targets storms
	Fire	Option targets wildfires
	Not related	Option does not target an extreme event
Implementation scale	National	Option is to be implemented at national level
	Regional	Option is to be implemented at regional level
	Basin	Option is to be implemented at basin level
	Municipal	Option is to be implemented at municipal level
Implementation time horizon	Short	Option can be functioning on short term (<5yrs)
	Medium	Option can be functioning on medium term (5-20 yrs)
	Long	Option can be functioning on long term (>20 yrs)
Expected lifetime	Short (< 5 years)	Expected time for which the option is operational without major rehabilitation is short (less than 5 years)
	Medium (5 -20 years)	Expected time for which the option is operational without major rehabilitation is medium (5 - 20 years)
	Long (> 20 years)	Expected time for which the option is operational without major rehabilitation is long (more than 20 years)
Timelag between implementation and effectiveness	Short (< 5 years)	Expected time since the option is implemented until it starts to have the desired effect is short (less than 5 years)
	Medium (5 -20 years)	Expected time since the option is implemented until it starts to have the desired effect is short (less than 5 years)
	Long (> 20 years)	Expected time since the option is implemented until it starts to have the desired effect is long (more than 20 years)
Character	Demand	Option targets the need for water
	Supply	Option targets the availability of water
	Support	Option targets improved governance (incl. awareness raising, monitoring, stakeholder involvement)
	Environmental conservation	Option targets the recovery of the ecological status
Implementation costs *(one-time set up cost of*	< 10,000 €	Direct capital costs of implementing the option are below 10,000 €
	10,000 - 100,000 €	Direct capital costs of implementing the option are in the range 10,000-100,000 €

implementing the measure, after which there will only be recurring operational or running costs)	100,000 - 1,000,000 €	Direct capital costs of implementing the option are in the range 100,000-1,000,000 €
	> 1,000,000 €	Direct capital costs of implementing the option are over 1,000,000 €
Operational costs *(costs incurred annually to maintain the measure operating)*	< 10,000 € / yr	Total annual running costs for this option are below 10,000 €
	10,000 - 100,000 € / yr	Total annual running costs for this option are in the range 10,000-100,000 €
	100,000 - 1,000,000 € / yr	Total annual running costs for this option are in the range 100,000-1,000,000 €
	> 1,000,000 € / yr	Total annual running costs for this option are over 1,000,000 €
Effectiveness (capacity to tackle the specified challenge)	High	Option is highly effective in tackling the specified challenge
	Medium	Option is medium effective in tackling the specified challenge
	Low	Option is low effective in tackling the specified challenge
	Uncertain	Uncertainty about how the option may tackle the specified challenge
Approach to adaptation	Green	Ecosystem-based approaches that use services of nature
	Grey	Technological and engineering solutions
	Soft	Managerial, legal and policy approaches that change human behaviour and styles of governance

Nature of approach	Bear the loss	Occurs when those affected have no capacity to respond in any other ways
	Share the loss	Occurs when the losses are shares among a wider community (either extended family or village-level in traditional societies or through public relief, rehabilitation and reconstruction or insurance)
	Modify the threat	Occurs when the measure exercises a degree of control over the environmental threat itself (e.g. flood control measures such as dikes)
	Prevent effects	Occurs when the option involves steps to prevent the effects of climate change and variability (e.g. modification in crop management practices)
	Change use	Occurs when the continuation of an economic activity is changed due to the difficulty of continuing it (e.g. agricultural use changed into forest use)
	Research	Occurs when the option means use of new technologies and new methods of adaptation
	Educate, inform and encourage behavioural change	Occurs when the option is based on dissemination of knowledge through education, public campaigns leading to behavioural change
Potential to address climate change	Robustness	An option is considered robust to uncertainties if it can maintain its effectiveness under different climatic and socioeconomic development scenarios.
	Flexibility	An option is considered flexible when it can be adjusted/ complemented or reversed when it turns out to be inadequate or inappropriate in practice.
Feasibility	No major obstacle	No barriers for the implementation
	Minor obstacles	Physical, technical or organizational obstacles that can easily be overcome
	Serious obstacles	Physical, technical, regulatory or organizational obstacles that would be difficult to overcome within the time horizon of the project
Acceptability (a priori)	High	There is not significant reason a priori for anyone to reject the option.
	Low	There are obvious signs that one or several actors of the RB will reject the option because of its design.

Documentation of the Fuzzy Cognitive Map for the Pedieos river basin

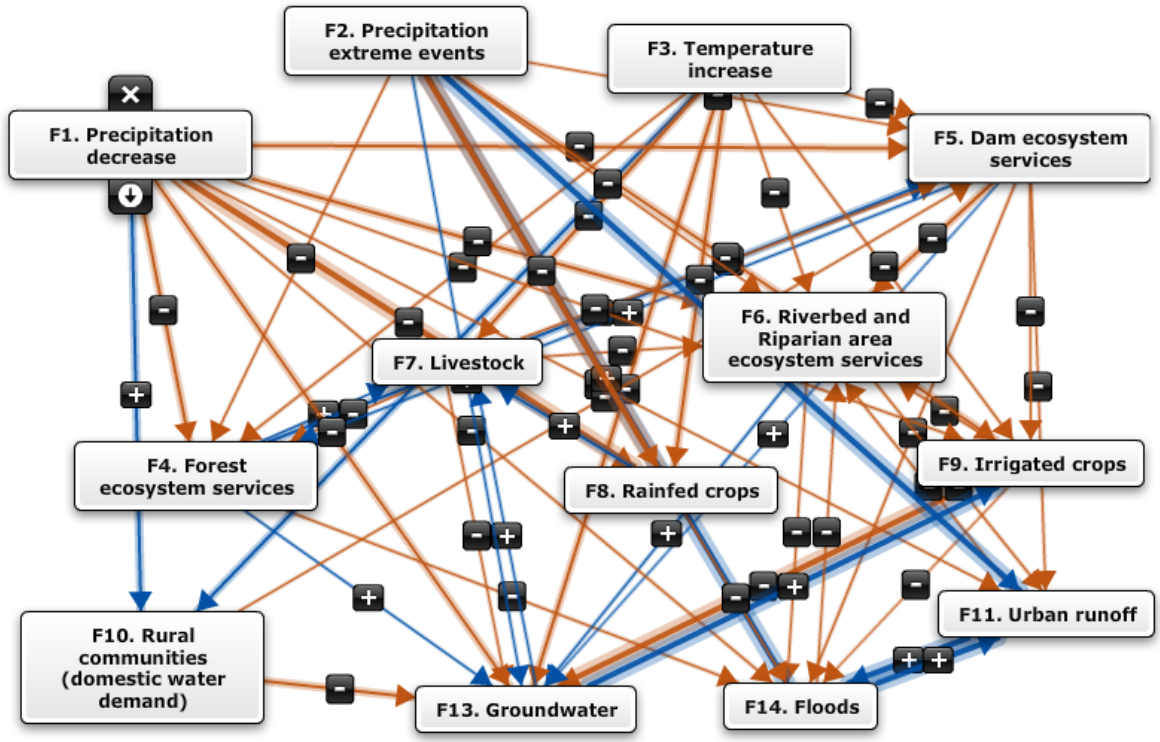

Figure S1: Fuzzy Cognitive Map developed for the Pedieos river basin.

Table S2: Definition of the factors for the Pedieos river basin

Number	Name of factor	Definition
F1	Temperature increase	Overall increase in temperature (1-2 ^{0}C), and more hot days (>35 ^{0}C) and tropical nights (>22.5 ^{0}C).
F2	Precipitation decrease	Reduction in the average annual rainfall (1-12%) and more very dry years.
F3	Precipitation extreme events	Increase in the number of extreme precipitation events (days with more than 50 mm rain).
F4	Forest ecosystem services	Ecosystem services provided by forests, namely, ecological, sociocultural, scenic and landscape services and values, including the regulation of water flows and reduction of erosion.
F5	Dam waterbody ecosystem services	Quantitative and qualitative status of surface water, related to the ecosystem services provided by the Tamassos dam reservoir, including flood control, water supply, provision of habitat for biodiversity and recreation.
F6	Riverbed and riparian area ecosystem services	Ecosystem services of the river and riparian zones, including sediment and nutrient filtering, water storage and release, aquifer recharge, bank stabilization and provision of habitat for biodiversity.
F7	Rainfed cropland	Land cultivated with crops that rely on rainfall for water, mainly barley grown during November-April and some olive orchards.

F8	Irrigated cropland	Land cultivated with irrigated crops such as vegetables, fruit trees and some olive orchards.
F9	Livestock	Intensive livestock farms, mainly with sheep, goats, chickens, but also cows and horses. Occasional grazing of natural vegetation by sheep and goats in the lower upstream and upper midstream areas.
F10	Rural communities (domestic water demand)	Water demand of rural households for drinking and gardens' watering purposes.
F11	Groundwater	Quantitative and qualitative status of groundwater.
F12	Urban runoff	Surface runoff of rainwater created by impervious surfaces (roofs, roads, sidewalks etc) and poor urban drainage systems.
F13	Floods	Flooding from the Pedieos river.

Table S3: Documentation of the relationships for the Pedieos river basin

From	To	Justification	Relationship
F1	F4	The increase in temperature negatively impacts on the ecosystem services provided by the forests	-0.2: weak negative relationship
F1	F5	The increase in temperature negatively impacts on the ecosystem services provided by the Tamassos dam reservoir, including mainly the water supply and the provision of habitat for biodiversity	-0.2: weak negative relationship
F1	F6	The increase in temperature negatively impacts on the ecosystem services of the river and the riparian zones including water storage and release and aquifer recharge.	-0.2: weak negative relationship
F1	F7	The increase in temperature creates strong negative impacts on the rainfed crops that rely on rainfall for water	-0.5: medium negative relationship
F1	F8	The increase in temperature negatively impacts on the irrigated crops	-0.2: weak negative relationship
F1	F9	The increase in temperature creates strong negative impacts on livestock	-0.5: medium negative relationship
F1	F10	The increase in temperature strongly increases the water demand of rural households for drinking and gardens' watering purposes	0.5: medium positive relationship
F2	F4	The reduction in the average annual rainfall creates strong negative impacts on the ecosystem services provided by the forests	-0.5: medium negative relationship
F2	F5	The reduction in the average annual rainfall creates strong negative impacts on the ecosystem services provided by the Tamassos dam reservoir, including mainly water supply.	-0.5: medium negative relationship
F2	F6	The reduction in the average annual rainfall creates strong negative impacts on the ecosystem services provided by the river and the riparian zones including mainly the water storage and release and the aquifer recharge.	-0.5: medium negative relationship

F2	F7	The reduction in the average annual rainfall creates very strong negative impacts on the rainfed crops that rely on rainfall for water	-1: very strong negative relationship
F2	F8	The reduction in the average annual rainfall negatively impacts on the irrigated crops	-0.2: weak negative relationship
F2	F10	The reduction in the average annual rainfall strongly increases the water demand of rural households for drinking and gardens' watering purposes	0.5: medium positive relationship
F2	F11	The reduction in the average annual rainfall creates strong negative impacts on the quantitative status of groundwater.	-0.5: medium negative relationship
F2	F12	The reduction in the average annual rainfall decreases the surface runoff of rainwater in urban areas	-0.2: weak negative relationship
F3	F4	An increase in the number of extreme precipitation events affects negatively the ecosystem services provided by the forests.	-0.2: weak negative relationship
F3	F5	An increase in the number of extreme precipitation events affects negatively the ecosystem services provided by the Tamassos dam, mainly the flood control.	-0.2: weak negative relationship
F3	F6	An increase in the number of extreme precipitation events affects negatively the ecosystem services provided by the river and the riparian zones, mainly the bank stabilization and the provision of habitat for biodiversity.	-0.2: weak negative relationship
F3	F7	An increase in the number of extreme precipitation events creates very strong negative impacts on rainfed crops.	-1: very strong negative relationship
F3	F8	An increase in the number of extreme precipitation events creates strong negative impacts on rainfed crops.	-0.5: medium negative relationship
F3	F11	An increase in the number of extreme precipitation events improves the quantitative and qualitative status of groundwater resources	0.2: weak positive relationship
F3	F12	An increase in the number of extreme precipitation events very strongly increases the surface urban runoff in urban areas	1: very strong positive relationship
F3	F13	An increase in the number of extreme precipitation events very strongly increases the flooding from the Pedieos river	1: very strong positive relationship
F4	F5	Forest ecosystem services including the regulation of water flows and the reduction of erosion strongly improve the ecosystem services provided by the Tamassos dam reservoir, namely, flood control and provision of habitat for biodiversity and recreation.	0.5: medium positive relationship
F4	F9	Forest ecosystem services improve livestock	0.2: weak positive relationship

F4	F11	Forest ecosystem services including the regulation of water flows and the reduction of erosion improve the qualitative and quantitative status of groundwater	0.2: weak positive relationship
F4	F13	Forest ecosystem services including the regulation of water flows and the reduction of erosion reduces the flooding from the Pedieos river.	-0.2: weak negative relationship
F5	F4	The ecosystem services provided by the Tamassos dam reservoir positively impact on the ecological, sociocultural, scenic and landscape services of the forests.	0.2: weak positive relationship
F5	F6	The improvement of the ecosystem services provided by the Tamassos dam reservoir create strong negative effects on the ecosystem services of the river and riparian zones, including sediment and nutrient filtering, water storage and release, aquifer recharge, bank stabilization and provision of habitat for biodiversity.	-0.5: medium negative relationship
F5	F8	The improvement of the ecosystem services provided by the Tamassos dam reservoir negatively impacts on the irrigated crops since less water is diverted for irrigation	-0.2: weak negative relationship
F5	F11	The improvement of the ecosystem services provided by the Tamassos dam reservoir increases the groundwater recharge.	0.2: weak positive relationship
F5	F13	The improvement of the ecosystem services provided by the Tamassos dam reservoir reduces the flooding from the Pedieos river.	-0.2: weak negative relationship
F6	F11	The improvement of the ecosystem services of the river and riparian zones improves the aquifer recharge	0.2: weak positive relationship
F6	F13	The improvement of the ecosystem services of the river and riparian zones reduces the flooding from the Pedieos river.	-0.2: weak negative relationship
F7	F9	Better management of rainfed crops creates strong positive effects on the livestock	0.5: medium positive relationship
F7	F13	Rainfed crops reduce the flooding from the Pedieos river through the land cover.	-0.2: weak negative relationship
F8	F6	Irrigated crops negatively impacts on the ecosystem services of the river and riparian zones since less water flows in the riverbed	-0.2: weak negative relationship
F8	F11	Irrigated agriculture creates very strong negative impacts on the groundwater resources both in quantitative and qualitative terms	-1: very strong negative relationship
F8	F13	Irrigated crops reduce the flooding from the Pedieos river through the land cover.	-0.2: weak negative relationship
F9	F4	The expansion of livestock negatively impacts on the ecosystem services provided by the forests	-0.2: weak negative relationship
F9	F5	The expansion of livestock negatively impacts on the ecosystem services provided by the Tamassos dam reservoir	-0.2: weak negative relationship

F9	F6	The expansion of livestock negatively impacts on the ecosystem services provided by the river and riparian zones	-0.2: weak negative relationship
F9	F11	The expansion of livestock negatively impacts on the qualitative and quantitative status of groundwater.	-0.2: weak negative relationship
F10	F5	An increase of rural households' water demand reduces the quantities of the surface water.	-0.2: weak negative relationship
F10	F11	An increase of rural households' water demand strongly reduces the quantities of the groundwater.	-0.5: medium negative relationship
F11	F8	The improvement of the quantitative and qualitative status of groundwater releases more water for irrigation purposes creating thus very strong positive effects on irrigated agriculture	1: very strong positive relationship
F11	F9	The improvement of the quantitative and qualitative status of groundwater positively impacts on the livestock	0.2: weak positive relationship
F12	F6	Urban runoff negatively impacts on the ecosystem services provided by the river and riparian zones	-0.2: weak negative relationship
F12	F13	Urban runoff strongly increase the flooding from the Pedieos river	1: very strong positive relationship
F13	F6	Flooding from the Pedieos river negatively impacts on the ecosystem services of the river and riparian zones	-0.2: weak negative relationship
F13	F12	Flooding from the Pedieos river strongly increase the urban runoff	1: very strong positive relationship

Documentation of the Fuzzy Cognitive Map for the Rmel river basin

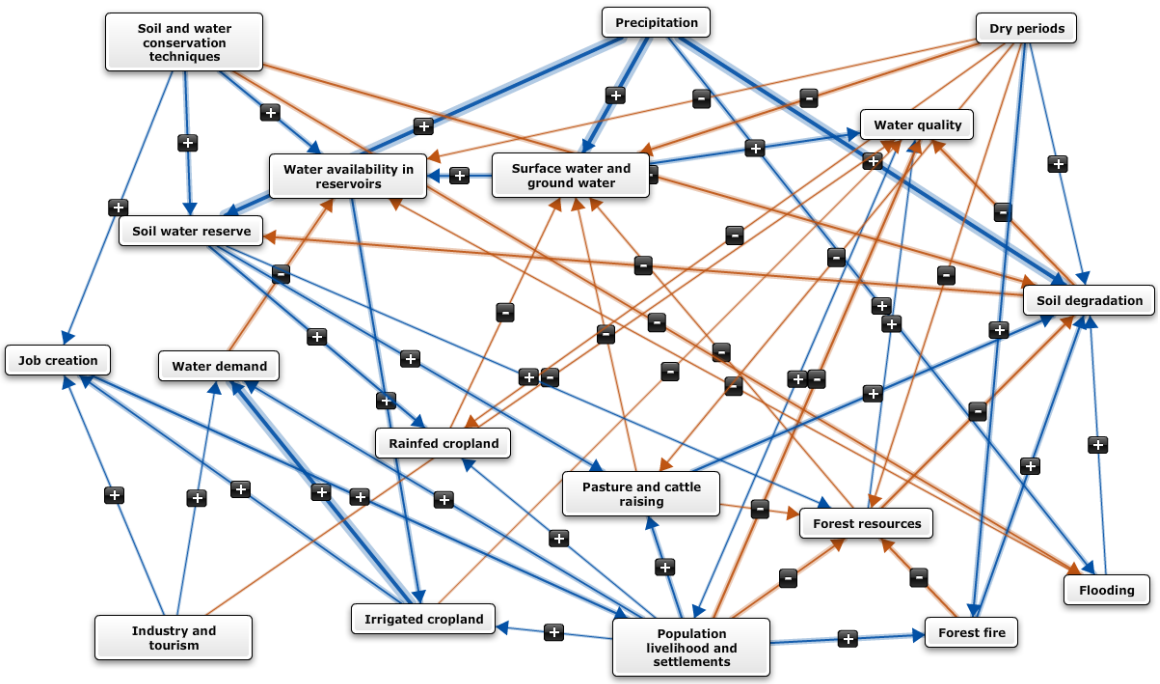

Figure S2: Fuzzy Cognitive Map developed for the Rmel river basin.

Table S4: Definition of the factors for the Rmel river basin

Number	Name of factor	Definition
F1	Precipitation	Irregular and high intensity regime of precipitation
F2	Surface water and ground water	Volumes of water in rivers and the level of aquifers.
F3	Soil water reserve	Volume of water that is stored in the soil
F4	Flooding	Natural extreme event.
F5	Soil degradation	Caused by heavy precipitation on bare soils and steep areas.
F6	Water availability in reservoirs	Volume of water available in dams, hill, lakes, etc.
F7	Irrigated cropland	Irrigated fields that are created downstream after the construction of the dam.
F8	Water quality	Refers to pollution of rivers and aquifers by industrial zone that is recently created.
F9	Forest resources	Various tree species (productive and protected species).
F10	Water demand	Water demand of different sectors (Agriculture, population, industry and tourism).
F11	Soil and water conservation techniques	Limited within the catchment, they are located on steep up stream farmlands to collect runoff water.
F12	Job creation	Creation of jobs in agricultural and environmental sectors to promote development in the region.
F13	Forest fire	Disaster that can be natural or anthropogenic.

F14	Industry and tourism	Includes different enterprises, factories ,olive presses and thermal stations, etc.
F15	Population livelihood and settlements	Includes all population categories and settlements in different sectors based on promoting new agricultural and environmental projects
F16	Pasture and cattle raising	Developed mainly in Rural communities.
F17	Rainfed cropland	Land contains crops that rely on rainfall.
F18	Dry periods	Succession of dry years.

Table S.5: Documentation of the relationships for the Rmel river basin

From	To	Justification
F1 Precipitation	F2 Surface and groundwater	Strong positive relation because a fraction of precipitation reaches rivers directly as runoff or, indirectly, through deep drainage to groundwater and stream base flow.
F1 Precipitation	F3 Soil water reserve	Strong positive relation because a fraction of rainfall infiltrates into the soil and is available for plants.
F1 Precipitation	F4 Flooding	Medium positive relation as flooding occurs occasionally
F1 Precipitation	F5Soil degradation	Strong positive relation because precipitation is the main reason of the soil degradation in the Rmel watershed
F2 Surface water and ground water	F5 water availability in reservoirs	Medium positive relation because the water in reservoirs does not come only from surface water and groundwater ,it comes from precipitations also
F2 Surface water and ground water	F8 water quality	Medium positive relation displays that surface water can affect the quality of water
F3Soil water reserve	F9 Forest resources	Low positive relation because the soil water reserve could maintain the growth of forests
F3Soil water reserve	F16 Pasture and cattle raising	Medium positive relation because the more we have water the more grass we have for the cattle
F3Soil water reserve	F17 Rainfed cropland	Medium positive relation because rainfed croplands depend on water
F4 Flooding	F6 Water availability in reservoirs	Low negative relation due to the damage that could be done by flooding
F4 Flooding	F5 Soil degradation	Low positive relation because flooding may cause runoff that leads to the soil degradation
F5 Soil degradation	F3Soil water reserve	Medium negative relation because when soil is degraded its retention capacity decreases
F5 Soil degradation	F8 water quality	Medium negative relation because when soil is degraded the salinity increases and affects water quality
F6 Water availability in reservoirs	F7 Irrigated cropland	Medium positive relation because when we have water in reservoirs the irrigated cropland will not depend only on rainy seasons
F7 Irrigated cropland	F8 water quality	Low negative relation because of the use of fertilizers and pesticides
F7 Irrigated cropland	F1 Water demand	Strong positive relation because of the water-consuming crops (watermelon, tomatoes…)

F7 Irrigated cropland	F12 Job creation	Medium positive relation because developed agriculture attracting somehow employers
F8 Water quality	F15 population livelihood and settlements	Low positive relation because in somehow when the water quality is good it might improve the population livelihood and hence it would have a positive impact on population-related sectors
F9 Forest resources	F2 surface water and ground water	Low negative relation because in some way with more forest we have more trees consuming water from aquifers
F9 Forest resources	F5 Soil degradation	Medium negative relation because forest resources contribute in protecting the soil
F9 Forest resources	F8 water quality	Low positive relation because forest protect soil from degradation and eventually the water quality, moreover the growth of forest does not require fertilizers so the water quality is intact
F10 Water demand	F5 water availability in reservoirs	Medium negative relation because when the water demand goes up the water availability decreases especially in summer
F11 soil and water conservation techniques	F3 soil water reserve	Medium positive relation because these techniques would decrease the runoff so the soil water reserve is preserved
F11 soil and water conservation techniques	F4 Flooding	Medium negative relation because these techniques can lessen the impact of flooding
F11 soil and water conservation techniques	F5 Soil degradation	Medium negative relation because these techniques can lessen the impact of the rainfall and runoff that cause the soil degradation
F11 soil and water conservation techniques	F5 water availability in reservoirs	Medium positive relation because these techniques provide the protections of reservoirs and do not allow sediment storage in reservoirs. They keep the storage capacity of the reservoirs
F11 soil and water conservation techniques	F12 Job creation	Low positive relation because these techniques require workers and funding, which is lacking currently
F12 Job creation	F15 population livelihood and settlements	Medium positive relation because more jobs may attract more people
F13 Forest fire	F5 Soil degradation	Medium positive relation because fire will damage plants and trees so it will accelerate the soil degradation
F13 Forest fire	F9 Forest resources	Medium negative relation for the fact that more fires destroy forest resources
F14 Industry and tourism	F8 water quality	Low negative relation because of the waste water of factories, olive presses…
F14 Industry and tourism	F10 Water demand	Low positive relation because growing industry and tourism need more water
F14 Industry and tourism	F12 Job creation	Low positive relation because when the industrial and touristic sectors grow, they create jobs

F15 population livelihood and settlements	F7 Irrigated cropland	Low positive relation. higher population would require more food production
F15 population livelihood and settlements	F8 water quality	Medium negative relation because the growth of population livelihood affect the water quality
F15 population livelihood and settlements	F9 Forest resources	Medium negative relation because of the growth of urbanization.
F15 population livelihood and settlements	F10 Water demand	Medium positive relation because when population grows, it needs more water
F15 population livelihood and settlements	F13 Forest fire	Medium positive relation and this is due to the lack of awareness to the importance of forest resources
F15 population livelihood and settlements	F16 Pasture and cattle raising	Low positive relation. This relation is due to the fact that when jobs are created they will target the population livelihood so pasture and cattle raising increases
F15 population livelihood and settlements	F17 Rainfed cropland	Low positive relation. Higher population would require more food production
F16 Pasture and cattle raising	F2 surface water and ground water	Low negative relation because more cattle means more needs in water
F16 Pasture and cattle raising	F5 Soil degradation	Medium positive relation because of the overgrazing and overexploitation of the land
F16 Pasture and cattle raising	F9 Forest resources	Low negative relation because of the overgrazing
F17 Rainfed cropland	F2 surface water and ground water	Low negative relation because rainfed croplands depend on surface and ground water coming from precipitations
F18 Dry periods	F2 surface waterand ground water	Medium negative relation because in dry periods surface water and groundwater are the most important water supply
F18 Dry periods	F5 Soil degradation	Low positive relation because in dry periods vegetation cover will decrease and during autumn period precipitations on bare soils will probably lead to soil loss. The evaporation processes active during dry periods and leads generally to the salinization of the soil surface (bring the salt on surface)
F18 Dry periods	F5 water availability in reservoirs	Low negative relation because in dry periods there is a frequent use of water from the reservoirs
F18 Dry periods	F9 Forest resources	Low negative relation because in dry periods forest resources became more fragile
F18 Dry periods	F13 Forest fire	Medium positive relation because high temperature can ignite fire
F18 Dry periods	F16 Pasture and cattle raising	Low negative relation because in dry periods pasture and cattle raising are affected due to the vegetation shortage

F18 Dry periods	F17 Rainfed cropland	Low negative relation because in dry periods rainfed croplands are affected because of lack of precipitation

Documentation of the Fuzzy Cognitive Map for the Tordera river basin

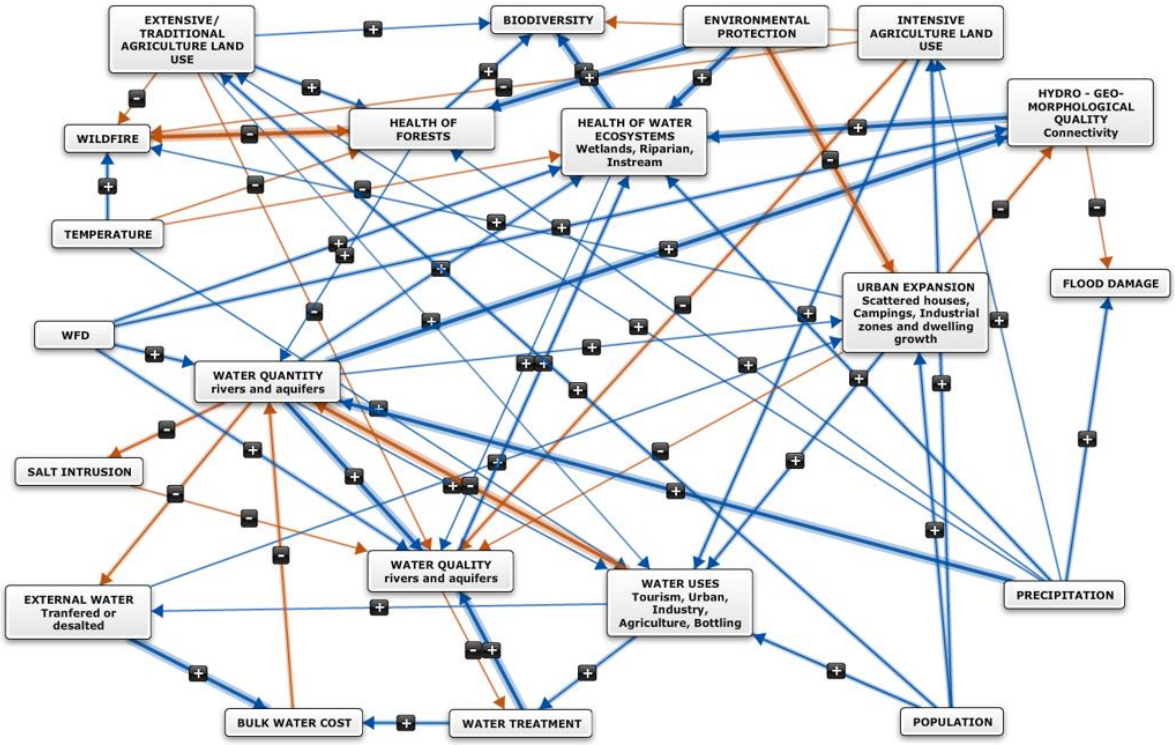

Figure S3: Fuzzy Cognitive Map developed for the Tordera river basin.

Table S6: Definition of the factors for the Tordera river basin

Number	Factors	Definition
F1	Wildfire	Forest fire
F2	Health of forests	Composition of species, forest structure and functionality.
F3	Extensive/ traditional agriculture land use	Refers to enterprises with a low input exploitation model. Factor refers to land use, water use these activities enhance is considered part of the F6
F4	Biodiversity	Indicates level of biodiversity in all ecosystems
F5	Water quality	Refers to chemical and biological quality of rivers; chemical quality of aquifers.
F6	Water uses	Urban, Tourism, Industry, Agriculture, Bottling are main uses considered.
F7	Intensive agriculture land use	Refers to enterprises with a high input exploitation model. Factor refers to land use, water use these activities enhance is considered part of the F6
F8	Temperature	Temperature of the air
F9	Health of water ecosystems	Quality of wetlands, riparian, in-stream ecosystems

F10	Salt intrusion	Lowering level of freshwater in aquifers entails intrusion of seawater.
F11	Water quantity	Refers to the volumes of water flowing in rivers, the level of aquifers and feed in ratio of all related water bodies.
F12	Hydro - geo-morphological quality	Broad concept, Includes: river space, all forms of connectivity and delta/coastline morphology. This factor includes Sediment flows (mobilization of sand, gravel and all solid components)
F13	Urban expansion	Scattered houses, Camping, Industrial zones and dwelling growth
F14	External water	Refers to all input from no natural sources of the basin: Transferred from other basins or produced through desalinization or reclaiming plants.
F15	Bulk water cost	Refers to the real costs to obtain bulk water
F16	Water treatment	The presence of wastewater treatment facilities, as well as purification plants.
F17	Flood damage	Refers to the impact on people and infrastructure of floods.
F18	Precipitation	Precipitation regime
F19	Population	Refers to both resident and tourist population
F20	WFD	Refers to those management and policy measures implemented to meet WFD objectives
F21	Environmental protection	Refers to all legislation aiming at environmental protection: N2K, PEIN, Parks, etc.

Table S7: Documentation of the relationships for the Tordera river basin

Relationship	**Explanation**
F1 Wildfire to F2 Health of Forests	Strong negative relation because where forest fires occur, it destroys the whole ecosystem.
F2 Health of Forests *to* F1 Wildfire	Medium negative relation because the structure of forests determinate the conditions for wildfires to occur.
F2 Health of Forests *to* F4 Biodiversity	Medium positive relation because forest ecological quality and functionality are crucial for biodiversity to develop.
F2 Health of Forests *to* F11 Water Quantity	Light negative relation because the level of water consumption of the forest evapotranspiration is influenced by its structure and composition.
F3 Ext. Agric. *To* F1 Wildfire	Light negative relation because extensive agriculture increases quality of land use mosaic and reduces fuel load in forests through livestock grazing.
F3 Ext. Agric. *to* F2 Health of Forests	Medium positive relation because extensive agriculture helps reducing understory vegetation through livestock grazing.
F3 Ext. Agric. *to* F4 Biodiversity	Light positive relation because traditional agricultural practices generate specific ecosystems and may function as ecological niche and corridor.
F3 Ext. Agric. *to* F5 Water Quality	Light negative relation because extensive agriculture uses little pesticides and fertilizers (niche products), uses more adapted crops, has better soil quality and may allow riparian / wetlands to co-exist in plots (bio-depuration).
F2 Health of Ecosystems *to* F1 Wildfire	Medium negative relation because healthy ecosystems the probability of wildfires occurrence, although this is not the only factor involved in prevention conditions.

F2 Health Of Ecosystems *to* F4 Biodiversity	Strong positive relation, as this factor is the main condition for biodiversity to develop.
F2 Health Of Ecosystems *to* F5 Water Quality	Medium positive relation because healthy ecosystems related to water bodies have a strong depurative function until a certain degree of pollution.
F3 Ext. Agric. *to* F6 Water Uses	Light negative relation because extensive agriculture land use is rainfed or supplied by gravity irrigation. The latter consumes much water, but also has very big return rates. In Tordera hydrogeology return rates go directly back to water bodies.
F5 Water Quality *to* F9 Health of Water Ecosystems	Light positive relation because clean water enhances ecosystem health, while pollution may be only partially absorbed by ecosystems.
F5 Water Quality *to* F16 Water Treatment	Light negative relation because purification treatment is less intensive when water quality is higher, but still needed in most cases.
F6 Water Uses *to* F11 Water Quantity	Strong negative relation because Tordera basin suffers strong overexploitation.
F6 Water Uses *to* F14 External Water	Light positive relation because demand is the main impulse for unconventional water production.
F6 Water Uses *to* F16 Water Treatment	Medium positive relation because all uses affect water quality and most wastewater should be treated.
F7 Intensive Agr. *to* F1 Wildfire	Light negative relation because intensive agriculture farming clears the land and contributes to land use mosaic, reducing wildfire fuel.
F7 Intensive Agr. *to* F4 Biodiversity	Light negative relation because intensive agriculture farm practices strongly degrade biodiversity
F7 Intensive Agr. *to* F5 Water Quality	Medium negative relation because intensive farming practices are highly polluting and occupy riparian areas (no buffer strips) increasing direct runoff into rivers
F7 Intensive Agr. *to* F6 Water Uses	Medium positive relation because intensive agriculture has a strong and consolidated demand, in the lower part of the river.
F5 Water Quality *to* F6 Water Uses	Light positive relation because water quality is a limiting factor to water uses, due to high treatment costs. Especially relevant aspect in Tordera.
F5 Water Quality *to* F15 Bulk Water Cost	Light negative relation (actually could be stronger) because salt intrusion and nitrate pollution in groundwater are very costly processes to be developed for drinkwater production.
F8 Temperature *to* F1 Wildfire	Medium positive relation because especially in summer, high temperatures generate the conditions for wildfires to occur.
F8 Temperature *to* F2 Health of Forests	Light negative relation because forest ecosystems suffer from high temperature, even though some species are adapted.
F8 Temperature *to* F6 Water Uses	Light positive relation because agriculture and urban (tourism) water demands increase with high temperature, but this is not valid for bottling plants and industry.
F8 Temperature *to* F9 health of water Ecosystems	Light negative relation because temperature increases evaporation and temperature of the water, but the effect on water ecosystems depends on many factors.
F9 Health of Water Ecosystems *to* F4 Biodiversity	Strong positive relation because water ecosystems highly contribute to quality of biodiversity.

F9 Health of Water Ecosystems *to* F5 Water Quality	Light positive relation because the capacity of water depuration by water ecosystems is constraint to many environmental conditions.
F10 Salt intrusion *to* F5 Water Quality	Light negative relation because the phenomenon is limited to the lower part of the basin. In those areas this is a crucial factor and relationship is strong.
F11 Water Quantity *to* F5 Water Quality	Strong positive relation because quantity determinates water quality at all levels.
F11 Water Quantity *to* F6 Water Uses	Light positive relation because water quantity is a limiting factor to all uses, but the availability of external water may reduce this weight.
F11 Water Quantity *to* F9 Health of Water Ecosystems	Medium positive relation because adequate flow regime is a precondition to ecosystems to exist.
F11 Water Quantity *to* F10 Salt intrusion	Medium negative relation because the phenomenon is limited to the lower part of the basin. In those areas this is a crucial factor and relationship is strong.
F11 Water Quantity *to* F14 External Water	Medium negative relation because Tordera is an overexploited Basin and external water is partially compensating the lack available flows for some uses.
F12 Hydro-Geo-m. *to* F9 Health of Water Ecosystems	Strong positive relation because river morphology is crucial to enhance habitats for the ecosystem to develop
F12 Hydro-Geo-m. *to* F17 Flood Damage	Light negative relation as flood damage to dwellings and people is directly proportional to the quality of river morphology.
F13 Urban Expansion *to* F1 Wildfire	Light positive relation because the more people living in scattered houses or touristic dwellings, the more the risk of wildfire increases
F13 Urban Expansion *to* F5 Water Quality	Light negative relation because the expansion of dwellings also implies more wastewater pollution and most small settlements do not have any treatment facilities.
F13 Urban Expansion *to* F6 Water Uses	Medium positive relation because increased settlements entail increased urban water use.
F13 Urban Expansion *to* F12 Hydro-Geo-m.	Medium negative relation because much urban expansion - especially industrial areas in the middle part of the basin - are positioned in the river space.
F14 External Water *to* F13 Urban expansion	Light positive relation because when there is no water availability for new demands, unconventional water resources are produced.
F14 External Water *to* F 15 Bulk Water Cost	Strong positive relationship, because water desalting and reclaiming plants are costly investments and entail energy consumption.
F 15 Bulk Water Cost *to* F11 Water Quantity	Strong negative relation, as direct catchments from water bodies are cheaper than external water, when bulk water price is high, water service entities will increase direct catchments, reducing the water quantity in water bodies.
F16 Water Treatment *to* F5 Water Quality	Strong positive relation as the presence of water treatment facilities are the main precondition for enhancing water quality.

F16 Water Treatment *to* F 15 Bulk Water Cost	Medium positive relation because water treatment facilities are costly investments and entail energy consumption.
F 18 Precipitation *to* F2 Heath of Forests	Light positive relation because Mediterranean forests ecosystems are sensible to variations in precipitation
F 18 Precipitation *to* F3 Ext. Agric.	Light positive relation because extensive agriculture depends a lot on precipitation but also has more resilience due to the use of native species.
F 18 Precipitation *to* F7 Intensive Agr.	Light positive relation because intensive agricultural practices depend on precipitation, but integrate natural resources with irrigation from regulated water bodies.
F 18 Precipitation *to* F9 Health of Water Ecosystems	Medium positive relation because water related ecosystems are highly dependent on precipitation, especially those in wetlands and smaller streams.
F 18 Precipitation *to* F11 Water Quantity	Strong positive relation because water flows in all water bodies depends on precipitation.
F 18 Precipitation *to* F17 Flood Damage	Medium positive relation because flood intensity is highly related to the intensity of precipitation, although the damage largely depends on the presence of infrastructure and people in the flooding zone.
F19 Population *to* F3 Ext. Agric.	Medium positive relation because extensive agriculture engages a high number of people and food produced is mostly consumed locally.
F19 Population *to* F6 Water Uses	Medium positive relation because this is the direct pressure on urban demand, the most relevant demand in the Basin.
F19 Population *to* F7 Intensive Agr.	Medium positive relation because in the lower part of the basin intensive horticulture is the main agriculture activity and engages many people.
F19 Population *to* F13 Urban Expansion	Medium positive relations because touristic facilities are growing in the basin and so do interregional transport facilities.
F20 WFD *to* F5 Water Quality	Medium positive relation because this legal framework has many actions orientated to directly increase water quality, but it is only partially implemented.
F20 WFD *to* F9 Health of Water Ecosystems	Medium positive relation because this legal framework has many actions orientated to directly increase water related ecosystems, but it is only partially implemented.
F20 WFD *to* F11 Water Quantity	Medium positive relation because this legal framework has many actions orientated to directly increase water flows in rivers and aquifers, but it is only partially implemented.
F20 WFD *to* F12 Hydro-Geo-m.	Medium positive relation because this legal framework has many actions orientated to directly increase Hydro-geo-morphological quality, but it is only partially implemented.
F21 Environmental protection *to* F2 Heath of Forests	Strong positive weight because in Tordera most healthy forests are those with more protection strategies.
F21 Environmental protection *to* F9 Health of Water Ecosystems	Strong positive weight because environmental protection strategies are crucial to avoid complete destruction of Tordera water bodies.
F21 Environmental protection *to* F13 Urban Expansion	Strong negative weight because constructions are prohibited or limited in environmentally protected areas.

Documentation of the Fuzzy Cognitive Map for the Vipava river basin

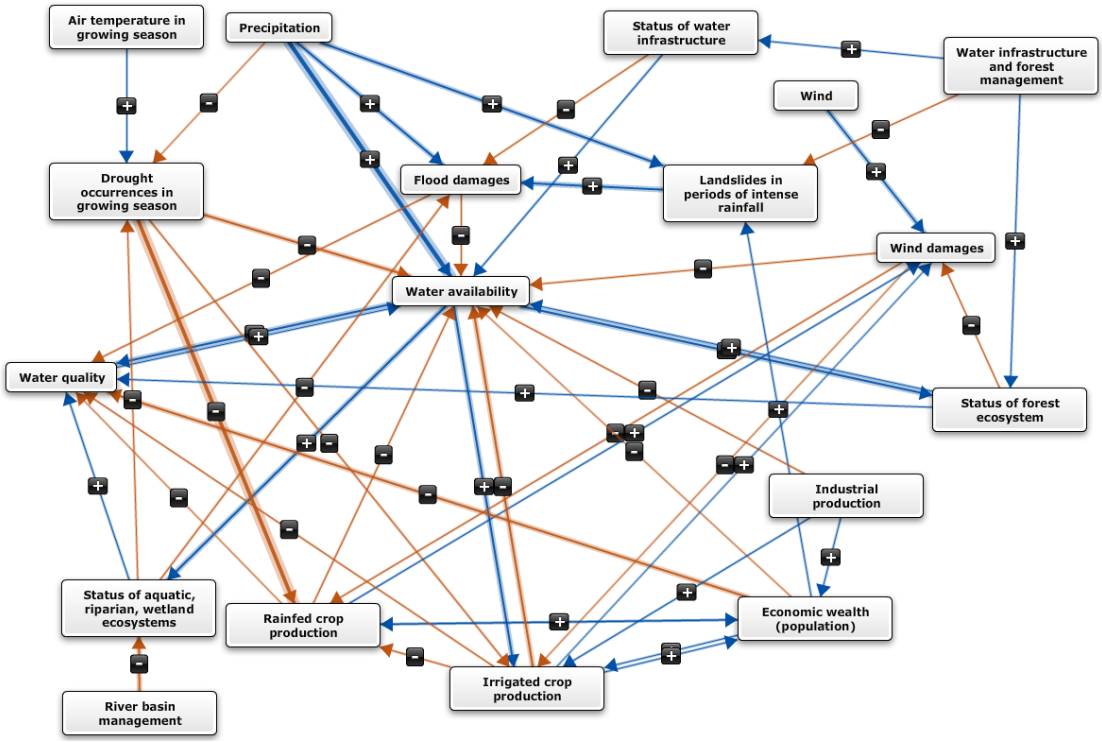

Figure S4: Fuzzy Cognitive Map developed for the Vipava river basin.

Table S8: Definition of the factors for the Vipava river basin

Number	Name of factor	Definition
F1	Precipitation	Annual average precipitation.
F2	Air temperature in growing season	Growing season - the period of time in a given year when the climate is prime for both indigenous and cultivated plants experience the most growth.
F3	Wind	Strong bora wind, cold and gusty north-eastern wind, especially in the cold half of the year (October to March).
F4	Water infrastructure and forest management	Management of water infrastructure of aquatic and riparian area, forests.
F5	Drought occurrences in growing season	Droughts that occur in growing season. Meaning meteorological and hydrological droughts.
F6	Flood damages	Damages caused by floods along the Vipava river and its tributaries.
F7	Landslides in periods of intense rainfall	Landslides on the slope of the Vipava valley – mostly associated with geological and morphological conditions.
F8	Wind damages	Damages caused by strong bora wind.
F9	Status of water infrastructure	Physical condition of existing water infrastructure – e.g. accumulation with dam (Vogršček), river embankments, check dams (storage of sediments)

F10	Status of forest ecosystems	Ecological condition of forest ecosystems.
F11	Status of aquatic, riparian, wetland ecosystems	Ecological, Hydrological, Morphological, Biological status of aquatic, riparian and wetland ecosystems
F12	Water availability	The availability of the water at its source (river, spring, accumulation) for all users – ecosystems and needs arising from human activities.
F13	Water quality	Physical-chemical parameters of water.
F14	River basin management	Management of surface waters and groundwater; e.g. the status, program of measures, maintenance and investment work planned and carried by concessionaire with confirmation of ministry responsible for the environment.
F15	Rainfed crop production	Crops that are not irrigated and they are dependent only from rain.
F16	Irrigated crop production	Crops that are irrigated (also in closed spaces – glasshouses).
F17	Economic wealth (population)	Including population and settlements development in the RB.
F18	Industrial production	Mostly food processing and textile industry.

Table S9: Documentation of the relationships for the Vipava river basin

From	To	Justification	Strength of the relationship
F1	F5	more precipitation mean less drought occurrences	1-: weak negative relationship
F1	F6	longer periods of rainfall or even shorter periods of heavy rainfal cause flood events that cause damages mostly to infrastructure	2+: medium positive relationship
F1	F7	longer periods of rainfall or even shorter periods of heavy rainfal can trigger landslides; in Vipava RB it has been observed that most landslides are triggered in periods of heavy rainfall, due to impacts of water on the geological structure and formation of the terrain	2+: medium positive relationship
F1	F12	more precipitation mean more water available in streams, soil and groundwater; for ecosystems (aquatic, riparian, wetland and forest) and water users (agriculture, households, industry)	3+: strong positive relationship
F2	F5	if air temperature (average annual or monthly) in growing season is getting higher, more droughts occur (weak relationship as droughts are not affected just by the air temperature, there are other factors like changes in precipitation patterns – temporal, spatial)	1+: weak positive relationship
F3	F8	strong Bora wind (mostly from October to March) cause wind damages, mostly to infrastructure and vegetation, it does not affect the whole basin	2+: medium positive relationship

F4	F7	current management of water infrastructure is present in the basin, but is not efficient enough, not optimal drainage and maintenance of existing water infrastructure. Still management of water infrastructure is present (weak negative relationship) with the objective to decrease landslides	1-: weak negative relationship
F4	F9	current management of water infrastructure is present in the basin, but is not efficient enough, so weak positive relationship is defined as status of water infrastructure is not optimal; only important (most needed) intervention works are done and less maintenance works are carried out	1+: weak positive relationship; example for water reservoir Vogršček – leakage on the dam - intervention works were carried out but due to lack of funding only 1st phase was carried out; water infrastructure on torrents are in poor state not serving its purpose, etc.
F4	F10	forest management is present in the basin and is positively affecting status of forest ecosystem, as most of the forest is in the hinterlands of the basin (sparsely populated) and only present in small parts of the valley where established protected areas of forest along Vipava river; weak positive relationship was determined	1+: weak positive relationship; (Forest management service - units Tolmin and Ajdovščina)
F5	F12	when droughts occur in growing season there is less water available for ecosystems and their services and for water users (agriculture sector, urban users)	2-: medium negative relationship
F5	F15	increased frequency and intensity of droughts in growing season (mostly crop-growing periods) reduces the rainfed crop production (smaller or loss of income) - droughts can harm crops and reduce yields, water demand of crops is difficult to meet as water supplies are reduced	3-: strong negative relationship; SH in 1st WS indicated, that droughts pose a bigger problem for agriculture in the upper part of the RB. In the period from April to September major part of the Vipava valley is endangered or much endangered by drought. (http://geo.ff.uni-lj.si/pisnadela/pdfs/zaksem_201407_jus_znidarsic.pdf).
F5	F16	increased frequency and intensity of droughts in growing season (mostly crop-growing periods) reduces the irrigated crop production (smaller or loss of income) - droughts can harm crops and reduce yields, water demand of crops is difficult to meet as water supplies are reduced	1-: weak negative relationship; only a small part of the agricultural land is being irrigated from water reservoir Vogršček (lower part of the basin) and Vipava

			river (upper part of the basin) (irrigation needs in the Vipava Valley are greater than the available water quantities and other water sources beside water reservoir Vogršček would be needed)
F6	F12	floods cause damages to water supply systems (power failure – problems in water purifying plants, after heavy rainfall water in karst spring becomes turbid and it needs to be cleaned for further use) and so less water is available for its users	1-: weak negative relationship
F6	F13	floods cause damages to water supply systems (power failure – problems in water purifying plants, after heavy rainfall water in karst spring becomes turbid and it need to be cleaned for further use) and so quality of drinking water deteriorates, also surface water becomes turbid, carrying potential pollutants downstream – surface water quality also deteriorates	1-: weak negative relationship
F7	F6	more landslides trigger in periods of intense rainfall, more damages caused by floods occur; when landslides trigger they move large amounts of sediments, which not only stay on slopes, but also reach the fluvial network. Under catastrophic conditions, land sliding may lead to torrential outbursts, debris flows or dam-break waves after a dam-breach of natural dams. As a result, floods of larger scope occur.	2+: medium positive relationship; landslides occur on specific places of the basin, where the terrain is becoming more steep (hillslopes)
F8	F12	strong bora wind damages infrastructure and causes power failure - drinking water cannot be transported to some settlements, also purifying plant for drinking water cannot not work	1-: weak negative relationship, temporally and spatially limited impact
F8	F15	strong bora wind causes damages in agriculture mostly through wind erosion - removal of top soil, additionally drying soil and causing damages to the crops (damages to leaves); the result is lower crop production	1-: weak negative relationship, spatially limited impact meaning where planted wind barriers, this effects are not so strong, and where strong bora wind prevails, permanent grassland are present
F8	F16	strong bora wind causes damages in agriculture mostly through wind erosion - removal of top soil, additionally drying soil and causing damages to the crops (damages to leaves); the result is lower crop production	1-: weak negative relationship, spatially limited impact, where irrigation prevails, wind is not so strong and causes less damages; the expansion of irrigation

			crop production in greenhouses is also limited
F9	F6	if status of infrastructure is good, floods cause less damage	1-: weak negative relationship; spatially limited impact, e.g. water reservoir Vogršček also provides flood safety downstream, but due to leakage of the dam and not finished intervention works, lower water level is maintained by higher discharge of water into Vogršček
F9	F12	if status of water infrastructure, where present and intended for water use (e.g. irrigation system) is in good condition, working properly, more water is available for ecosystems and sectors (agriculture)	1+: weak positive relationship; spatially limited impact, some water infrastructure is present but not in good condition to fully provide water available in the basin
F10	F8	when forest is in good condition, there are less damages caused by strong bora wind	1-: weak negative relationship; weak relationship is due to low percent of forest in the form of wind barriers (wind breaks) in the valley
F10	F12	the main catchment area of the Vipava river and its tributaries are plateaus in the north, north-east side covered with forest, the status of forest ecosystem positively affects water availability in the flat part of the basin	1+: weak positive relationship
F10	F13	if the forest ecosystems is in better status, water is better quality - forests impact positively on quality of surface and ground water through minimizing soil erosion on site, thus reducing sediment in water bodies (wetlands, ponds and lakes, streams and rivers), and through trapping or filtering other water pollutants	1+: weak positive relationship; in the hinterland of the basin forests prevail, this area is also sparsely populated; good chemical status of groundwater and moderate status of surface waters
F11	F5	with better status of aquatic, riparian, wetland ecosystems more water is retained and not drained away (better retention function, infiltration of water in the ground) and so less hydrological drought occur	2-: medium negative relationship
F11	F6	with better status of aquatic, riparian, wetland ecosystems flood cause less damages, ecosystems services slow down the flow velocity – like for	1-: weak negative relationship; some floodplains and meanders

		example menders and floodplains connected to the river	are present in the lower part of the basin, and are in a function of slowing down the flow velocity, but due to cannot alone reduce the extend of floods due to regulations of the watercourses in the upper part on the basin (more rapid water runoff from the basin, increased flow velocity, decreased retention function of the riverbed and soil)
F11	F13	with better status of aquatic, riparian, wetland ecosystems better self-cleansing capability of the aquatic environment (improvement in water quality through reduced nutrients)	1+: weak positive relationship; weak relationship due to moderate ecological status of surface water
F12	F10	water available in streams, soil and groundwater, satisfies basic environmental needs and if more water is available, forest ecosystem is in better state	2+: medium positive relationship
F12	F11	water available in streams, soil and groundwater, satisfies basic environmental needs and if more water is available, aquatic, riparian, wetland ecosystems are in better state	2+: medium positive relationship
F12	F13	when there is more water in watercourses and groundwater, water quality is of better quality mostly due to dilution of (potential) pollutants	2+: medium positive relationship; in the case of where net water quantities increase by moderate amounts, and surface water quality will generally improve as streams fill and dilute their pollutants
F12	F16	when more water is available for irrigation, agriculture production is higher	2+: medium positive relationship; spatially limited impact
F13	F12	if water is of better quality, more water is available for users (drinking water, water for irrigation and industry)	1+: weak positive relationship; one of the factor, but not the most important one - for domestic use raw water is being purified (due to nature of Hubelj (and Mrzlek) karst spring, used for drinking water, water is being purified with the help of water purification plant)

F14	F11	due to past regulations of watercourses and also due to improper intervention works on watercourses, aquatic, riparian and wetland ecosystems are not achieving e.g. good status according to Water framework Directive and natural habitats and habitats of species according to Habitats Directive	2-: medium negative relationship
F15	F8	if rainfed crop production is expanded or intensified, more wind damages occur due to expansion of arable land – in the past farmers alone have removed wind barriers that were introduced with Republic Green plan to expand the arable land – consequently more wind damages occur	1+: weak positive relationship
F15	F12	if rainfed crop production is expanded or intensified, the higher water uptake by plants and less water available for water-dependent ecosystems and sectors	2-: medium negative relationship
F15	F13	if rainfed crop production is expanded or intensified, water quality deteriorates due to the use of plant protection products and nutrients	1-: weak negative relationship; less pollution than from settlements (nutrients), but still present in Vipava RB, fungicides in fruit growing, Viticulture
F15	F17	if rainfed crop production is expanded or intensified, economic wealth gets higher – jobs guaranteed with higher income	1+: weak positive relationship
F16	F8	if irrigated crop production is expanded or intensified, more wind damages occur due to expansion of arable land – in the past farmers alone have removed wind barriers that were introduced with Republic Green plan to expand the arable land – consequently more wind damages occur	1+: weak positive relationship; limitations for vegetable crop production in closed areas (greenhouses) as wind tends to damage infrastructure
F16	F12	if irrigated crop production is expanded or intensified, less water is available for water-dependent ecosystems and sectors	2-: medium negative relationship; Water is used for irrigation that means irreversible water use. Irrigation crop production is present mostly in the lower part of the basin, near water reservoir Vogršček and where irrigation systems are present and functioning. In the upper part of the basin, irrigation of agricultural land is also present and the Vipava River is the only water source for irrigation

F16	F13	if irrigated crop production is expanded or intensified, water quality deteriorates due to the increased use of plant protection products and fertilizers	1-: weak negative relationship; less pollution than from settlements (nutrients), but still present in Vipava RB, fungicides in fruit growing, vegetable crop production
F16	F15	if irrigated crop production is expanded or intensified, area intended for rainfed crop production decreases – only if no expansion of arable land is planned	1-: weak negative relationship
F16	F17	if irrigated crop production is expanded or intensified, economic wealth increases – jobs guaranteed, self-sufficiency increases	1+: weak positive relationship; due to low purchase prices, agriculture crop productions is not so strong(e.g. peaches)
F17	F7	with increased economic wealth the expansion of settlement (individual houses) also occur and if the buildings extend into "problematic »terrain more landslides in periods of intense rainfall can occur due to inadequate regulation of storm water and hinterland water drainage	1+: weak positive relationship; spatially limited impact – on the slopes
F17	F12	if economic wealth gets higher and the population increases, domestic water use decreases water availability	1-: weak negative relationship; less water is used compared to the past, some SH say that due to the economic crisis people care more about the consumption
F17	F13	if economic wealth and the population increases, water quality deteriorates (more waste, waste waters) – in basin small and dispersed settlements have insufficient drainage and municipal wastewater treatment that are causing organic pollution of the surface water	2-: medium negative relationship
F17	F15	if economic wealth and population growth increases, rainfed crop production can be expanded or intensified due to increase in demand for food	1+: weak positive relationship
F17	F16	if economic wealth and population growth increases, irrigated crop production can be expanded or intensified due to increase in demand for food	1+: weak positive relationship
F18	F12	if the industrial production increases (heavy industry), water availability decreases – industry using a great amount of water (Fructal, Mlinotest, Tekstina) impacts water availability (where the same water source is being used - Vipava river, Hubelj spring)	1-: weak negative relationship; only if industry increases the consumption of water

F18	F16	if the industrial production increases (food processing industry, beverage production), irrigated crop production is expanded or intensified due to the increase in demand for crops	1+: weak positive relationship; industrial activities, food processing, beverage production purchase crops – right now as food processing industry is not so strong, low purchase prices for peaches allow only a small portion of irrigated crop production
F18	F17	if the industrial production increases, economic wealth together with population growth increases	1+: weak positive relationship; industrial activities (SME) are not so strong but still people work there and so the industry enables population development and economic wealth