ACTION PLAN FOR THE KAMIENNA PILOT CATCHMENT (D.T3.5.4)

Poland

October 2020

Research co-funded by The Polish Ministry of Science and Higher Education in the frame of the programme: International Cofunded projects during 2017 - 2020.

Table of Contents

1 Introduction, challenges, problems

The main objective of the FramWat project is to strengthen the regional common framework for floods, droughts and pollution mitigation by increasing the buffer capacity of the landscape using the Natural (Small) Water Retention Measures (N(S)WRM) approach in a systematic way.

Limited integration of N(S)WRM in the river basin and flood risk management in CE is mainly a consequence of lack of knowledge base and tools on how to plan, assess and implement the multiple benefits of measures on the river basin scale. Until now, the projects were mainly focusing on one specific measure where the effects on entire river basin scale are insignificant. Thus, it is important to strengthen the capacities and develop an innovative systematic approach to support the implementation of N(S)WRM.

The Action Plan was developed on the basis of the Concept Plan for Pilot Catchment Kamienna. The Concept Plan was based on the landscape valorization map (developed in FroGIS) and by building upon the first results of the static and dynamic modelling of the pilot catchment. The Concept Plan gives information on the best locations and suitable types of measures with the cumulative effect. Action plan is an implementation document which describes clear steps, timeline, financial resources and responsible actors for integrating N(S)WRMs into River Basin Management Plans (RBMPs).

The process of problem identification was carried out by reviewing publicly available documents, carrying out discussions with the main stakeholders, own analysis and field recognition.

1.1 Flood risk

The flood risk analysis was based on flood risk maps developed during the ISOK project in 2013 and available on the http://mapy.isok.gov.pl/imap portal. The flooding extend is presented for the probability of occurrence once every 10, 100 and 500 years. As shown in *Fig. 1*, floods occur practically along the entire length of the Kamienna River, omitting its source section. Agricultural lands located in the lower part of the basin, especially at its outlet to the Vistula river are under the highest threat. The urban areas of Starżyszko Kamienna, Starachowice and Ostrowiec Świętokrzyski are slightly threatened.

1.2 Problem with achieving good ecological status

Problems with poor water quality were diagnosed according to reports of the General Inspectorate for Environmental Protection conducted in 2014-2019 [GIOŚ, 2020]. That assessment identifies the mouth section of the Kamienna river and its upper tributary Kamionka as reaches with bad water status. The main cause of its poor condition are biological indicators such as phytobenthos and phytoplankton and a problem with macrophytes. Problems concerning priority substances (i.e. Benzo (a) pyrene) occur in all the monitored water bodies. Exceeded physico-chemical indicators (i.e. COD—Mn, Total organic carbon) were found in the north-western part of the catchment.

The status assessment does not include: Świślina to reservoir Wióry, Dunaj, Ścięgno, old riverbed in Stare Stoki, Kamienna from Świśliny to outlet. Therefore, in July 2018, one-time monitoring was carried out, which showed elevated nutrient concentrations in a number of tributaries. However, during this period there was a climatic, agricultural and hydrological drought which can make the

samples unrepresentative. Despite the fact that in the current assessment of water status, the maximum values and samples collected during extreme phenomena are rejected, it can be noticed after statistical analysis of all measurements (present in deliverable D.T.1.3.1), that acceptable limit of good status for PO4, Organic Nitrogen is often exceeded and slightly less for Total P and BOD5. In order to determine the duration of exceedances monthly statistics of selected agricultural catchments (Kamionka, Szewnianka, Pokrzywianka and Świślina) were prepared. The results show that the exceedance occurs in the summer months and this applies to compounds (PO4, Total P and Organic N), which get into the water as a result of surface runoff. Exceedances of good status are caused by point discharges from large towns along the Kamienna river section below Skarżysko Kamienna and Starachowice, which have a very negative impact on the Brody Iłżyckie Reservoir below, where sediments accumulate and algae with cyanobacteria blooms occur.

1.3 Drought risk

Problems connected to droughts were analysed on the basis of the Drought Impact Mitigation Plan for Central Vistula (DIMP), which contains an assessment (*Fig. 2*) of four types of drought (climatic, agricultural, hydrological, hydrogeological). It concludes that the greatest problems are caused by agricultural drought in the north-eastern part of the Wolanka catchment, then in the lower and middle sections of the Kamienna river and all sub-catchments with agricultural land use. The climatic drought extent is equally large and concentrates in the middle of the catchment. A very small threat is visible in case of hydrological and hydrogeological drought. In order to confirm the results of that valorisation, a map was drawn (*Fig. 3*) with the number of farmers applications from 2018 for crop damage compensation. The comparison of these maps shows that the acute problem of agricultural drought was confirmed in the south-eastern part of the basin.

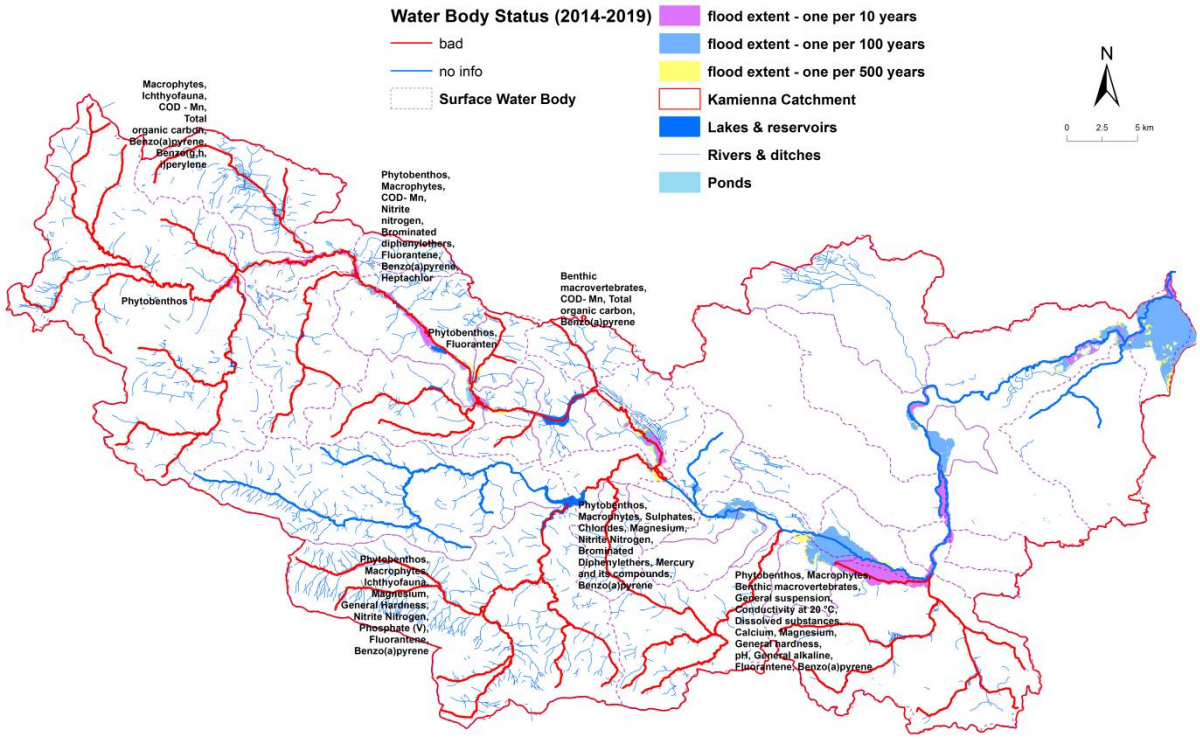

Fig. 1 Map of surface water body status and flood extent for Kamienna Catchment

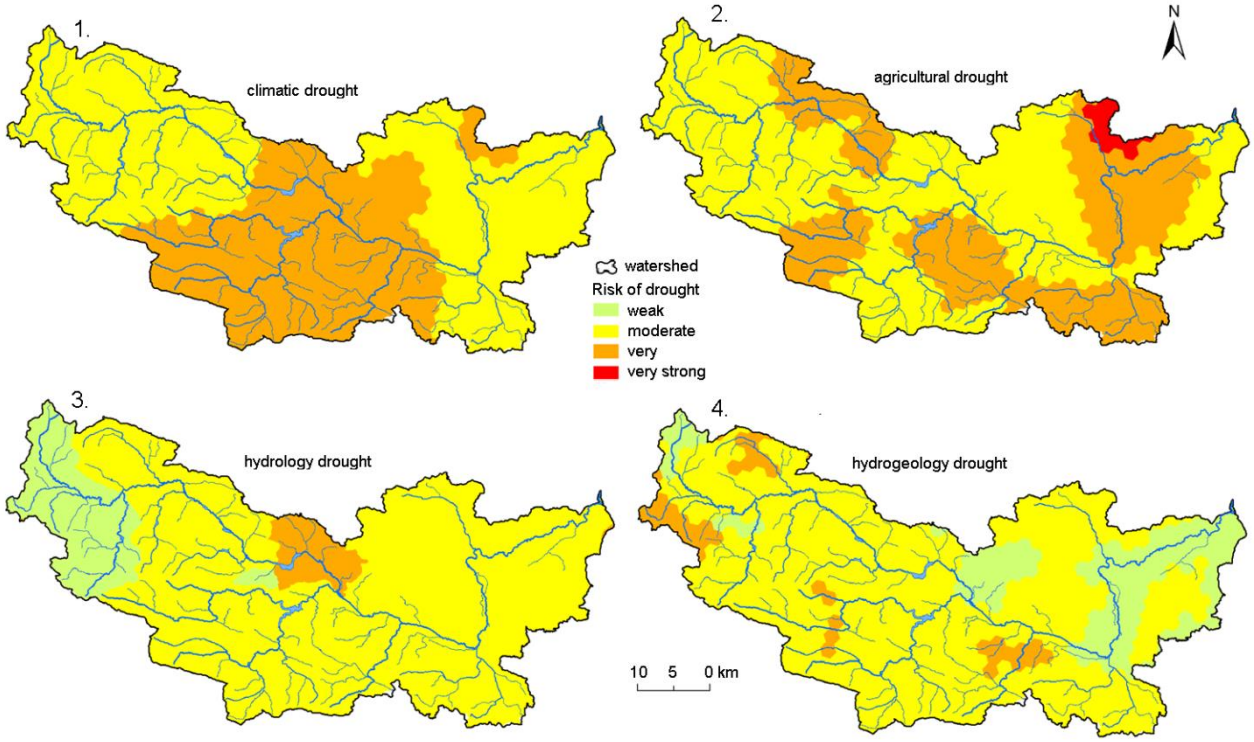

Fig. 2 Map of areas threatened by different types of drought included in the Drought Management Plan approved in 2017. Where: 1. Climatic, 2. Agricultural, 3 Hydrology, 4. Hydrogeology drought

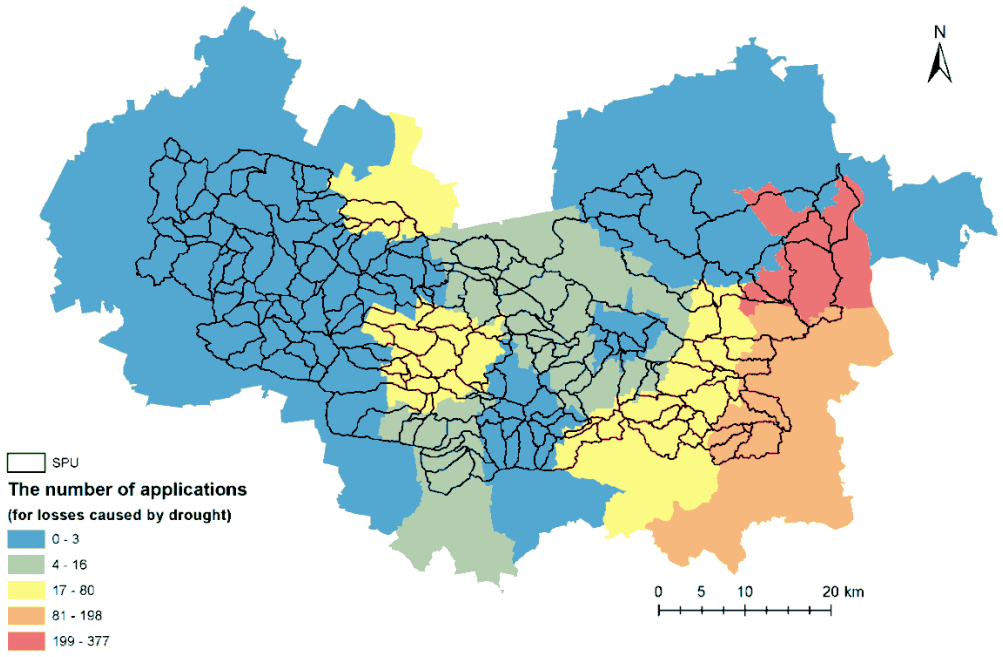

Fig. 3 Number of farmers applications for crop damage compensation in 2018 (source: Świętokrzyska Agricultural Chamber http://www.sir-kielce.pl access date 1.08.2018)

1.4 Climate change

The analysis of climate change was carried out with the use of the portal http://climateimpact.sggw.pl for the lower section of the Kamienna River flowing through the town of Ostrowiec Świętokrzyski. The projections were based on the RCP8.5 global scenario of CO_2 changes, dynamic downscaling and near (nf) and far (ff) future time horizons. Changes in meteorological conditions are projected to have an increasing tendency as shown in *Tab. 1*. These changes will have a drastic effect on surface runoff (-39% in spring and 92% in winter) and surface water flow (56% in winter) as shown in *Tab. 2*.

Tab. 1 Change of meteorological conditions for Kamienna catchment (measures in Ostrowiec Świętokrzyski) for RCP8.5

Parameters	**Actual 1970-2000**	**Changes**	
		Near future 2020-2050	**Far Future 2070-2100**
Annual min. air temperature	3,57 °C	+1,54 °C	+3,72 °C
Annual max. air temperature	12,23 °C	+1,17 °C	+3,43 °C
Annual sum of precipitation	647,6 mm	+6,22 %	+17,20 %

Tab. 2 Change of hydrology conditions for Kamienna catchment (measures in Ostrowiec Świętokrzyski) for RCP8.5

Parameters	**Near future [increase %] 2020-2050**					**Far future [increase %] 2070-2010**				
	Spring	Summer	Autumn	Winter	Annual	Spring	Summer	Autumn	Winter	Annual
Surface runoff	-39,2	43,1	5,3	92,1	-1,2	-51,2	67,2	186,3	103,1	18,7
Actual evapotran-spiration	12,3	0,7	0,3	10,9	3,6	27,5	2,3	-15,5	50,7	9,2
Low flow	37,2	28,1	22,4	27,0	30,0	134,5	68,0	52,7	145,5	77,6
Average flow	16,9	24,5	20,2	55,9	30,7	40,2	35,6	47,6	108,2	60,6
High flow	9,8	19,2	19,1	46,2	18,5	15,4	31,4	49,9	72,6	37,2

2 Selection of measures

With the use of the Concept Plan for Kamienna Catchment (CP) and by taking into account the outcomes of the national stakeholder meetings it was decided to move all the planned N(S)WRM to this document and carry out an assessment of the effectiveness and prioritization of activities.

2.1 Methodology

According to the Practical Guideline on Planning N(S)WRM developed during the FramWat project the planning process should be preceded by data collection and landscape valorisation. Then Concept Plan should be developed in four phases (A,B,C,D) as shown in Fig. 4 Diagram of the proposed procedure for N(S)WRM planning in river basins, and the role of Guidelines and Manual in this process (1, 2, 3, 4, 5 – steps in the Guidelines; A, B, C, D – phases in the Manual of . Selected measures should in particular improve areas with high needs and water retention capacity indicated in the valorization map. This map was developed by the FroGIS tool for all goals (drought, flood, water quality). However, in this study, the map integrating all goals presented in Fig. 5 Map of needs and possibilities for water retention (valorization map) was adopted. The process of measure selection is based on two methods: static and dynamic efficiency analysis, which are characterized by different accuracy and possibilities of analysis of selected types of measures (Tab. 3 List of selected measures with aggregation into groups (representing a similar retention mechanism) and the assessment method.). The course of this analysis is described in chapter 2.2. In addition, it is recommended to use the multi-criteria analyses based on the Analytic Hierarchy Process (AHP) method which is one of the multi criteria decision-making methods for dealing with complex problems.

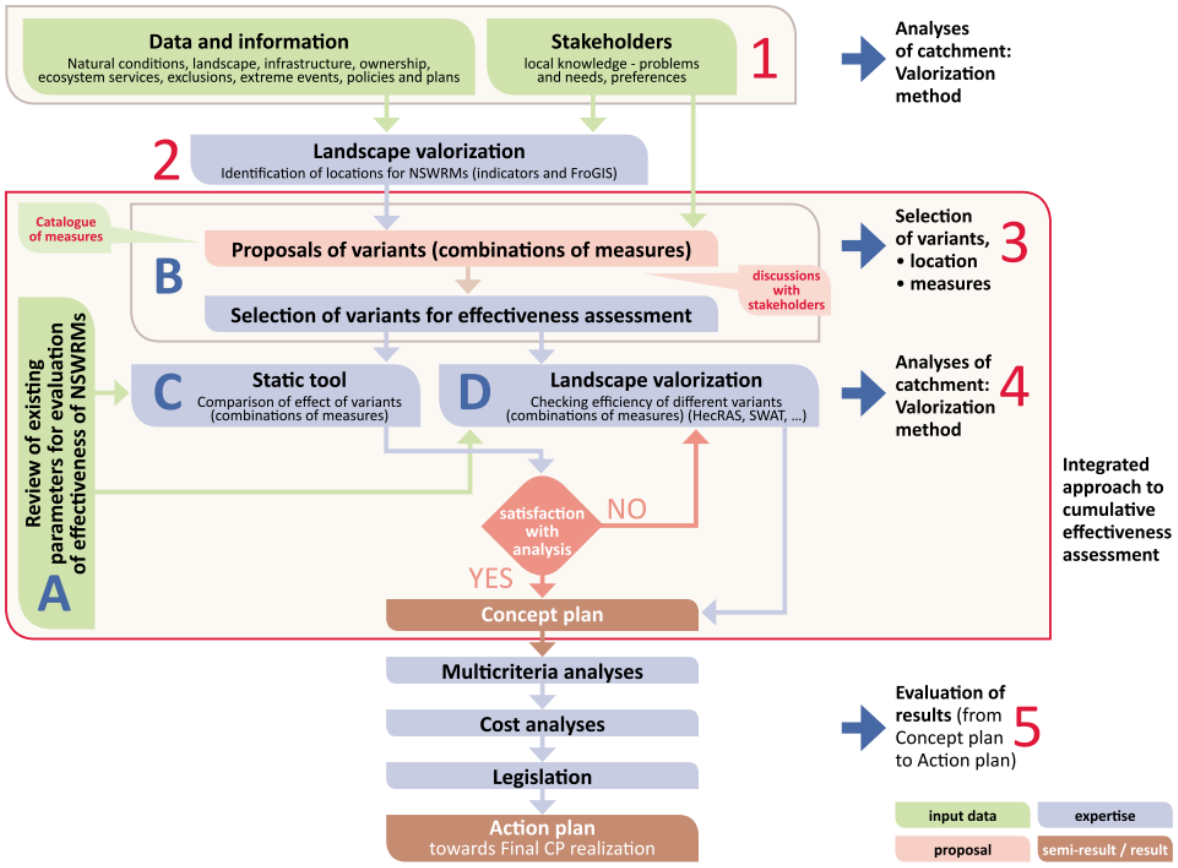

Fig. 4 Diagram of the proposed procedure for N(S)WRM planning in river basins, and the role of Guidelines and Manual in this process (1, 2, 3, 4, 5 – steps in the Guidelines; A, B, C, D – phases in the Manual of effectiveness.

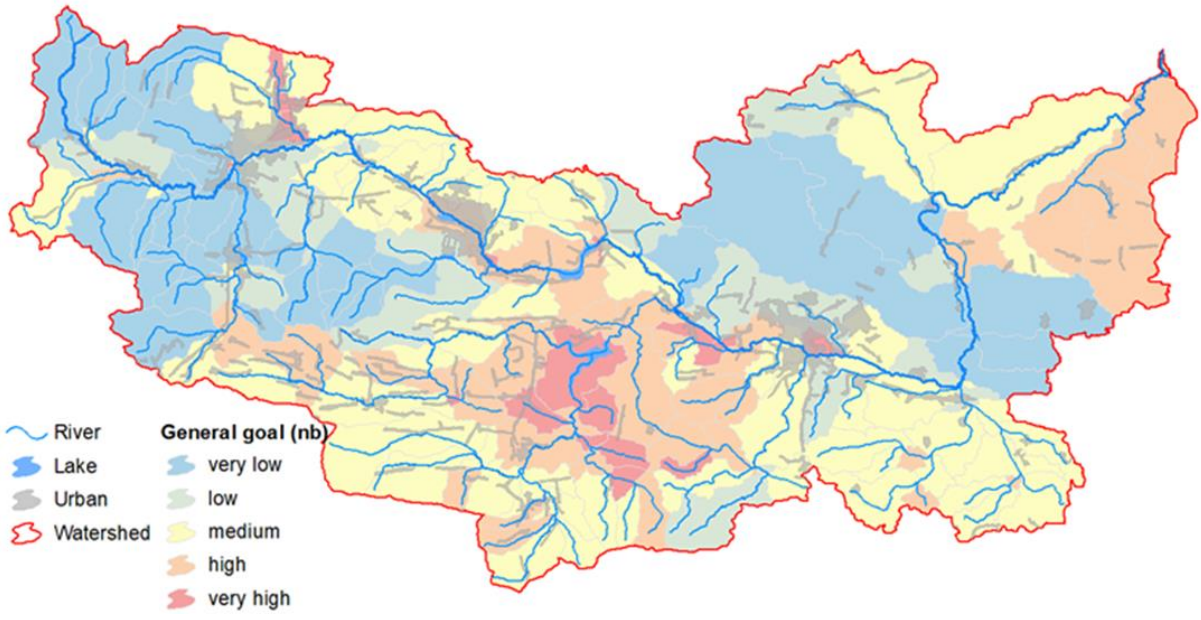

Fig. 5 Map of needs and possibilities for water retention (valorization map).

AHP method was used in the FramWat project to develop AHP tools dedicated for the selection of the type of single measures in a location known to the stakeholder. When selecting a set of actions, a multi-criteria analysis based on the following indicators was used:

- Needs and potential for water retention
- Effectives in subbasin or SPU (from static or dynamic methods)
- Potential land requirement (need to purchase parcels)
- Maintenance complexity

The values of the collected indicators should be converted into indices from 1 to 5, where one is a low mark and 5 a high mark. Then the indices in each SPU and for each type of measure should be added together.

As an indicator that does not exclude the implementation of the measures, the following information indicating the investment risk was assumed:

- Protected areas in the catchment,
- Public/private areas,
- Bad ecological status of the Water Body

2.2 Effectiveness analysis

2.2.1 Division of measures for efficiency calculations

The measures selected in the CP were developed and analysed in two variants: expert and local preference. However, as some of the actions were present in both variants, it was decided to merge the two sets of measures to assess effectiveness. In addition, since it is not possible to assess all types of measures using the dynamic method, the study presents both approaches.

Tab. 3 List of selected measures with aggregation into groups (representing a similar retention mechanism) and the assessment method.

No NSWRM	Aggregated measure No	Name of measure	Dynamic methods (model)	Static methods
A02	A2	Buffer strips and hedges		x
A03	WRAL	Crop rotation		x
A08	WRAL	Green cover/After-crops		x
D01	BPDA	Regulated outflow from drainage systems	SWAT	x
D02	BPDA	Water damming in ditches, weirs with constant crest (valleys)		x
D03	BPDA	Active water management on a drainage system (river valleys)		x
D04	BPDA	Construction of micro reservoirs on ditches	SWAT	
F01	F01	Forest riparian buffers	SWAT	x
F06	F06	Continuous cover forestry		x
F08	F08	Appropriate design of roads and stream crossings		x
F14	F14	Overland flow areas in peatland forests	SWAT	x
N02	ER	Wetland restoration and management		x
N03	ER	Floodplain restoration and management		x
N06	N06	Restoration and reconnection of seasonal streams	HEC-RAS	x
T01	T01	Polders, dry flood protection reservoirs, sediment trapping dams	HEC-RAS /SWAT	x
T02	T02	Widening or removing of flood protection dikes	HEC-RAS /SWAT	x
T03	T03	Construction of small reservoirs	HEC-RAS /SWAT	x

Explanations of abbreviations WRAL - best practices for Water Retention in Agricultural Lands, BPDA - Best practices on drained areas, ER - Renaturation of water dependent ecosystems (Ecosystems Restoration)

2.2.2 Static Tools evaluation results

The effectiveness of all measures was assessed in StaticTools.xlsx after aggregation into groups with a similar retention mechanism (Tab. 3) and to Special Planning Units (SPU). The detailed process of input data preparation and calculations is described in report D.T2.2.2. The results of the assessment are presented in Fig. 6 and Appendix 1. High-efficiency measures are mostly located in three areas: the upper reaches of the Kamienna River above Skarżysko Kamienna and the lower reaches the river of the Bałtów community and the agricultural catchment area of the river Przepaść. In the first two the technical measures predominate (mainly T3 - retention reservoirs) and in the last one the natural agricultural measures (mainly A2 - buffer strips and hedges). Definitely the biggest total effect was achieved by the measure small reservoir (T3), then buffer strips and hedges (A02).

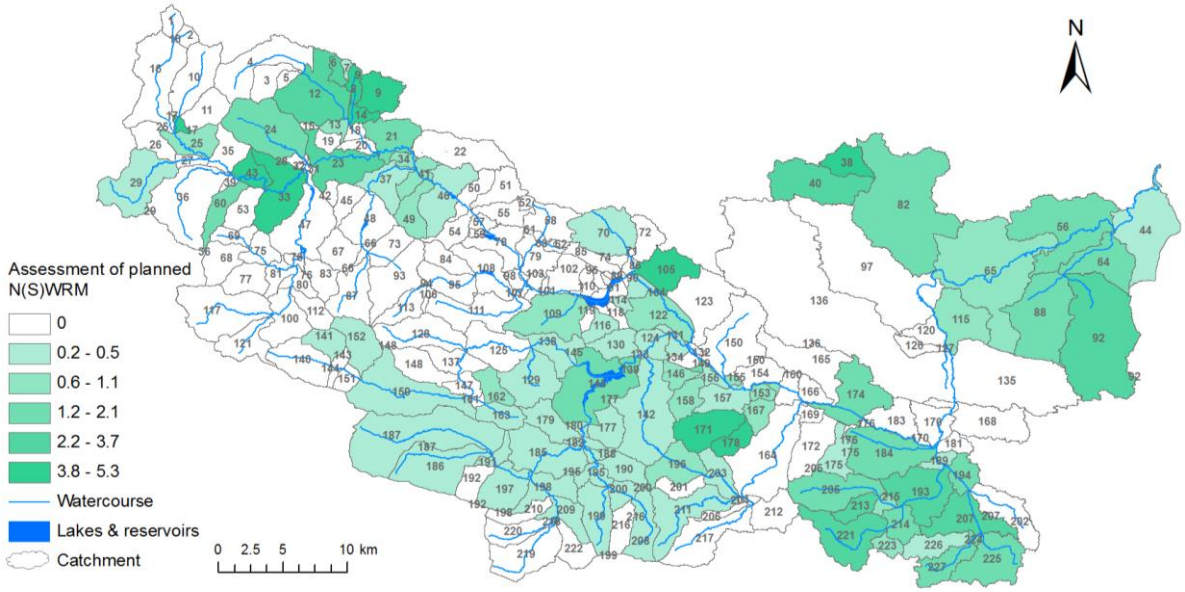

Fig. 6 Assessment of planned N(S)WRM with the Static method

2.2.3 Dynamic Tools evaluation results

In the Kamienna catchment seven different types of measures were tested with the dynamic models:

- D01 - Regulated outflow from drainage systems – Restoration of active water management in existing drainage facilities by means of existing weirs and gates, planting trees along the southern embankment of the river to increase its shading.
- D04 - Construction of micro reservoirs on ditches – selection of the ditches with dynamic flow, in place of a small slope, natural enlargement of the valley.
- N06 - Restoration and reconnection of seasonal streams.
- F01 - Forest riparian buffers – In the Geospatial Information Systems, 5 m buffers were generated on both sides of the watercourse (as polygon objects) for separated sections of watercourses with a length of 100 m. A selection was also made on the basis of the Numerical Model of Terrain Coverage and those parts of watercourses with flood embankments were removed from the analysis.
- F14 - Overland flow areas in peatland forests – Backwaters, floodplains in the area of forest ditches - areas intended for flooding in the spring at a high-water level, which improve the retention capacity of the area and biodiversity.
- N06 - Restoration and reconnection of seasonal streams.
- T01 - Polders, dry flood protection reservoirs, sediment trapping dams. Dry flood protection reservoirs - their entire capacity is designated for flood protection purposes, these are reservoirs that collect water only during floods, except for sides, their bowls are used for agricul-

ture as meadows and pastures - there are no intensive crops – in Kamienna Catchment - Dry reservoir Mychałów.

- T02 - Widening or removing of flood protection dikes - The construction of flood embankments, the purpose of which is flood protection, in fact, limits river flooding areas and increases water levels and flow rates. Moving the embankments away from the river bed brings significant benefits. The dike may then be lower, and because of the greater capacity of the embankment, the level of freshets will decrease, and the flow rate will decrease flood waters, the river banks will be less damaged.
- T03 - Construction of small reservoirs– 4 reservoirs were designed: Reservoir Rudka Bałtowska, Reservoir Boria, Reservoir Lemierze and Reservoir Ruda Kościelna.

Two hydrological SWAT and hydraulic HEC-RAS models were used to improve the accuracy of the analysis. The first one simulated the quantity and quality of the water resources in the entire catchment area with the above described set of measures. The second one, simulated the flow transformation of the largest flooding wave through the Kamienna River from Skarżysko Kamienna to the outlet.

The above-mentioned measures were implemented in SWAT (hydrological model Soil and Water Assessment Tool) by modifying parameters in the input files and scenarios were developed by running SWAT for 2009 - 2017. Simulation results of flow characteristics (high and low), total nitrogen, total phosphorus and sediment loads were presented at reach (Fig. 7) level. For low flow slight decrease was observed in the upper and middle Kamienna, however, most downstream reservoirs caused a 5% increase of low flow at the outlet of the catchment. For high flow notable decrease, ranging from -65% to -5%, was observed with cumulative effect at the catchment outlet reaching -16%. Sediment, nitrogen and total phosphorus load reduction at the Kamienna outlet reached 35%, 12% and 20%, respectively (Fig. 8-11).

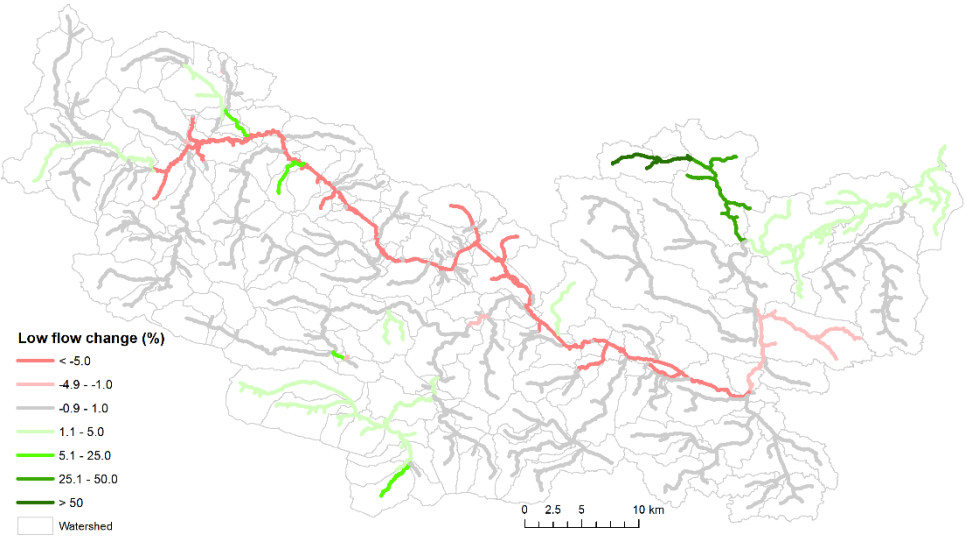

Fig. 7 Relative change of low flow characteristics for Concept Plan vs Baseline scenario at reach level

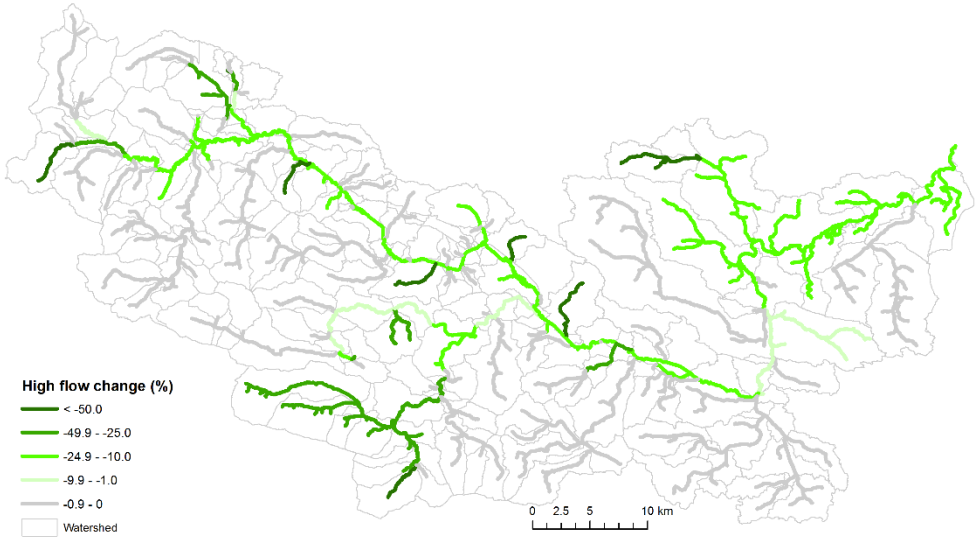

Fig. 8 Relative change of high flow characteristics for Concept Plan vs Baseline scenario at reach level.

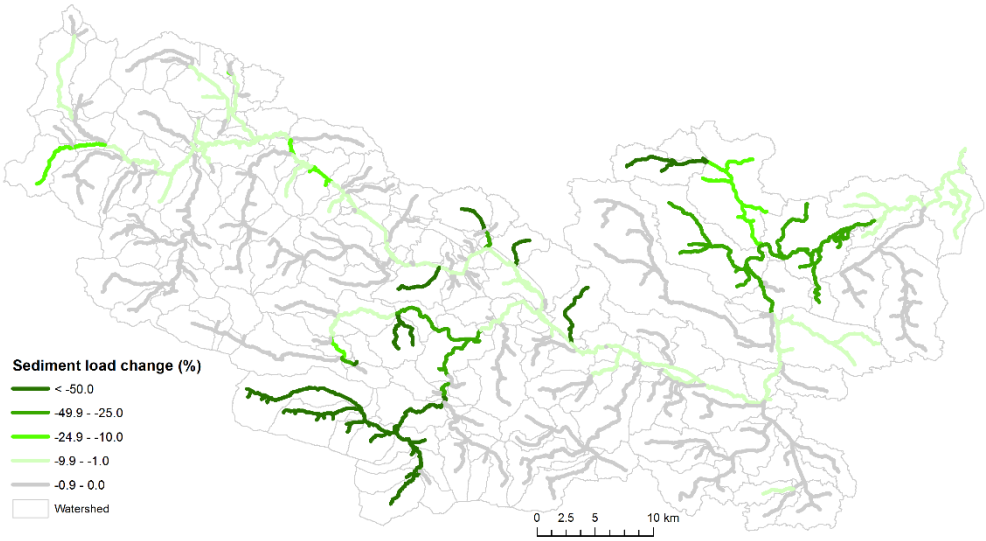

Fig. 9 Relative change of total sediment load for Concept Plan vs Baseline scenario at reach level.

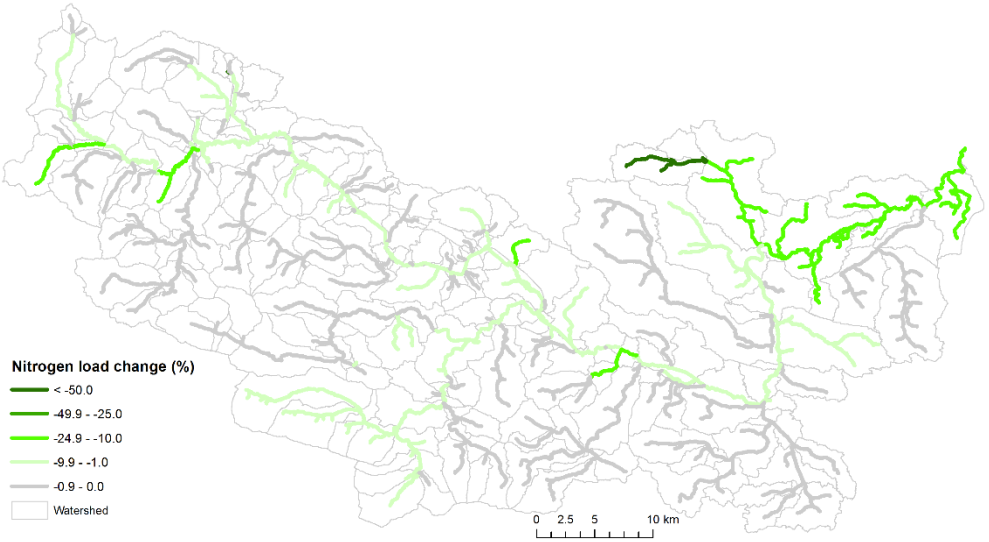

Fig. 10 Relative change of total nitrogen load for Concept Plan vs Baseline scenario at reach level

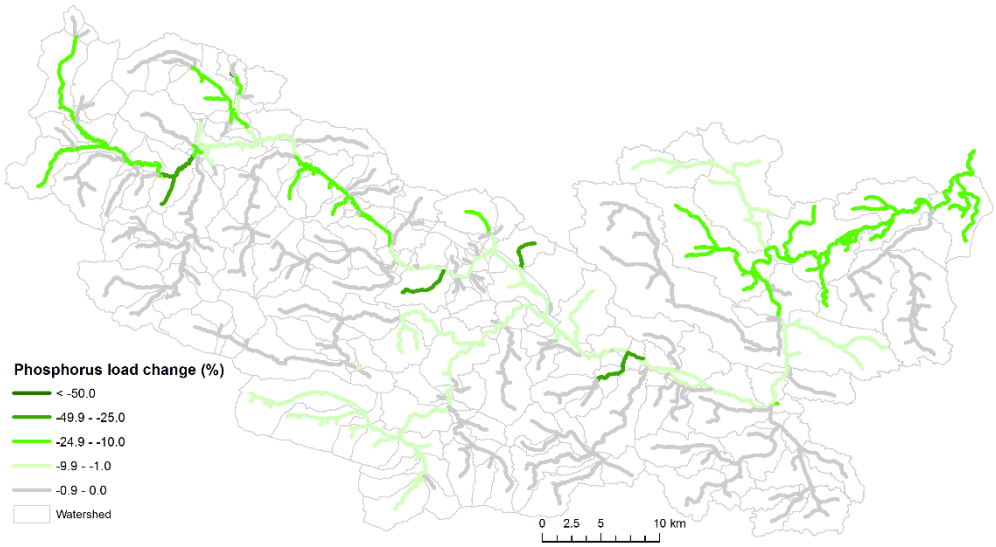

Fig. 11 Relative change of total phosphorus load for Concept Plan vs Baseline scenario at reach level.

2.2.4 Aggregation of indicators and selection of measures

In accordance with the methodology described in chapter 2.1, the measures that are presented in Tab. 4 were selected and ranked according to the importance for the general goal. Measures have not been removed because the ranking is variable according to the choice of goal. The total evaluation values were in the range from 2 to 15. The measures were ranked from the best to the worst. The detailed location of measures is illustrated on the map in Appendix 4.

Tab. 4 Ranking list of measure (aggregated in SPU) from the best to the worst for general goals.

SPU	Group of Measure	Asse-sment	SPU	Group of Measure	Asse-sment	SPU	Group of Measure	Asse-sment	SPU	Group of Measure	Asse-sment	SPU	Group of Measure	Asse-sment
23	T2	14.9	20	ER	10.0	51	T3	8.9	38	BPDA	7.8	123	ER	6.0
91	T3	14.8	91	F06	10.0	33	T3	8.9	43	T3	7.8	125	F06	6.0
226	A02	13.1	108	F06	10.0	50	T3	8.8	153	A02	7.5	136	F06	6.0
155	A02	12.6	138	F06	10.0	60	T3	8.8	214	A02	7.3	158	F06	6.0
92	A02	12.5	145	F06	10.0	52	T3	8.8	209	A02	7.3	168	F06	6.0
130	A02	12.3	149	F06	10.0	58	T3	8.8	197	A02	7.1	181	F06	6.0
124	A02	12.3	175	F06	10.0	167	A02	8.8	199	A02	7.1	205	F06	6.0
44	A02	12.2	105	F08	10.0	213	A02	8.8	211	A02	7.1	223	F06	6.0
138	A02	12.2	70	ER	10.0	115	A02	8.7	211	F01	7.1	225	F06	6.0
109	A02	12.2	105	ER	10.0	194	A02	8.6	137	F01	7.0	170	F08	6.0
100	A02	12.1	109	ER	10.0	34	ER	8.6	156	WRAL	7.0	66	F14	6.0
147	A02	12.1	57	T3	9.9	158	A02	8.6	172	A02	7.0	219	ER	6.0
202	A02	12.0	205	A02	9.9	25	T3	8.6	164	A02	7.0	13	BPDA	6.0
125	A02	12.0	17	T3	9.9	193	A02	8.6	135	A02	7.0	214	WRAL	5.9
145	WRAL	12.0	184	T3	9.8	162	A02	8.5	137	A02	7.0	24	T3	5.8
178	T1	11.9	65	A02	9.7	203	A02	8.3	214	F01	7.0	6	BPDA	5.3
171	T1	11.9	146	A02	9.7	152	A02	8.2	140	A02	7.0	7	BPDA	5.1
88	A02	11.6	196	A02	9.7	163	A02	8.2	105	WRAL	7.0	197	BPDA	5.1
224	A02	11.2	225	A02	9.6	114	A02	8.2	109	WRAL	7.0	209	BPDA	5.1
189	A02	11.1	184	A02	9.3	198	A02	8.2	187	WRAL	7.0	164	WRAL	5.0
145	A02	11.0	190	A02	9.2	159	A02	8.1	183	F06	7.0	198	WRAL	5.0
14	BPDA	10.9	157	A02	9.2	208	A02	8.1	150	ER	7.0	21	F01	5.0
8	BPDA	10.9	142	A02	9.2	195	A02	8.1	215	WRAL	6.9	23	F01	5.0
37	T3	10.8	129	A02	9.2	141	A02	8.1	40	BPDA	6.9	41	F01	5.0
64	A02	10.7	156	F01	9.2	187	A02	8.1	218	BPDA	6.7	49	F01	5.0
6	F14	10.6	221	A02	9.2	215	A02	8.1	182	WRAL	6.1	122	F01	5.0
46	ER	10.4	185	A02	9.2	148	A02	8.1	40	F01	6.1	174	F01	5.0
200	A02	10.4	56	A02	9.2	176	ER	8.1	136	N06	6.1	128	WRAL	4.0
116	A02	10.4	180	A02	9.2	191	A02	8.1	210	BPDA	6.0	149	WRAL	4.0
188	A02	10.3	201	F01	9.1	154	F01	8.0	72	F01	6.0	120	T3	3.3
179	A02	10.2	46	F01	9.0	197	F14	8.0	192	BPDA	6.0	9	WRAL	3.0
177	A02	10.2	82	A02	9.0	208	F01	8.0	162	BPDA	6.0	12	WRAL	3.0
227	A02	10.2	46	F06	9.0	154	A02	8.0	40	A02	6.0	97	WRAL	3.0
207	A02	10.2	117	F06	9.0	82	ER	8.0	128	F01	6.0	186	WRAL	3.0
21	ER	10.2	67	F14	9.0	145	BPDA	8.0	38	A02	6.0	221	BPDA	3.0
104	A02	10.1	29	ER	9.0	22	ER	8.0	148	WRAL	6.0	86	T3	2.0
175	A02	10.1	139	ER	9.0	202	F06	8.0	203	WRAL	6.0			
131	N06	10.1	13	T3	9.0	65	F08	8.0	220	BPDA	6.0			

Explanations of abbreviations WRAL - best practices for Water Retention in Agricultural Lands, BPDA - Best practices on drained areas, ER - Renaturation of water dependent ecosystems (Ecosystems Restoration)

2.3 Investment risk assessment

The investment risk, the implementation of measures in protected areas and land ownership was analysed. The table below shows the number of measures that are located in protected areas. The detailed table with the division into specific measures, protected area and share of public areas is included in Appendix 1. Location of planned measures is shown in Fig. 4.

Tab. 5 Number of measures in particular types of protected areas (without analysis of linear and distributed activities A02, A03, F01).

Protection Type	Count of measures
Landscape Park	2
Landscape Park, Special Habitat Protection Areas	3
National Park, Special Habitat Protection Areas	6
Protected Landscape Area	53
Protected Landscape Area, Landscape Park, Special Habitat Protection Areas	3
Protected Landscape Area, Nature Reserve, Special Habitat Protection Areas	2
Protected Landscape Area, Special Habitat Protection Areas	18
Special Habitat Protection Areas	8

Analysing the investment risk in terms of land ownership, it should be noted that 79 of measures are located at least in 70 percent in private areas (30% or less located on public areas).

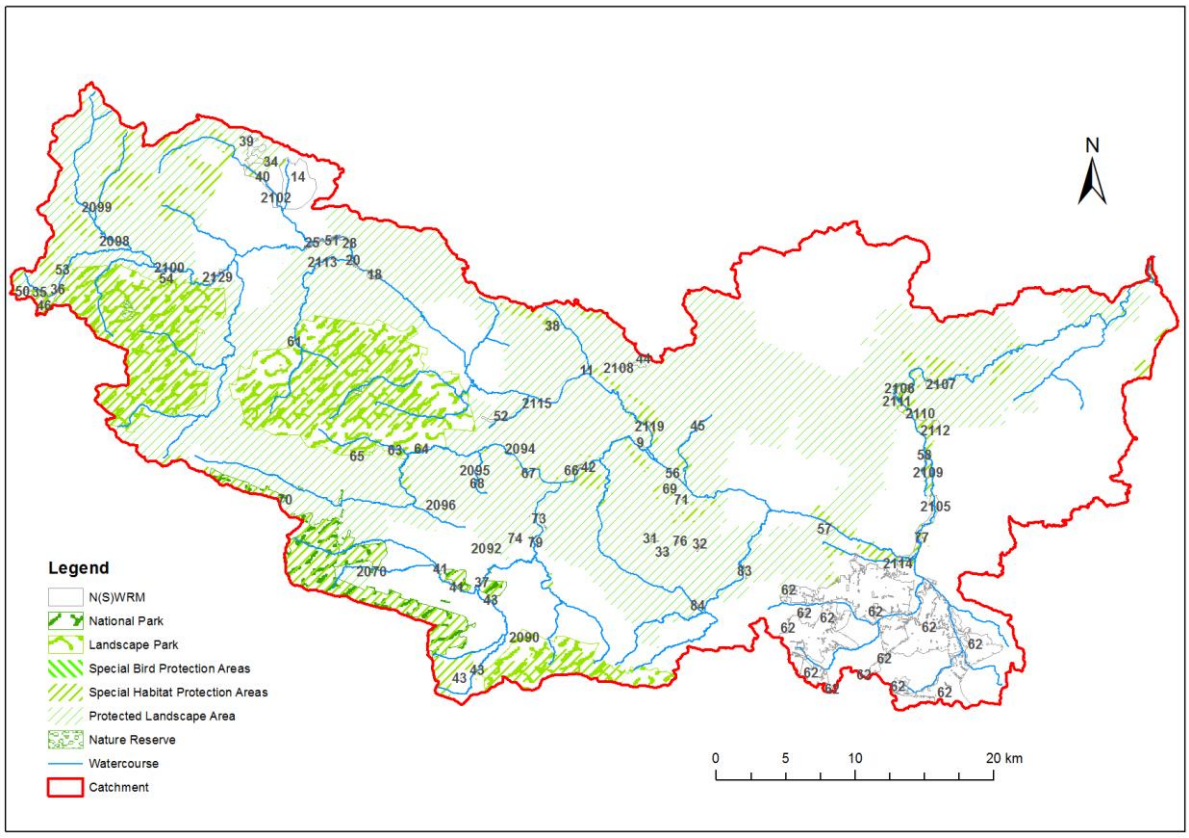

Fig. 12 Location of planned measures in relation to protected areas (without A02, A03, F01).

3 Legislation/policy

The summary of legal procedures for the implementation of selected small retention investments can be found on the website: http://planning.waterretention.sggw.pl/#/legal-assistant

It is applicable to Polish legal system.

The legal-assistant tool allows to get acquainted with the procedures and required documents, the authority issuing a given document, depending on the type of natural small water retention measure, location of the planned investment (private/public area) and type of protection of the area. The following forms of nature protection were included: valuable natural areas (general), national park, nature reserve, landscape park, protected landscape area, Natura 2000 area, natural monument, documentation site, ecological use or nature-landscape complex. The table below presents the legal basis for the planned natural small water retention measures.

Tab. 6 Summary of national regulations.

ID	National regulations (ENG)	National regulations (PL)
1.	Act of 20 July 2017 Water Law	Ustawa z dnia 20 lipca 2017 r. Prawo wodne
2.	Act of 16 April 2004 on the protection of nature	Ustawa z dnia 16 kwietnia 2004 r. o ochronie przyrody
3.	Act of 27 April 2001 Environmental Law	Ustawa z dnia 27 kwietnia 2001 r. Prawo ochrony środowiska
4.	Act of 3 October 2008 on the provision of environmental information to its protection, public participation in environmental protection and environmental impact assessment	Ustawa z dnia 3 października 2008 r. o udostępnianiu informacji o środowisku u jego ochronie, udziale społeczeństwa w ochronie środowiska oraz ocenie oddziaływania na środowisko
5.	Act of 8 July 2010 on special rules for preparing for the implementation of investments in flood-protection structures	Ustawa z dnia 8 lipca 2010 r. o szczególnych zasadach przygotowywania do realizacji inwestycji w zakresie budowli przeciwpowodziowych
6.	Act of 3 February 1995 on the protection of agricultural and forestry land	Ustawa z dnia 3 lutego 1995 r. o ochronie gruntów rolnych i leśnych
7.	Act of 7 July 1994 Building Law	Ustawa z dnia 7 lipca 1994 r. Prawo budowlane
8.	Act of 14 June 1960 Code of Administrative Procedure	Ustawa z dnia 14 czerwca 1960 r. Kodeks Postępowania Administracyjnego
9.	Act of 10 April 2003 on special rules for the preparation and implementation of investments in public roads	Ustawa z dnia 10 kwietnia 2003 r. o szczególnych zasadach przygotowania i realizacji inwestycji w zakresie dróg publicznych
10.	Law of 28 September 1991 on forests	Ustawa z dnia 28 września 1991 r. o lasach
11.	Regulation of the Council of Ministers of 9 November 2010 on projects likely to have a significant impact on the environment	Rozporządzenie Rady Ministrów z dnia 9 listopada 2010 r. w sprawie przedsięwzięć mogących znacząco oddziaływać na środowisko
12.	Regulation of the Council of Ministers of 10 September 2019 on projects likely to have a significant impact on the environment	Rozporządzenie Rady Ministrów z dnia 10 września 2019 r. w sprawie przedsięwzięć mogących znacząco oddziaływać na środowisko

4 N(S)WRM Financing

In Poland N(S)WRM could be financed by public budgets, either national or EU funds or a combination of both. There are many national programs that aim to support small retention in rural and urban areas:

- "My water" program. Co-financing for household retention installations - the National Fund for Environmental Protection through Provincial Funds for Environmental Protection plans to co-finance the creation of backyard water ponds and rainwater harvesting installations under the "My Water" program.
- City with Climate - "green and blue infrastructure" - this is a competition for local governments announced by the National Fund for Environmental Protection and Water Management together with the Ministry of Climate. It is meant for co-financing of projects in the field of rainwater management and shaping urban greenery.
- Modernization of farms - it is a program of subsidies for irrigation for farms implemented by the Agency for Restructuring and Modernisation of Agriculture (ARMA). This program is intended for farmers.
- Riverbed retention (water retention in watercourses, canals and drainage ditches) - The program for shaping water resources in agricultural areas is implemented by National Water Management Authority (Polish: Państwowe Gospodarstwo Wodne Wody Polskie).
- Water storage activities are also carried out by Provincial Fund for Environmental Protection and Water Management (WFOŚiGW) and local governments. In many communes, self-government programs co-financing pro-retention activities are implemented. Also, for private persons, e.g. co-financing of rainwater tanks.

More detailed information on national programs supporting small water retention can be found at: https://www.wody.gov.pl/aktualnosci/1054-programy-wspomagajace-mala-retencje

In terms of possible financing from European Union, the LIFE Programme (combined with national funds) is a specific funding instrument supporting the Birds and Habitat Directive, and it is therefore specifically tailored to support environmental conservation and restoration in Europe. In addition, there are European financial instruments such as the Common Agriculture Policy (CAP) and Rural Development Programme (RDP) or ERDF and Cohesion Funds.

Detailed information on funding Natural Small Water Retention Measures could be found at the European online platform for NWRM (http://nwrm.eu/), in the synthesis document which is related to the financial support of NWRM (http://nwrm.eu/sites/default/files/sd11_final_version.pdf) and at the official website of the European Commission: https://ec.europa.eu/environment/funding/intro_en.htm

The estimated costs of planned measures are presented in Tab. 7 and detailed information on costs can be found in the document:

https://www.interreg-central.eu/Content.Node/DT331-Reports-from-the-pilot-actions-WULS.pdf

Tab. 7 Estimated costs of planned measures - aggregated in types (no land repurchase costs).

No.	Measures	Size	Unit	Estimated total cost [EUR]	Responsible
1	A02 – buffer strip and hedges	271	km	1 586 065	Farmers & Management of Protected Areas
2	A03 - Crop rotation	15752	ha	9 070 000	Farmers & Agency for Restructuring and Modernisation of Agriculture
3	A08 - Green cover	142	ha	33 255	Farmers & Agency for Restructuring and Modernisation of Agriculture
4	D01- Regulated outflow from drainage systems	3338	ha	1 058 360	Water Management Boards & Farmers
5	D02 - Water damming in ditches, weirs with constant crest (valleys)	5	ha	45 000	Water Management Boards
6	D03 - Active water management on a drainage system (river valleys)	-	-	1 170 960	Water Management Boards
7	D04 - Construction of micro reservoirs on ditches	26	ha	121 780	Forest & Water Management Boards
8	F01- Forest riparian buffers	41	km	240 000	Forestry Management
9	F06 - Continuous cover forestry	148	ha	11 452 240	Forestry Management
10	F08 - Appropriate design of roads and stream crossings	430	m	115 947	Forestry Management
11	F14 - Overland flow areas in peatland forests	1056	ha	37 470	Forestry Management
12	N02 - Wetland restoration and management	120	ha	93 677	Farmers and Management of Protected Areas and Water Management Boards
13	N03 - Floodplain restoration and management	173	ha	105 386	Farmers and Management of Protected Areas and Water Management Boards
14	N06 - Restoration and reconnection of seasonal streams	26	ha	164 754	Farmers and Management of Protected Areas and Water Management Boards
15	T01 - Polders, dry flood protection reservoirs, sediment trapping dams	621	th.m3	159 654	Water Management Boards
16	T02 - Widening or removing of flood protection dikes	4905	m	1 298 044	Water Management Boards
17	T03 - Construction of small reservoirs	10044	th.m3	41 231 850	Water Management Boards
Total				**67 984442**	

5 Monitoring

In order to achieve the planned environmental effects associated with water retention, account should be taken of the necessary monitoring of the activities carried out and their maintenance as a condition for achieving the pursued objectives. The purpose of hydrological monitoring is to provide information on the direct impact of the project on the water conditions in the affected areas of the

project. The proposed comprehensive monitoring should include: zero monitoring, post-executive monitoring and monitoring of effects in different time horizons (including possible unexpected effects). The scope of monitoring should concern i.e. surface water, groundwater, water quality, technical condition of investments, natural elements - indicators (e.g. restoration or improvement of wetland communities). In case of hydrotechnical investments under Article 60 of the Building Law, the contractor shall, by putting the work into service, provide the owner or the manager of the building with the construction documentation and the post-performance documentation. Other documents, including operation instructions, facility, installation and equipment manuals are also subject to the transfer of documents associated with measures.

6 Conclusions

- The Action Plan summarizes the work carried out in the pilot area – Kamienna Catchment during the project development. The overall aim of the Action Plan is to support sustainable water management in the catchment. Action plans for the pilot catchments provide the compilation of the catchments modelling results and presents the effectiveness of a selected set of NSWRM in the catchments. The Action Plan is an implementation document agreed by The National Water Management Authority in Poland (Państwowe Gospodarstwo Wodne Wody Polskie).
- The FramWat project demonstrated that NSWRMs could contribute to the flood safety, improvement of water quality and finding solutions to problems with sediment and drought.
- The FramWat project's findings could be taken into account during the preparation and drafting of the second update of the water management plan “aPGW”.
- Small water retention can optimize the local microclimate and can provide habitat for aquatic communities. Integrated vision of the river basin should include sustainability of land resources, environmental, social and economic dimensions of NWRMs.
- National guidelines for NSWRMs implementation are addressing many existing water and land policies. Attention should be paid to the placement of NSWRMs.
- Further implementation of NSWRMs in Kamienna Catchment should enclose continuous improvement of stakeholder`s technical knowledge (education) about NSWRMs alternatives/suggestions in a river basin.
- FramWat carried out the analysis and modelling of NSWRMs on the entire river basin. In the next phase, narrow technical problems should be addressed including the elaboration of feasibility studies (incl. assessment of consequences of not taking action), project and investment documentation.
- Taking into account the financing of NSWRM in Poland. N(S)WRMs could be financed by public budgets, either national or EU funds or a combination of both. There are many national programs that aim to support small retention in rural and urban areas. Taking into account

the investment risk, the implementation of measures in protected areas and land ownership was analysed.

- FroGis application is available to support the planning process, identifying areas for water retention, for prioritization in the river basin. The Static tool is suitable for comparing variants in the pilot catchment without using detailed hydrological and hydraulic models of the analysed catchment. HEC-RAS 1D model as a dynamic tool is available to model hydrodynamic processes.
- Governing stakeholders should locate financial resources for identified priorities and needs on a local level (crucial collaboration among the Water agency and municipalities).
- The effectiveness of NSWRM at the local scale is affected by multiple geographic, geologic, climatic, land use, and anthropogenic factors. Monitoring the effectiveness of NSWRM at the local scale is important as insights for the future can be gained.

7 References

GIOŚ, 2020. Raport z klasyfikacji i oceny stanu jednolitych części wód powierzchniowych wykonanej za 2019 rok na podstawie danych z lat 2014-2019

NFOŚiGW, 2017. Opracowanie planów przeciwdziałania skutkom suszy w regionach wodnych RZGW w Warszawie wraz z przeprowadzeniem konsultacji społecznych i strategicznej oceny.

8 Appendices

Appendix 1 Evaluation of the effectiveness of measures using the static tools.

227		Measure No.	1	2	3	4	5	6	7	8	9	10	11	12	Catchment grade for current variat
	Grade for a measure (total by SPUs):		36.43	18.66	2.91	0.00	0.00	5.99	6.85	0.12	24.63	7.80	2.94	67.67	0.86
SPU Id	SPU name	Measure Id by User	A02	WRAL	F01	F06	F08	F14	ER	N06	BPDA	T1	T2	T3	SPU grades
6	Oleśnica od dopł. spod tarów do dopł. z Lipowego Pola (l)	2.16						2.62			0.28				2.91
7	Oleśnica od dopł. spod tarów do dopł. z Lipowego Pola (l)	0.82									0.13				0.13
8	Dopływ z Lipowego Pola do dopł. spod Świerczka (l)	2.70									3.92				3.92
9	Dopływ spod Świerczka	8.55									3.85				3.85
12	Oleśnica od dopł. spod tarów do dopł. z Lipowego Pola (l)	20.55						0.25			2.65				2.90
13	Oleśnica od dopł. spod tarów do dopł. z Lipowego Pola (l)	2.30									0.90			4.98	5.96
14	Dopływ z Lipowego Pola od dopł. spod Świerczka do ujścia	2.66									3.96				3.95
17	Dopływ spod Leszczyn od dopł. z Zapowiedzi do ujścia	1.16												4.86	4.86
20	Oleśnica od dopł. z Lipowego Pola do ujścia	2.56							0.03						0.03
21	Kamienna od Oleśnicy do Wądyka (l)	9.99						0.03	1.16						1.20
23	Kamienna od Bernatki do Oleśnicy (l)	13.76							0.60				2.94		3.55
24	Bernatka	21.27												1.80	1.80
25	Kamienna od dopł. spod Leszczyn do Kuźniczki (p)	7.63												0.60	0.60
29	Kuźniczka do dopł. z Piechotnej (l)	18.00						0.33							0.33
33	Kamienna od dopł. w Cyganowie do Kamionki (p)	15.80												4.93	4.93
34	Kamienna od Wądyka do Zamówki (p)	1.94							0.64						0.64
37	Zamówka od Kaczki do ujścia	8.41							0.27					4.77	5.03
38	Dopływ spod Grechowa	6.64	0.01								3.82				3.83
40	Wolanka do dopł. spod Grechowa (l)	19.28	0.01		0.07						2.85				2.93
41	Kamienna od Zamówki do dopł. z Podławek (p)	4.75							1.11						1.11
43	Kamienna od dopł. spod Czerwonej Góry do dopł. w Cyganc	5.13												4.78	4.78
44	Kamienna od Ściegna do ujścia	23.26	0.19												0.19
46	Kamienna od dopł. z Podławek do dopł. z Siniej Wody (l)	13.95			0.03			0.01	0.42						0.46
49	Dopływ z Podławek	6.90							0.75						0.75
Sub_50	Kamienna od dopł. z Podławek do dopł. z Siniej Wod	5.43												4.81	4.81
Sub_51	Dopływ z Siniej Wody	6.89												4.94	4.94
Sub_52	Dopływ z kopalni żelaza	1.13												4.78	4.78
56	Kamienna od Wolanki do Ściegna (p)	30.53	1.17												1.17
Sub_57	Kamienna od dopł. z kopalni żelaza do Młynówki (l)	2.13												4.94	4.94
Sub_58	Majówka	8.71												4.78	4.78
60	Dopływ spod Czerwonej Góry	6.30												1.80	1.80
64	Ściegno od dopł. spod Dąbrowy do ujścia	13.82	1.67												1.67
65	Kamienna od Wolanki do Ściegna (p)	49.60	0.66			0.00									0.66
70	Lubianka do dopł. spod Lubieni-Podlesia (l)	15.39						0.17							0.17
72	Dopływ spod Lubieni-Podlesia	5.98			0.02										0.02
82	Wolanka do dopł. spod Grechowa do ujścia	54.78	2.03						0.01						2.04
88	Dopływ spod Dąbrowy	26.08	1.62												1.62
91	Bezpośrednia zlewnia zb. Brody Iłżeckie	5.27			0.07									4.78	4.85
92	Ściegno do dopł. spod Dąbrowy (l)	45.67	2.48												2.48
97	Kamienna od dopł. spod Podgórza do Wolanki (l)	51.96	0.05											0.24	0.29
100	Kamionka od Jaślanej do dopł. z Milchniowa (p)	10.72	0.11												0.11
104	Kamienna od dopł. z Lubieni do dopł. spod Boru Kunowski	2.97	0.12												0.12
105	Dopływ spod Boru Kunowskiego	10.55				0.00		0.57						4.75	5.32
108	Lubianka od dopł. spod Górnej Górki do Szczebrzy (p)	10.55			0.02										0.02
109	Dopływ z Kuczowa (p)	15.97	0.16					0.33							0.49
114	Bezpośrednia zlewnia zb. Brody Iłżeckie	1.45	0.18												0.18
115	Dopływ spod Podgórza	13.61	0.69												0.69
116	Bezpośrednia zlewnia zb. Brody Iłżeckie	4.09	0.38												0.38
117	Jaślana	21.45			0.04										0.04
120	Kamienna od starego koryta w Stokach Starych do d	4.60												0.26	0.26
122	Kamienna od dopł. spod Boru Kunowskiego do dopł. spod	12.00							0.48						0.48
124	Świślina od Węgierki do ujścia	5.20	0.27												0.27
125	Świślina od Psarki do Jaworek (p)	12.71	0.02	0.01	0.03										0.06
128	Świślina do Psarki (p)	14.16		0.00	0.01										0.01
129	Jaworki	13.90	0.23	0.00	0.02						0.03				0.28
130	Dopływ z Godowa	6.46	0.32												0.32
131	Świślina od Węgierki do ujścia	3.00			0.11					0.05					0.16
135	Kamienna od dopł. w Borowni do starego koryta w Stokach	40.80	0.01			0.00								0.12	0.13
136	Stare koryto w Stokach Starych	113.01				0.00				0.07					0.07
137	Psarka od Sieradowianki do ujścia	6.85	0.01		0.04										0.05
138	Świślina od Jaworek do zb. Włóry	8.44	0.18		0.02						0.01				0.21
139	Świślina od zapory zb. Włóry do dopł. z Godowa (l)	1.37		0.06				1.41							1.47
141	Dopływ spod Wzdołu Rządowego	5.49	0.12												0.12
142	Węgierka	26.53	0.23		0.05										0.27
145	Bezpośrednia zlewnia zb. Włóry	24.22	1.00	0.01	0.56						0.00				1.57
146	Dopływ spod Chocimowa	3.75	0.66												0.66
147	Psarka od Gozdkówki do Sieradowianki (l)	3.75	0.10												0.10
148	Sieradowianka	8.52	0.10	0.01											0.11
149	Kamienna od Świśliny do Dunaju (l)	0.88			0.03						1.11				1.14
150	Dunaj	20.03			0.04			0.07							0.11
152	Olszówka	9.85	0.23												0.23
153	Modła od dopł. spod Swarszowic do ujścia	2.07	0.48												0.48
154	Kamienna od dopł. spod Bukowia do Modły (p)	6.00	0.02		0.05										0.06
155	Kamienna od Dunaju do dopł. spod Bukowia (p)	8.80	0.58		0.07										0.65
156	Kamienna od Świśliny do Dunaju (l)	2.13		0.03	0.22										0.25
157	Kamienna od dopł. spod Bukowia do Modły (p)	7.52	0.23	0.01	0.09										0.33
158	Dopływ spod Bukowia do dopł. spod Chocimowa (l)	5.92	0.61		0.24										0.85
159	Psarka od Olszówki do Gozdkówki (p)	25.61	0.15	0.00											0.15
162	Dopływ spod Kowalikowa	5.17	0.54								0.02				0.56
163	Gozdkówka do dopł. spod Kowalikowa (p)	5.99	0.20												0.20
164	Izewnianka od Pokrzywianki do ujścia	26.06	0.01	0.01											0.02
167	Modła od dopł. spod Swarszowic do ujścia	4.92	0.78												0.78
170	Kamienna od Przepaści do dopł. w Borowni (p)	8.00		0.01		0.00									0.01
171	Modła do dopł. spod Swarszowic (p)	11.98	0.38	0.01								3.84			4.24
172	Dopływ spod Rzuchowa do dopł. spod Moczydła (p)	11.21	0.03		0.05										0.08
174	Kamienna od dopł. z Ostrowca-Rzeczek do dopł. spod Rzuc	15.88							1.29						1.29
175	Dopływ spod Moczydła	6.43	0.07	0.02	0.03										0.12
176	Kamienna od dopł. z Ostrowca-Rzeczek do dopł. spod Rzuc	0.69							0.08						0.08
177	Dopływ z Bolesnowa Dolnego (p)	6.64	0.23												0.23
178	Dopływ spod Swarszowic	4.91	0.22	0.01								3.94			4.17
179	Dopływ spod Chybic	7.66	0.23	0.00											0.24
180	Pokrzywianka od dopł. spod Chybic do ujścia	1.18	0.16	0.09											0.26
182	Pokrzywianka od Dobruchny do dopł. spod Chybic (l)	1.71		0.13											0.13
184	Dopływ z Bodzechowa	19.48	0.20	0.89		0.00								4.75	5.91
185	Pokrzywianka od Słupianki do Dobruchny (p)	16.80	0.20	0.01				0.02			0.01				0.24
186	Pokrzywianka do Czarnej Wody (l)	18.65	0.09								0.06				0.15
187	Czarna Woda	36.79	0.12								0.00				0.12
188	Dobruchna od dopł. spod Czajęcic do ujścia	1.93	0.28												0.28
189	Przepaść od Krzczonowianki do dopł. z Bodzechowa (l)	2.47	0.10	0.04											0.14
190	Dopływ spod Czajęcic	6.15	0.25												0.25
191	Pokrzywianka od Czarnej Wody do dopł. z Bielowa (p)	3.03	0.08					0.05							0.13
192	Dopływ z Bielowa	5.27									0.02				0.02
193	Krzczonowianka od Lipowej do ujścia	16.45	0.59	2.33	0.01										2.93
194	Przepaść od dopł. spod Bidzin do Krzczonowianki (l)	5.53	0.64	0.69											1.33
195	Dobruchna od dopł. ze Skoszyna do dopł. spod Czajęcic (p)	3.99	0.12												0.12
196	Pokrzywianka do dopł. spod Garbacza (p)	10.30	0.66		0.04										0.69
197	Pokrzywianka od dopł. z Bielowa do Słupianki (p)	11.20	0.14					0.04			0.08				0.25
198	Słupianka od dopł. z Łaz do ujścia	8.47	0.17					0.02			0.01				0.20
199	Dopływ ze Skoszyna	10.91	0.14												0.14
200	Dobruchna od dopł. z Wronowa do dopł. ze Skoszyna (l)	3.97	0.38												0.38
201	Dopływ spod Garbacza	3.89			0.11										0.11
202	Dopływ spod Bidzin	11.63	0.03	0.02	0.06										0.10
203	Pokrzywianka od dopł. spod Garbacza do Garbutki (p)	6.53	0.31	0.01											0.32
205	Krzczonowianka do dopł. z Małoszyc (p)	15.99	0.88	1.15	0.06										2.09
207	Przepaść od dopł. spod Grochocic do dopł. spod Bidzin (p)	13.45	1.17	2.51											3.68
208	Dobruchna do dopł. z Wronowa (l)	9.55	0.14		0.02										0.15
209	Słupianka od Łagowianki do dopł. z Łaz (l)	6.47	0.26								0.06				0.32
210	Dopływ z Łaz	4.53									0.03				0.03
211	Garbutka do dopł. z Wierzbiontowic (l)	16.55	0.12		0.11										0.22
213	Dopływ z Małoszyc	4.40	0.75	2.50											3.25
214	Lipowa od dopł. z Rosoch do ujścia	5.88	0.29	0.90	0.00										1.19
215	Krzczonowianka od dopł. z Małoszyc do Lipowej (p)	1.97	0.11	0.89											0.99
218	Łagowianka od dopł. w Jeleniowie do ujścia	0.11									0.74				0.74
219	Łagowianka do dopł. w Jeleniowie (p)	14.57						0.05			0.01				0.06
221	Lipowa do dopł. z Rosoch (p)	17.46	1.21	1.64	0.04										2.89
223	Dopływ z Rosoch	2.92		0.59	0.36										0.95
224	Przepaść od dopł. z Kaliszan do dopł. spod Grochocic (p)	0.81	0.16	1.88											2.04
225	Dopływ spod Grochocic	15.48	0.57	1.06	0.18										1.82
226	Dopływ z Kaliszan	7.23	0.07	0.05											0.12
227	Przepaść do dopł. z Kaliszan (l)	8.18	0.22	1.10											1.31

Appendix 2 Affiliation of planned measures to risk factors.

Id	Type measure	Name of measure	Commune	Protection Type	Occupation by public area (%)	Water Body Status (2014-2019)
9	N06	Reconstruction of the water supply of the Nietulisko Rolling Mill	Kunów	PLA	18%	Bad
11	T3	Dry res. Brody Lublianka	Brody	PLA, SHPA	26%	Bad
14	D01	Control outflow - Swierczek	Skarżysko Kościelne, Mirów, Skarzysko-Kamienna	SHPA	9%	Bad
16	N03	Floodplain restoration and management	Wąchock	PLA	25%	Bad
17	N03	Floodplain restoration and management	Wąchock	PLA	20%	Bad
18	N03	Floodplain restoration and management	Wąchock, Mirzec	PLA	37%	Bad
19	N03	Floodplain restoration and management	Wąchock	PLA	3%	Bad
20	N03	Floodplain restoration and management	Wąchock	PLA	15%	Bad
21	N03	Floodplain restoration and management	Wąchock	PLA	10%	Bad
24	N03	Floodplain restoration and management	Skarżysko Kościelne	PLA	15%	Bad
25	N03	Floodplain restoration and management	Wąchock	PLA	20%	Bad
26	N03	Floodplain restoration and management	Skarżysko-Kamienna	PLA	1%	Bad
27	N03	Floodplain restoration and management	Skarżysko-Kamienna	PLA	18%	Bad
28	N03	Floodplain restoration and management	Wąchock	PLA	13%	Bad
29	N03	Floodplain restoration and management	Skarżysko Kościelne	PLA	4%	Bad
30	T1	Dry res. Mychałów Kol.1	Bodzechów	PLA	35%	Bad
31	T1	Dry res. Mychałów Kol.2	Bodzechów, Waśniów	PLA	16%	Bad
32	T1	Dry res. Jędrzejowice	Bodzechów	PLA	16%	Bad
33	T1	Dry res. Mychałów Kol.3	Bodzechów	PLA	7%	Bad
34	F14	Overland flow areas in peatland forests	Szydłowiec	PLA, SHPA	0%	Bad
35	F14	Overland flow areas in peatland forests	Bliżyn	LP, SHPA	0%	Bad
36	F14	Overland flow areas in peatland forests	Bliżyn	PLA, LP, SHPA	60%	Bad
37	F14	Overland flow areas in peatland forests	Nowa Słupia	NP, SHPA	0%	Bad
38	F14	Overland flow areas in peatland forests	Brody	PLA, NR, SHPA	100%	Bad
39	F14	Overland flow areas in peatland forests	Szydłowiec	PLA, SHPA	0%	Bad
40	F14	Overland flow areas in peatland forests	Szydłowiec	PLA	0%	Bad
41	F14	Overland flow areas in peatland forests	Nowa Słupia	NP, SHPA	0%	Bad
42	F14	Overland flow areas in peatland forests	Waśniów	PLA, SHPA	0%	Bad
43	F14	Overland flow areas in peatland forests	Nowa Słupia	NP, SHPA	0%	Bad
44	F14	Overland flow areas in peatland forests	Brody	PLA	0%	Bad
45	F14	Overland flow areas in peatland forests	Kunów	PLA	0%	Bad
46	F14	Overland flow areas in peatland forests	Bliżyn	LP, SHPA	0%	Bad
47	F14	Overland flow areas in peatland forests	Nowa Słupia	NP, SHPA	0%	Bad
48	F14	Overland flow areas in peatland forests	Bliżyn	PLA, LP, SHPA	0%	Bad
49	F14	Overland flow areas in peatland forests	Wąchock	PLA	0%	Bad
50	F14	Overland flow areas in peatland forests	Bliżyn	PLA	0%	Bad
51	F14	Overland flow areas in peatland forests	Wąchock	PLA	0%	Bad
52	F14	Overland flow areas in peatland forests	Pawłów	PLA	0%	Bad
53	F14	Overland flow areas in peatland forests - Odrowążek	Bliżyn	PLA, SHPA	0%	Bad
54	T3	Res. Stary Gostów	Bliżyn	PLA, SHPA	0%	Bad
56	D02	Riverbed retention Kunów	Kunów	PLA	0%	No info
57	N03	Oxbow Bodzechów	Bodzechów	PLA, SHPA	0%	No info
58	N06	Oxbow Stoki Stare	Ćmielów	SHPA	0%	No info
61	F08	Ford Mostki	Suchedniów, Wąchock	PLA, LP, SHPA	0%	Bad
62	A03	Crop rotation	Wojciechowice, Ćmielów, Sadowie, Opatów	PLA, SHPA	0%	Bad
63	A08	Green cover	Pawłów	LP	0%	No info
64	A08	Green cover	Pawłów	LP, SHPA	0%	No info
65	A08	Green cover	Bodzentyn	PLA	0%	No info
66	A08	Green cover	Pawłów	PLA, SHPA	0%	No info
67	A08	Green cover	Pawłów	PLA, SHPA	0%	No info
68	A08	Green cover	Pawłów	PLA	0%	No info

69	A08	Green cover	Kunów	PLA	0%	No info
70	A08	Green cover	Bodzentyn	PLA	0%	No info
71	A08	Green cover	Kunów	PLA, SHPA	0%	No info
72	A08	Green cover	Pawłów	PLA	0%	Bad
73	A08	Green cover	Pawłów	PLA	0%	Bad
74	A08	Green cover	Pawłów	PLA	0%	Bad
75	A08	Green cover	Pawłów	PLA	0%	Bad
76	A08	Green cover	Bodzechów	PLA	0%	Bad
77	A08	Green cover	Ćmielów	SHPA	0%	No info
78	A08	Green cover	Bodzechów	PLA	0%	Bad
79	A08	Green cover	Pawłów	PLA	0%	Bad
82	A08	Green cover	Bodzechów	PLA	0%	Bad
83	A08	Green cover	Bodzechów	PLA	0%	Bad
84	A08	Green cover	Bodzechów	PLA	0%	Bad
2070	D04	Construction of micro reservoirs on ditches	Nowa Słupia	NP, SHPA	99%	Bad
2071	D04	Construction of micro reservoirs on ditches	Bodzentyn, Nowa Słupia	NP, SHPA	99%	Bad
2077	D04	Construction of micro reservoirs on ditches	Nowa Słupia	SHPA	0%	Bad
2090	D04	Construction of micro reservoirs on ditches	Nowa Słupia	LP	0%	Bad
2092	D04	Construction of micro reservoirs on ditches	Pawłów	PLA	0%	Bad
2093	D04	Construction of micro reservoirs on ditches	Pawłów	PLA	97%	Bad
2094	D04	Construction of micro reservoirs on ditches	Pawłów	PLA	0%	No info
2095	D04	Construction of micro reservoirs on ditches	Pawłów	PLA	0%	No info
2096	D04	Construction of micro reservoirs on ditches	Pawłów	PLA	0%	No info
2097	D04	Construction of micro reservoirs on ditches	Pawłów	PLA	0%	Bad
2098	T3	Res. Górki-Gilów	Bliżyn	PLA, SHPA	93%	Bad
2099	T3	Res. Mroczków	Bliżyn	PLA	1%	Bad
2100	T3	Res. Wołów	Bliżyn	PLA	16%	Bad
2102	D01	Control outflow Lipowe Pole	Skarżysko-Kamienna, Skarżysko Kościelne	SHPA	24%	Bad
2103	F08	Appropriate design of roads and stream crossings	Suchedniów	PLA	90%	Bad
2104	F06	Continuous cover forestry	Brody	PLA	100%	Bad
2105	F06	Continuous cover forestry	Ćmielów	SHPA	19%	No info
2106	D01	Regulated outflow from drainage systems	Bałtów	PLA, NR, SHPA	1%	No info
2107	F06	Continuous cover forestry	Bałtów	PLA, SHPA	70%	No info
2108	D04	Construction of micro reservoirs on ditches	Brody	PLA	100%	Bad
2109	T3	Res. Ruda Kościelna	Ćmielów	SHPA	0%	No info
2110	T3	Res. Boria	Bałtów, Ćmielów	PLA, SHPA	0%	No info
2111	T3	Res. Rudka Bałtowska (nr 1 - Bałtów)	Bałtów	PLA, SHPA	0%	No info
2112	T3	Res. Lemierze (nr 2 - Bałtów)	Bałtów, Ćmielów	PLA, SHPA	0%	No info
2113	T3	Res. Michałów	Wąchock	PLA	47%	Bad
2114	T3	Res. Ćmielów	Ćmielów	SHPA	30%	Bad
2115	D03	Renovation the Styków pumping station	Brody	PLA	100%	Bad
2116	T3	Renovation Brody Iłzycikie weir	Brody	PLA	98%	Bad
2119	N02	Oxbow Nietulisko	Kunów	PLA, SHPA	18%	Bad
2129	T3	Res. Bzin	Skarżysko-Kamienna	PLA, SHPA	42%	Bad

Protection Type: PLA-Protected Landscape Area, SHPA-Special Habitat Protection Areas, LP-Landscape Park, NP-National Park, NR-Nature Reserve

Appendix 3 Results of a multi-criteria analysis of the selection of measures for the general goal.

SPU	A02	WRA	F01	F06	F08	F14	ER	N06	BPDA	T1	T2	T3
6						11			5			
7									5			
8									11			
9		3										
12		3										
13									6			9
14									11			
16												
17												10
18												
20							10					
21			5				10					
22							8					
23			5								15	
24												6
25												9
27												
28												
29							9					
30												
31												
32												
33												9
34							9					
35												
37												11
38	6								8			
39												
40	6		6						7			
41			5									
43												8
44	12											
46			9	9			10					
49			5									
50												9
51												9
52												9
54												
56	9											
57												10
58												9
60												9
64	11											
65	10				8							
66						6						
67						9						
70							10					
71												
72			6									
78												
82	9						8					
86												2
88	12											
90												
91				10								15
92	12											
97		3										
99												
100	12											
102												
103												
104	10											
105		7			10		10					
108				10								
109	12	7					10					
114	8											
115	9											
116	10											
117				9								
120												3
122			5									
123							6					
124	12											
125	12			6								
128		4	6									
129	9											
130	12											
131								10				
132												
133												
134												

SPU	A02	WRA	F01	F06	F08	F14	ER	N06	BPDA	T1	T2	T3
135	7											
136				6				6				
137	7		7									
138	12			10								
139							9					
140	7											
141	8											
142	9											
145	11	12		10					8			
146	10											
147	12											
148	8	6										
149		4		10								
150							7					
152	8											
153	7											
154	8		8									
155	13											
156		7	9									
157	9											
158	9			6								
159	8											
160												
161												
162	9								6			
163	8											
164	7	5										
166												
167	9											
168				6								
170					6							
171										12		
172	7											
173												
174			5									
175	10			10								
176							8					
177	10											
178										12		
179	10											
180	9											
181				6								
182		6										
183				7								
184	9											10
185	9											
186		3										
187	8	7										
188	10											
189	11											
190	9											
191	8											
192									6			
193	9											
194	9											
195	8											
196	10											
197	7					8			5			
198	8	5										
199	7											
200	10											
201			9									
202	12			8								
203	8	6										
205	10			6								
207	10											
208	8		8									
209	7								5			
210									6			
211	7		7									
213	9											
214	7	6	7									
215	8	7										
218									7			
219							6					
220									6			
221	9								3			
223				6								
224	11											
225	10			6								
226	13											
227	10											

Assessment
very high
high
good
low
very low

Appendix 4 Map of planned measures