DEVELOPING THE CONCEPT PLAN FOR N(S)WRM IN RIVER BASIN

D.T2.3.1

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Pilot Catchment Kamienna
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1. INTRODUCTION

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 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 present Concept Plan was developed using the GIS Tool FroGIS developed for landscape valorization in the FramWat project and by building upon the first results of the static and dynamic modelling of the pilot catchment. The Concept plan gives information on best locations and suitable types of measures with cumulative effect.

The main objectives of the present Concept Plan are:

- to explain transparently the way how the analysis of information, data and context as well as the evaluation of experts knowledge and stakeholders preferences led to the chosen NSWRM design principles;
- to show how the design and location of the selected N(S)WRMs respond to the opportunities & constraints identified during the analyses;
- to explain and justify the way the N(S)WRMs are planned;
- to demonstrate a genuine response to context and not simply justify predetermined design solutions
- to provide a uniform guideline for the NSWRM planning process

2. ELABORATION METHOD OF THE CONCEPT PLAN

Figure 1 demonstrates the main steps of the concept plan elaboration, while details of the needed actions are discussed in the chapters below.

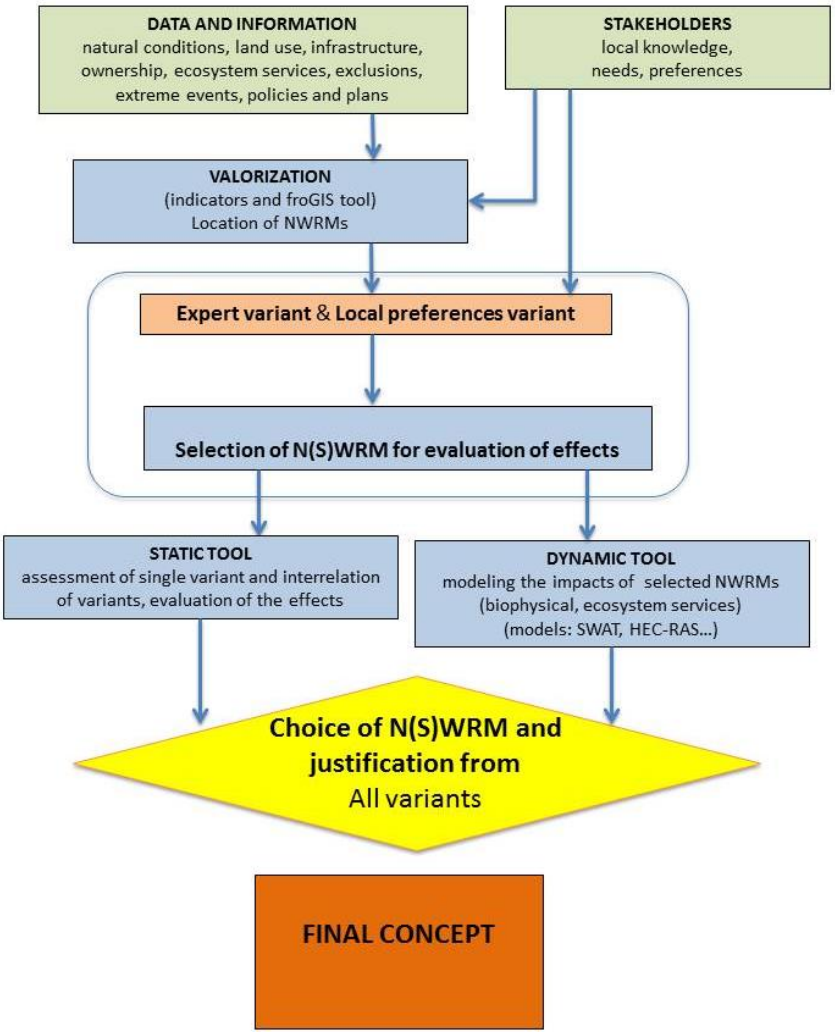


Figure 1: Main steps of the Concept Plan elaboration

3. CHARACTERISTICS OF THE PILOT AREA

The Concept Plan was carried out for the Kamienna river catchment subject to the Regional Water Management Authority (RWMA) in Warsaw, which is responsible for developing water management plans.

Fig. 1 Location of Kamienna catchment in Poland

Kamienna catchment is located in the water region of Central Vistula. The main river in the basin is the Kamienna River, a left-bank tributary of the Vistula. The source of the river is located at the boarder of the Masovian and Świętokrzyskie provinces close to Borki village (Chlewiska municipality, Szydłowiec County). The river is 156 km long and runs from west to east predominantly through the Świętokrzyskie Province.

Main tributuaries of Kamienna: Świślina, Kobylanka, Młynówka, Wolanka, Modła

Analysed catchment is located within the borders of seven counties: szydłowiecki, lipski, kielecki, konecki, starachowicki, ostrowiecki, opatowski and the catchment area is 2020 km2.

3.1 Natural conditions of the catchment

It is located in the area of the Polish Upland (according to Konracki, physico-geographical division) in the water region of Central Vistula. Kamienna River is a left-bank tributary of the Vistula, it is 156 km long and flows from west to east. There is a large number of small, artificial reservoirs in its area

and two large ones: Wióry and Brody Iłżeckie. Due to its location (lowland / piedmont) and land use, it is characterized by high flow dynamics which is responsible for floods events. Details are shown on the map in Fig. 1 and Tab. 2.

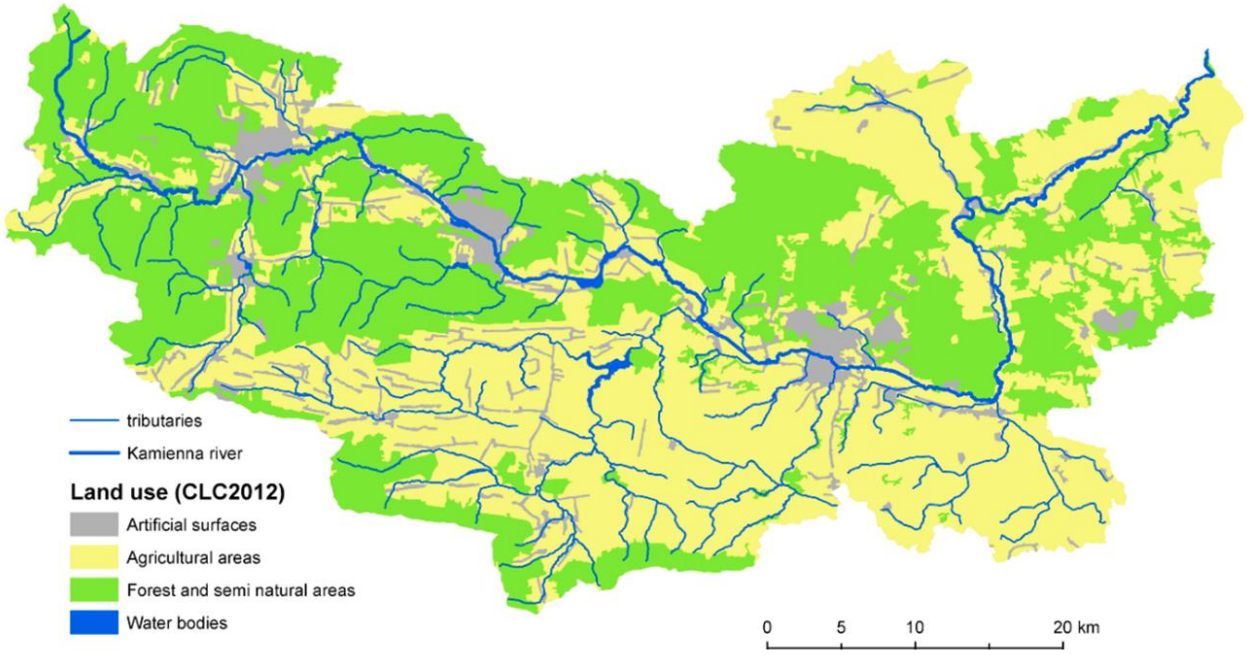


Fig. 2 Kamienna catchment land use distribution

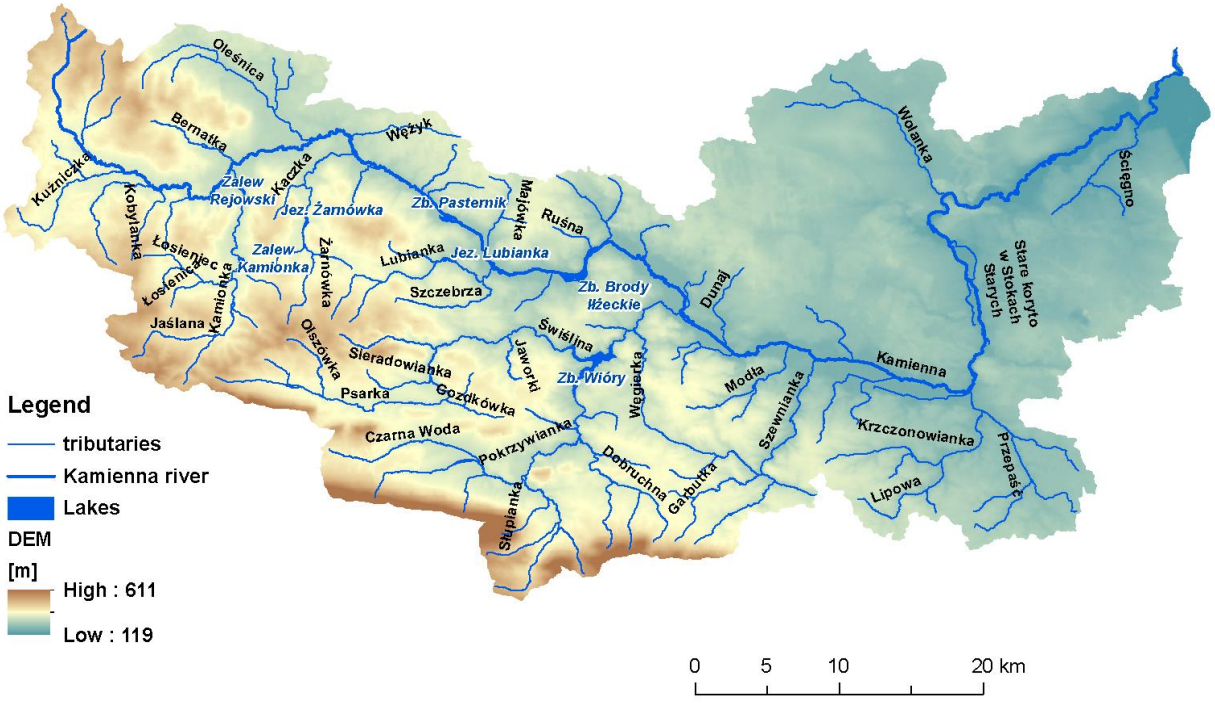


Fig. 3 Kamienna catchment mophology

Tab. 1 Characteristic of Kamienna catchment

Characteristic	Unit	Value
Character of catchment		Lowland/piedmont
Catchment size:	km2	2020
Average flow low/avg/high*	m3/s	2.9/8.3/40
Extreme flow low/high*	m3/s	0.07/113
Annual precipitation low/avg/high*	mm	420/640/920
Annual air temperature min/avg/max*	°C	03.06.2012
Agriculture area	%	54.2
Urban area	%	15.6
Forest area	%	29.6
Open Water area	%	0.6
Flooded area (1/100 years)	km2	55.6
Artificial drainage area	km2	59.2
Ecological status no good/bad	water body	2/11
Major problems to achieve good ecological status		Phitoplancton, Phytobenthos, Macrophytes, BOD5,PO4, Norganic

* From multiannual statistic 1951-2013

Lay of the land

The catchment range covers both upland and lowland areas, the highest point has a height of 609.60 m above sea level, while the lowest is located at 126.40 m above sea level. Due to the large variation of the longitudinal slope in the upper part of the river, Kamienna can be considered a mountain river because the longitudinal slope is around 10 ‰. Slope with such values continues to Skarżysko-Kamienna, from where it gradually decreases, and in Kunów it is about 0.7 ‰, closer to the estuary slope continues to decrease (Lenar-Matyas, Witkowska, i Żak 2006).

Geological structure

The geological structure of the Kamienna river basin as well as the whole Świętokrzyskie province is very varied and expressed by lithological changeability. Area of the province belongs to the Mid-Polish uplands, forming a latitudinal belt of low elevations and mild depressions included in the metacarpathian embankment (Koślacz i in. 2006). The basic structural and tectonic unit in the analyzed area is the Paleozoic core formed as a result of the Caledonian and Hercegovian orogenesis, occupying the central part of the province. In the remaining part of the area, the rocks from that period occur under a relatively thick cover of sedimentary rocks, constituting the Mesozoic cover of the core.

In the older substrate, complexes with a greater thickness (about 8000 m) of Paleozoic and Mesozoic sedimentary rocks are represented by sandstones, clays, siltstones, rocks, marls, clays and limestones.

Soils

The area of the Kamienna River basin is very diverse in terms of distribution and types of soils. A clear division is visible: in the southern part, loess (28% total area of catchment) with loess loam (2.2%) dominate, in the north-eastern part of the basin, clayey sand (5.5%) dominate and in the north-western clay (3%). However, in total area of catchment sand have a significant share: the average (18%), light (9%) and loose (7.2%).

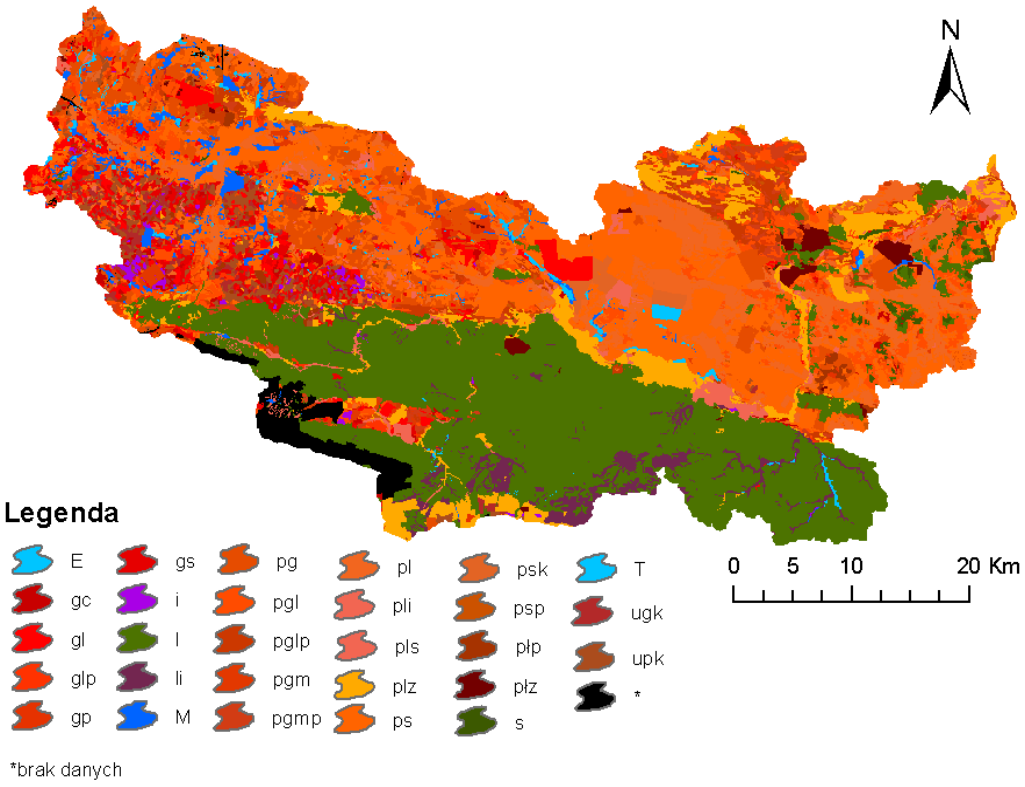


Fig. 4 Kamienna catchment soil type map

The presented soil map was developed on the basis of a soil and agricultural map in the scale of 1: 25 000 obtained from the Institute of Soil Science and Plant Cultivation in Puławy and the soil-habitat layer from the Forest Data Bank in 1: 5000 scale.

Groundwater

Large variation is also noticeable in the hydrogeological conditions of the Świętokrzyskie Province and in the catchment itself, this is due to the high lithological variability. According to the hydroregional division of Poland (Malinowski, 1991), the Świętokrzyskie province belongs to two macro-regions: mid-Poland and south-Poland.

The area of Kamienna river catchment has various modules of groundwater abundance, from areas without water-bearing levels (so-called anhydrous areas) in the southern part of the catchment, through areas with small and medium water abundance (up to 200 m3/24h/km2) in the central part of the catchment, up to north-eastern part of the basin with areas of high abundance (above 200 m3/24h/km2) (Koślacz i in. 2006).

Climate

Based on data provided by the Institute of Meteorology and Water Management (IMGW) at http://old.imgw.pl/klimat/# the average annual temperature for the years 1971-2000 in the area of the Kamienna basin was approximately 6 ° C in the area of Świętokrzyskie Mountains and approximately 7 ° C in the rest of the catchment. The average annual rainfall in the upper course of the river ranges from 650 mm to 550 mm and in the lower course from 600 mm to 500 mm. The catchment also shows a clear division in the length of the growing season. In the western part (the upper course of the river) it is 210-220 days and in the eastern (the lower course of the river) it is 220-230 days (Atlas Impact2C). IMGW developed in 2008 an annual climatic water balance (Fig. 4).

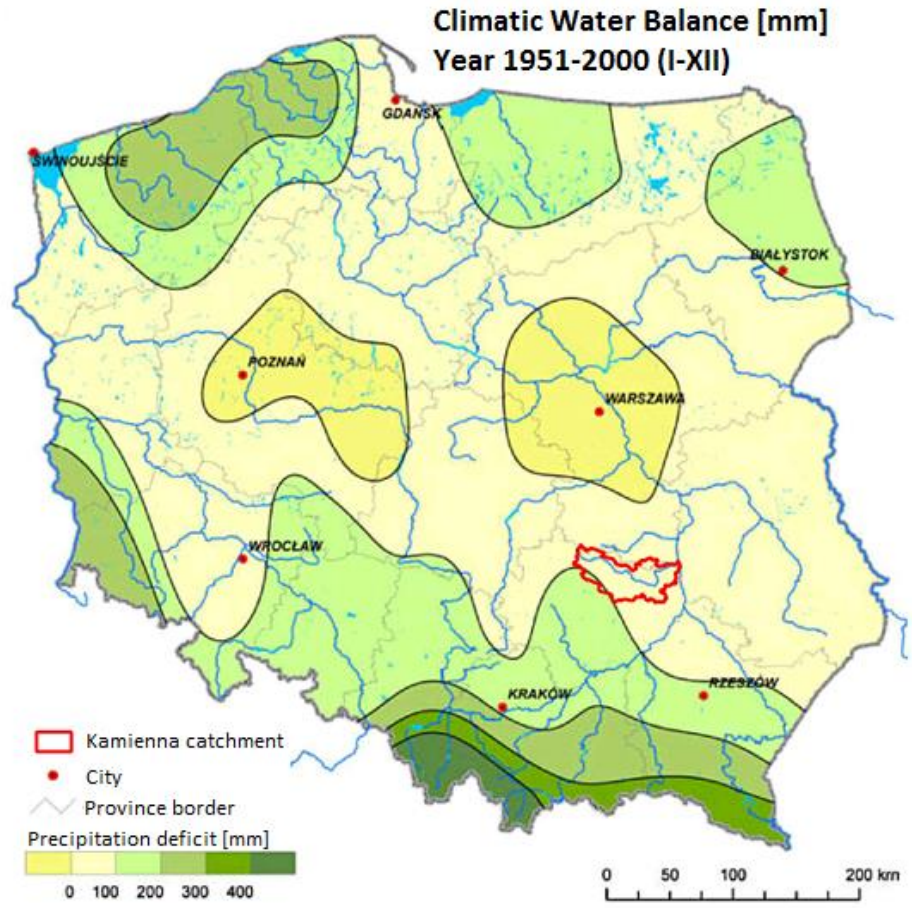


Fig. 1. Annual Climatic Water Balance (on the basis of CWB map prepared by IMGW (Poznań 2008)

This map shows differences between evaporation and precipitation, in Central Poland (near Warsaw and Poznań) evaporation is higher than precipitation - the deficit amounts up to -300 mm. Balance for Kamienna River basin is similar to the national average - in the dominating part of the catchment, the annual evaporation rate is comparable to the annual rainfall and in a small part there is a prevalence of precipitation over evaporation.

3.2 Land use, infrastructure and nature conservation areas

Land use in the catchment was determined on the basis of the CORINE Land Cover (CLC) Program established in 1985. The purpose of the CLC program is to provide information on land cover / land use across Europe. The unit responsible for the coordination of the CLC is the European Environment Agency. Poland participated in the implementation of all existing projects (CLC1990, CLC2000, CLC2006 and CLC2012), and the direct contractor was the Institute of Geodesy and Cartography. (GIOŚ - Corine Land Cover - CLC). The data used in this study comes from the 2012 program, it was assumed it is a good representation of the actual state. Fig. 2 shows the distribution of land use forms.

The dominant share is held by agricultural areas, they constitute more than half of the catchment area, about 30% are forests, including mixed forests (6.8%), deciduous forests (6.3%), coniferous forests (5.9) and forest complexes with shrub vegetation (10.6%). Anthropogenic areas stretching along the Kamienna river account for approximately 15.6% of the catchment area with the larger cities and communication routes visible in Figure 5. Featured water areas are mainly Wióry and Brody Łececkie reservoirs.

Nature conservation areas

Nature conservation areas are considered as separated areas with exceptional natural or landscape values. Types of those areas are distinguished by the level of protection. According to the Nature Conservation Act of April 16, 2004, 10 forms of nature conservation exist in Poland: national parks; nature reserves; landscape parks; protected landscape areas; Natura 2000 areas; nature monuments; documentation stands; ecological land; natural and landscape complexes and species protection of plants, animals and fungi. According to the information provided by the General Directorate for Environmental Protection, in the analyzed area all the above-mentioned forms of nature protection can be found. Figure 7 shows the distribution of protected areas in the catchment.

The maps show forms of nature conservation (only large scale ones), including:

- In the south-western part of the catchment - a fragment of the Świętokrzyski National Park with a buffer zone (map 1);
- In the central and south-western part of the basin - Landscape Parks: Suchdniowsko-Oblegorski, Sieradowiscki and Jeleniowski (map 2.), as well as Natura 2000 sites: Uroczysko Lasów Starachowickie, Dolina Kamienna, Wzgórza Kunowskie and Lasy Skarżyńskie (map 3);
- Present in the area of almost the whole catchment - Protected Landscape Areas (map 4).

The areas with different forms of nature conservation often overlap partially with each other, but in total about 70% of the catchment area is protected (map 5). The areas of cities: Ostrowiec Świętokrzyski, Starachowice and Skarżysko-Kamienna, as well as the south-eastern part of the basin do not include any protected areas.

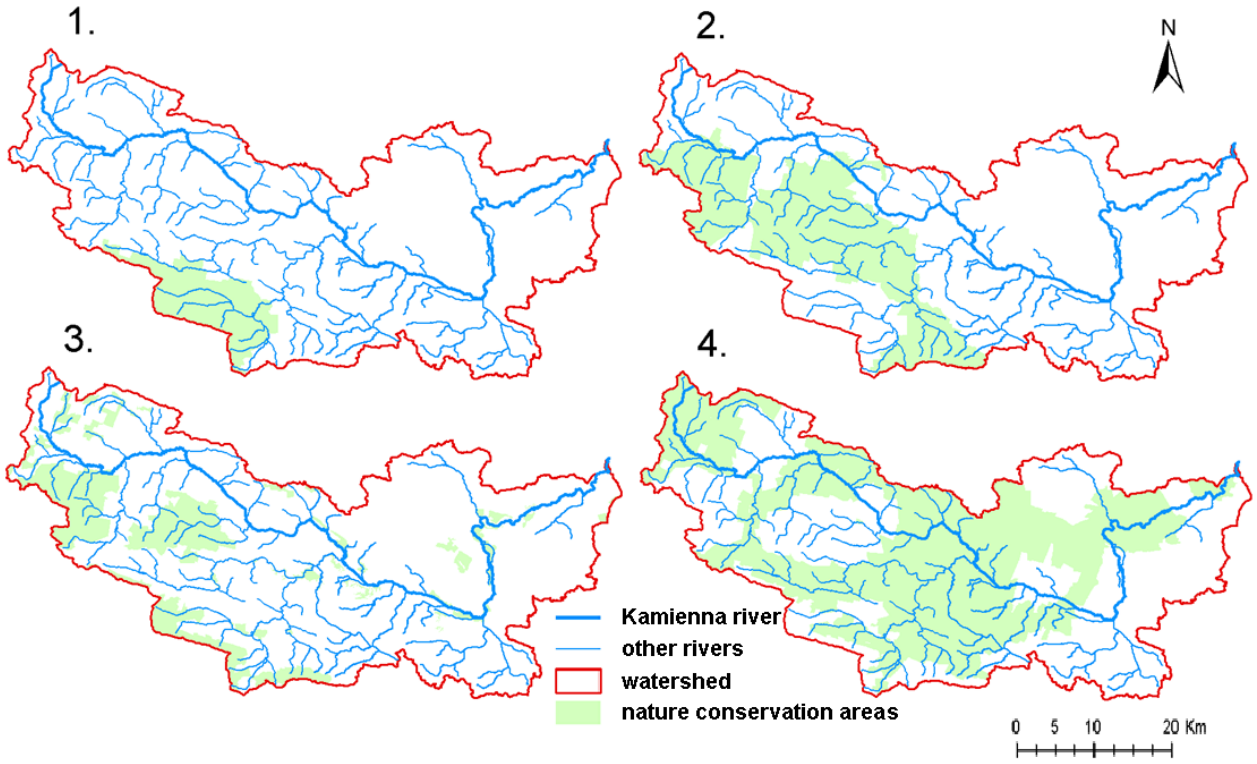


Fig. 5 Obszary chronione w zlewni rzeki Kamiennej: 1. - Świętokrzyski National Park; 2. - Landscape Park; 3. - Natura 2000; 4. - Areas of Protected Landscape;

3.3 Catchment problems

The process of problem identification can be carried out on a review of publicly available documents, discussions with the main stakeholders, own analysis and filed recognition.

Flood risk

The flood risk analysis was based on flood risk maps developed in the ISOK project in 2013 and available on the http://mapy.isok.gov.pl/imap portal. The flooding extend is presented therefor the probability of occurrence once every 10, 100 and 500 years. As shown in Fig. 6, floods occur practically along the entire

length of the Kamienna River, omitting its source section. The greatest threat concerns agricultural lands located in the lower part of the basin, especially at its outlet to the Vistula river. The urban areas Starżyszko Kamienna, Starachowice and Ostrowiec Świętokrzyski are slightly threatened.

Problem with achieving good ecological status

Problems with poor water quality were diagnosed according to reports of the Voivodship Inspectorate for Environmental Protection in Kielce conducted in 2010-2017. 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 only in the lower river reach. Problems concerning priority substances (i.e. Benzo (a) pyrene, Benzo (b) fluoranthene, Bezo (g, h, i) perylene) occur in the central part of the Kaminna catchment below the town of Starachowice and in the mouth section of Świśliny. Exceeded physico-chemical indicators (i.e. BOD5) were found only Brody Iłżyckie reservoir and in the lower section of Kamienna River below Ostrowiec Świętokrzyski, in which a problem with general alkalinity was noted.

The status assessment does not include 14 Water Bodies, which consist about 30% of the Kamienna catchment area. In particular, there is no assessment of the Ścięgno, Wolnak or Przepść rivers, catchments which areas are used in 90% for agriculture and do not include nature protection areas. 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 occurrence monthly statistics of selected agricultural catchments (Kamionka, Szewnianka, Pokrzywianka and Świślina). It shows that the exceedance occurs in the summer months and this applies to compounds (PO4, Total P and Organic N), which get into the waters 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.

Drought risk

Problems connected to droughts were analysed on the basis of the Drought Impact Mitigation Plan (DIMP), which contains an assessment (Fig. 7) 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 an agricultural land use. The climatic drought extent is equally large and its concentrated 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 up (Fig. 8) with the number of farmers crop damage compensation applications in 2018. The comparison of these maps shows that the acute problem of agricultural drought was confirmed in the south-eastern part of the basin.

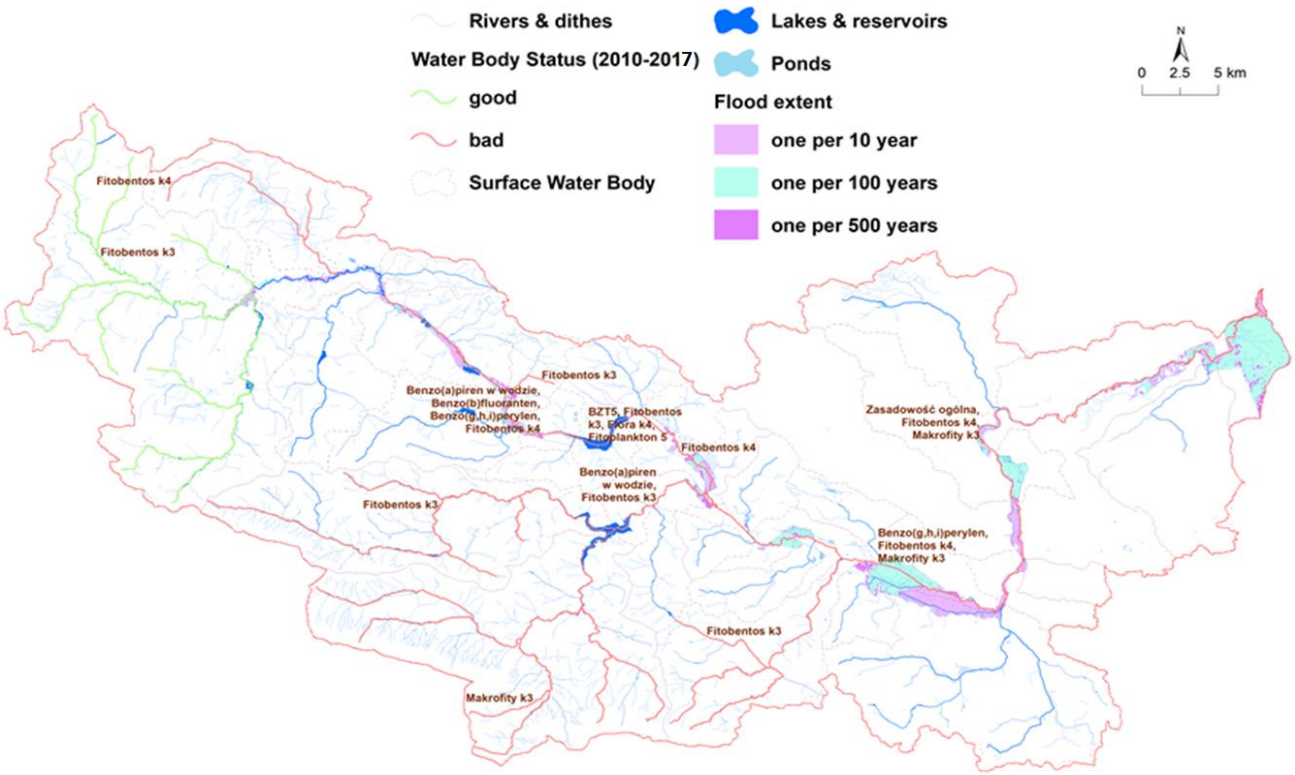


Fig. 6 Water body status and flooding extent

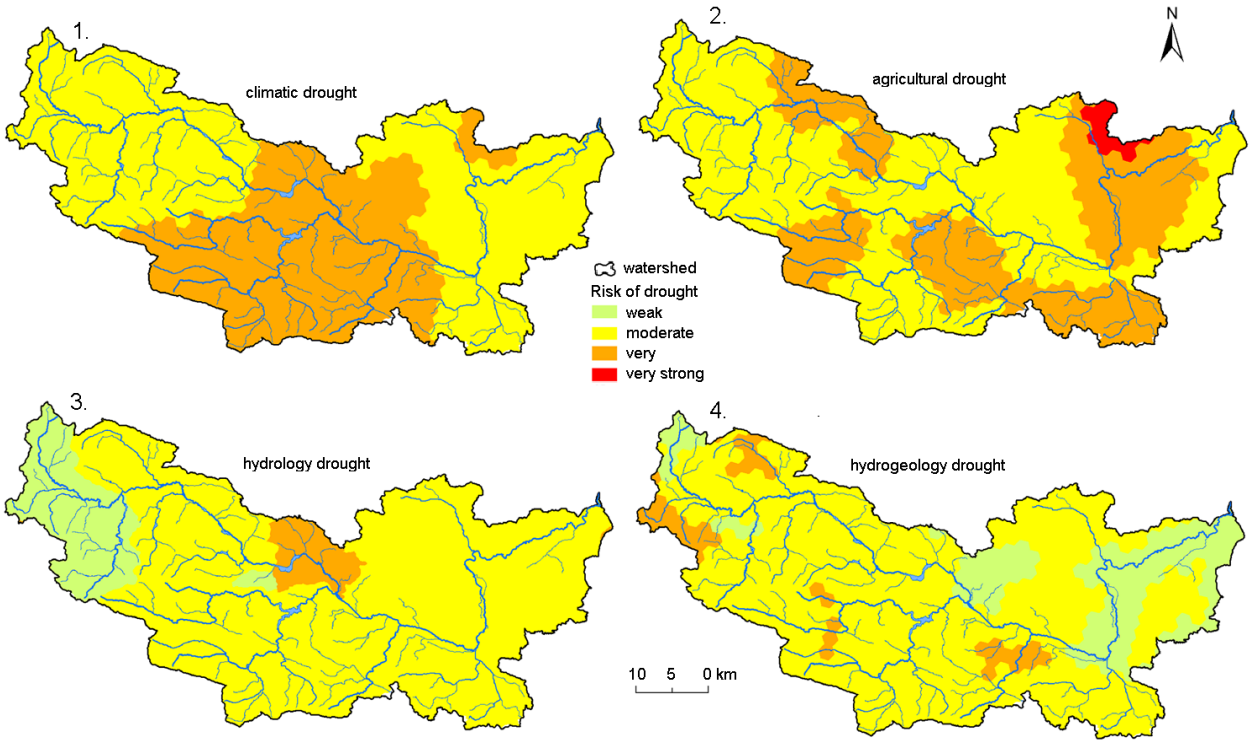


Fig. 7 Map of areas threatened by different types of drought included in the Drought Management Plan approved in 2016. Where: 1. Climatic, 2. Agricultural, 3 Hydrology, 4. Hydrogeology drought

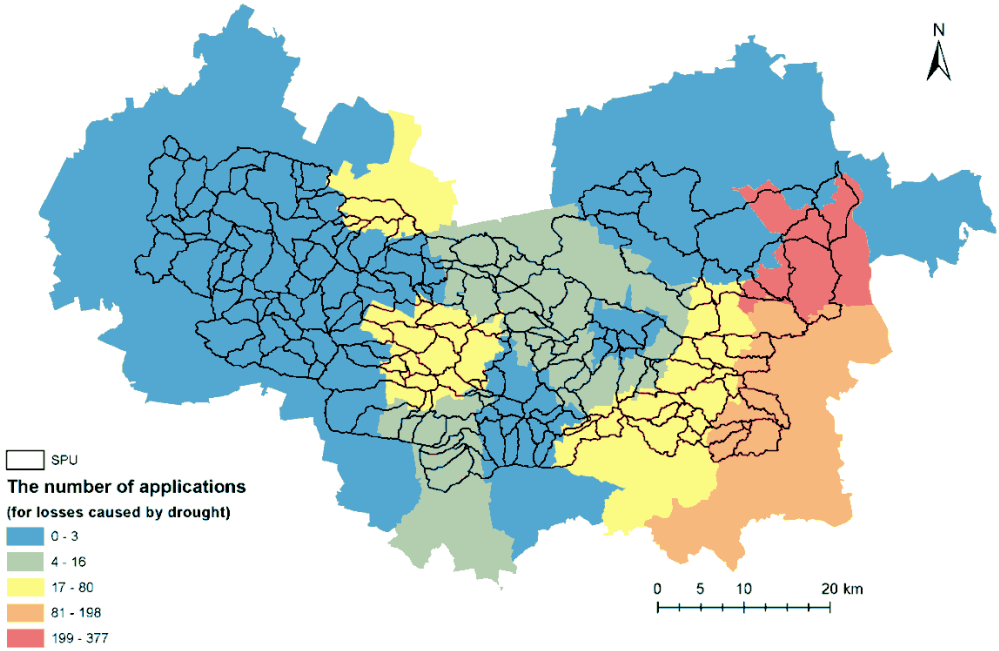


Fig. 8 Number of farmers crop damage compensation applications in 2018 (source: Świętokrzyska Agricultural Chamber http://www.sir-kielce.pl access date 1.08.2018)

Climate change

The analysis of climate change was carried out on the website http://climateimpacy.sggw.pl in the lower section of the Kamienna River flowing through the town of Ostrowiec Świętokrzyski for a projection based on the RCP8.5 global scenario of CO2 changes, dynamic downscaling and near (nf) and far (ff) future. Changes in meteorological conditions will have an increasing tendency as shown in Tab. 2. 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. 3.

Tab. 2 Change of meteorological condition for Kamienna catchment (measure 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. 3 Change of hydrology condition for Kamienna catchment (measure 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	-39,24	43,09	5,26	92,15	-1,15	-51,17	67,19	186,31	103,14	18,72
Actual evapotran-spiration	12,27	0,69	0,31	10,89	3,65	27,53	2,29	-15,49	50,66	9,20
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
Hight flow	9,8	19,2	19,1	46,2	18,5	15,4	31,4	49,9	72,6	37,2

4. VALORIZATION: A MULTI-CRITERIA ANALYSIS

4.1 The valorization method and tool

The aim of the landscape valorization was to identify areas with the highest need for NSWRM in the catchment for one of the overarching goals (1) drought mitigation, (2) flood control, (3) water quality improvement, or (4) sediment balance improvement. Valorization spatial scale (resolution) is based on the concept of spatial planning units (SPUs), which are homogeneous patches of the catchment that are assumed to have uniform response. Input data are processed and synthetized as indicators at the SPU scale. The valorization methodology allows incorporating different indicator classes such as land use, geological background, catchment morphology, climate and hydrology into a multi-criteria analysis. The valorization methodology is static, i.e. indicators are spatially explicit but time-independent. Statistics can be used to summarize multiannual time series of flow and climatic indicators into single values.

The GIS based tool FroGIS (Framework for Retention Optimization) was developed for the requested valorization purposes. Users need to provide their catchment data as input and as a result they can generate catchment maps and statistics showing areas with highest need for measures implementation.

The valorization was performed for the goal “sediment balance”, because fine sediments accumulation (siltation) in the rivers is a main problem in the catchment and also a major concern for the responsible regional water and nature protection authorities because it leads to both:

- ecological problems: habitat deterioration for river biota, key species: fresh water pearl mussel (Margaritifera margaritifera)
- hydraulic problems (flood control and protection): raising riverbeds causing decreased flow capacities within the river channels

The reasons for the siltation problem are diverse and a combination of multiple aspects. For a clearer understanding of the underlying processes the sediment aspect has therefore been studied separating the three fields (1) sediments generation, (2) sediment transport off stream, and (3) sediment transport in stream based on the evidence that:

- Retention need is higher for those areas in the catchment where sediment is easily produced (high erosion). This depends on the geological background, on soil properties, on land use, on climatic conditions, and on morphological conditions.
- Sediment retention need is higher for those areas where off-stream transport of sediment is higher and where the probability of detached sediment ending up in the river channels is higher.
- Regarding in-stream sediment transport, the need for onward sediment transport is higher for those reaches with higher tendencies for sediment accumulation and siltation due to their morphologic condition (lower slope, widening of cross-section...) and flow characteristics (less flow, less depth, less shear stress...).

4.1.1 Spatial planning units choice

Chosen SPUs are 187 elementary basins form Hydrographic division map in scale 1:10 000.

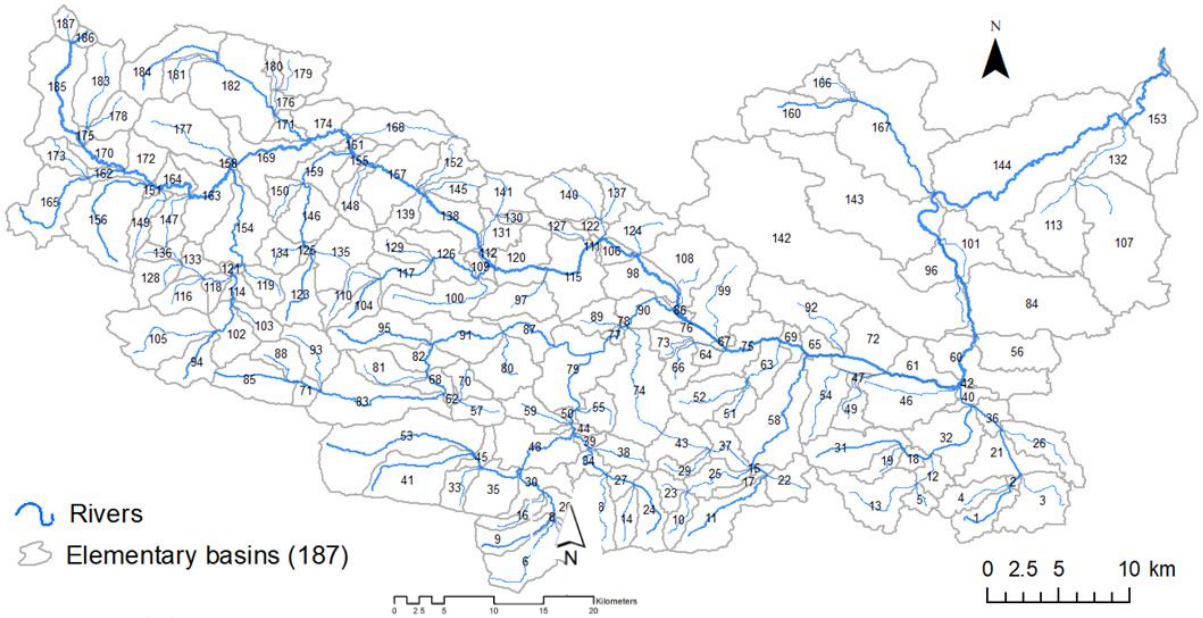


Figure 2: Spatial Planning Units

4.1.2 Input data

The data collection process adopted the principle of using generally available data on a scale not smaller than 1: 25,000 and covering the entire analysed area. Most of the data was obtained without costs under applicable laws and agreements, some of them for a small fee (eg water quality measurements), only the purchase costs of soil maps were significant. A detailed list of data is included in Tab. 4

Tab. 4 List of input data

Name	Source	Data type	Accuracy
Hydrological and meteorological data	Institute of Meteorology and Water Management, (for water gauges and meteorological stations)	Time series in point	7 gauges; daily
Water quality monitoring	Inspector of Environmental Protection	Time series in point	30 location
Length of the growing season	Geoportal for climate change (www.atlas.impact2c.eu)	raster	
Soil data	Institute for the Cultivation of Fertilization and Soil Science in Puławy	polygon	1:25000
Effective infiltration of precipita-tion into groundwater	Polish Geological Institute	polyline	
Hydrographic division map	Polish State Water Farm	polyline/polygon	1:10000
Flood hazard maps	Polish State Water Farm	polygon	1:10000
Digital Elevation Model (LIDAR)	Polish Head Office of Geodesy and Cartography	raster	10x10m; h=0.15m
Land use	Chief Inspectorate of Environmental Protection, Corine Land Cover 2012	polygon	1:25000

4.1.3 Indicators

Indicators from the list present in the FroGIS tool (levis-framwat.sggw.pl) were screened and we chose only those whose correlation with others was less than -0.75 or greater than 0.75. List of selected indicators presets Tab. 4

Table 1: List of selected indicators

Topic	Needs and possibility for water retention goals			
	General	**Flood**	**Drought**	**WaterQuality**
Climat	CWB		CWB	
	Pre_Var_a	Pre_Var_a	Pre_Var_a	
	PrecFreqLow75	PrecFreqLow75	PrecFreqLow75	
Ecology	EcoAraBuf20mRatio			EcoAraBuf20mRatio
	EcoNumRatio			EcoNumRatio
	NonForestedRatio	NonForestedRatio		NonForestedRatio
Hydrogeology	GRR	GRR	GRR	
Hydrography	DrainageD	DrainageD	DrainageD	DrainageD
	LakeRatio	LakeRatio	LakeRatio	LakeRatio
	MeanderRatio	MeanderRatio	MeanderRatio	
Hydrology	FloodRiskAreaRatio	FloodRiskAreaRatio	FloodRiskAreaRatio	
	FlowVarRatio_m	FlowVarRatio_m	FlowVarRatio_m	
	SRI	SRI	SRI	
Landuse	ArableRatio	ArableRatio	ArableRatio	ArableRatio
	ReclaimedRatio	ReclaimedRatio	ReclaimedRatio	ReclaimedRatio
	WetlandRatio	WetlandRatio	WetlandRatio	WetlandRatio
	UrbanRatio	UrbanRatio	UrbanRatio	UrbanRatio
Soil	SWR		SWR	
Topo	TWI	TWI	TWI	TWI

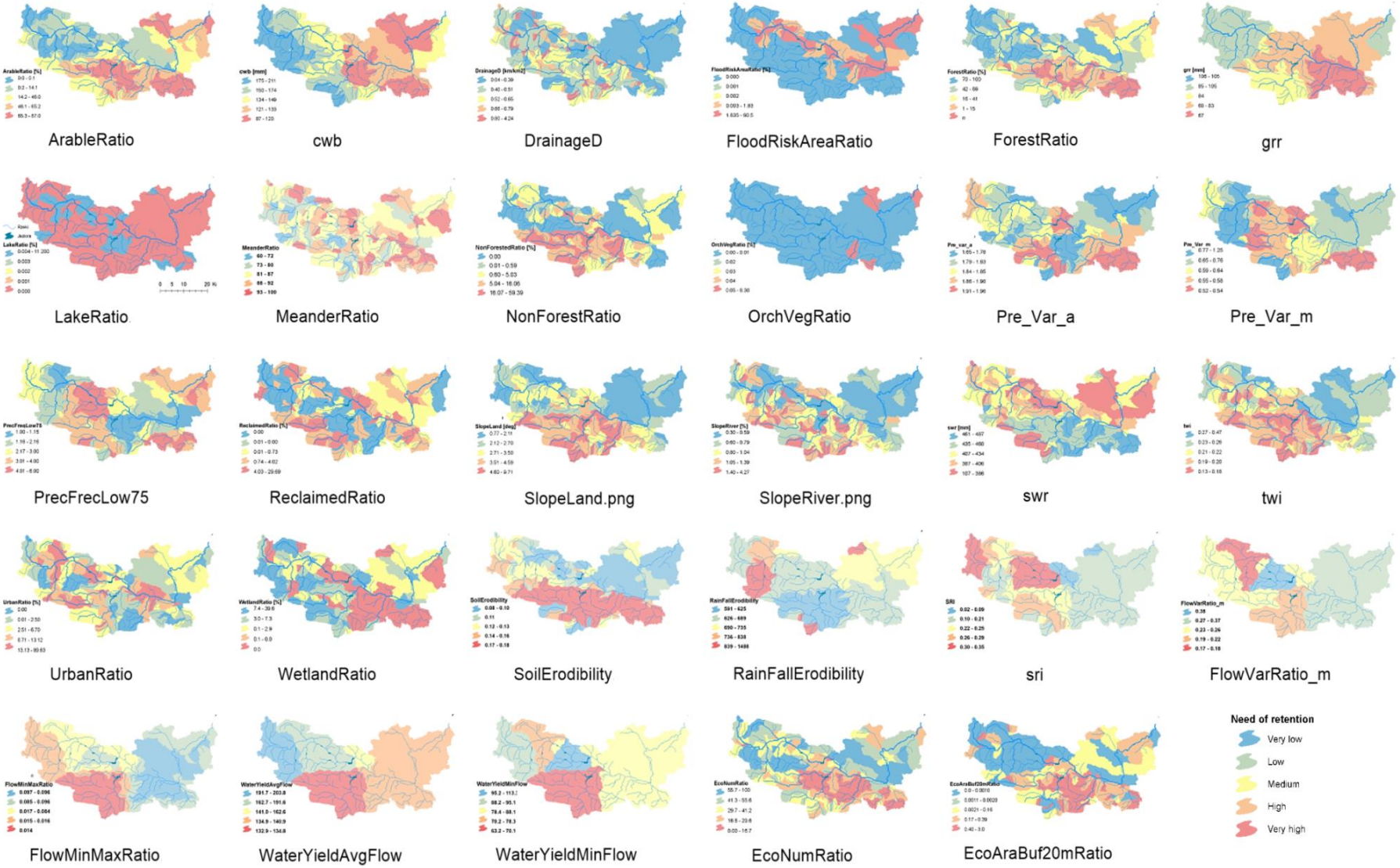


Fig. 9 Indicator values maps

The GIS Tool analysis has been carried out using natural breaks for indicators classification to 5 classes. Indicators have been aggregated without weights (all weights were set equal to 1, i.e. all indicators have the same relative importance).

4.2 Results of the valorization:

Finally four different valorization maps were produced for drought, water quality, flood and general water retention goals which is presented on Fig. 10:

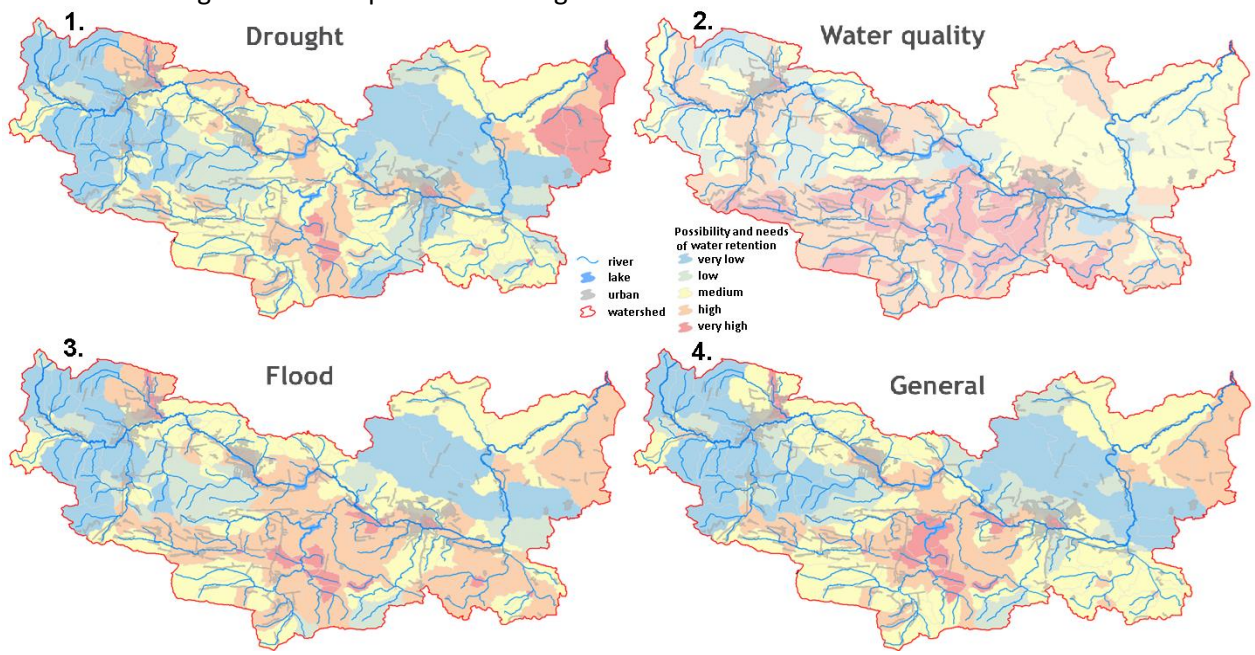


Fig. 10 Example maps for selected catchment indicators

5. REVIEW OF EXISTING AND PLANNED MEASURES

The task of the next analysis is to determine the existing and planned stakeholder activity in the scope of N(S)WRM. This will allow identifying areas with high water retention potential, which will be used to identify weighting factors for indicators. The existing activities were identified using Geomelio and Polish Waters databases as well as materials summarized in Tab. 5. Among them, about 400 ponds were identified, eight medium-sized water retention reservoirs, including two fish ponds, seven weirs and several damming systems on ditches.

Planned activities were identified on the basis of the materials listed in Tab. 5. Map in Fig. 11 includes only 12 water retention reservoirs proposed for construction or modernization and 3 dry retention reservoirs. Other activities concerning, for example, on drought didn't have a precise location, but only the conditions under which they should be applied.

Tab. 5 Action plans used for identification of existing and planned N(S)WRM

Goals	Action plans Name
Water quality	Water and environmental program of the country, 2016
Flood	Flood Risk Management Plan (FRMP) for the central Vistula,2016
Drought	Drought Impact Mitigation Plan (DIMP) for the central Vistula, 2016
General	River Basin Management Plan for Vistula (RBMP), 2016 River Maintenance Plan for area of Regional Water Management Authority in Warsaw, 2016 Small retention program, 2006 Action plans separately for lowlands and mountains - Increasing retention possibilities and counteracting drought and floods in forest ecosystems, 2007-2015 Rural Development Program, 2014-2020 Operational Program Infrastructure and Environment, 2014-2020;

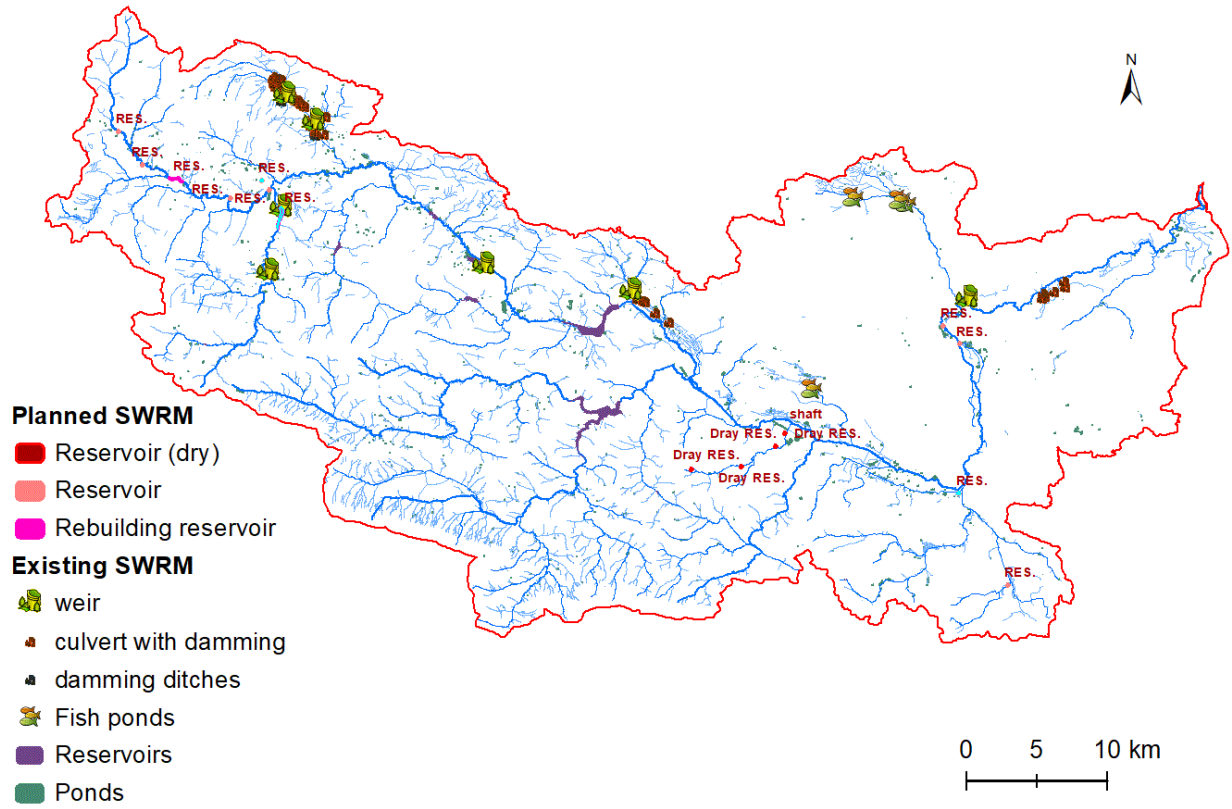


Fig. 11 Existing and planned SWRM for flood mitigation (RES means reservoir)

6. DEFINING VARIANTS

There are two types of variants that will be elaborated in the frame of the concept plan:

- Expert variant,
- Local preferences variant.

In this part of the planning process of the project, we have to select and place the appropriate measures and measures combinations for further examinations.

The expert variant developed by experts in the field of water management, protection of water resources, aquatic ecosystems and ecosystems dependent on water.

6.1 Natural small water retention measures in the project:

The basis for the measures in FramWat project is from Natural Water Retention Measures (NWRM), which was developed by a EU project, and the results can be found on the official website (http://nwrm.eu/measures-catalogue).

This platform gathers information on NWRM at EU level, cover a wide range of actions and land use types.

Main sectors of NWRM:

- Agriculture,
- Forestry,
- Hydro-morphology,
- Urban. (Not relevant in FramWat project)

In FramWat project the NWR measures were completed with other relevant technical measures regarding:

- Drainage area and,
- Hydro technical structures.

6.2 The expert variant

Experts preselected the appropriate measure combinations for Kamienna pilot catchment, taking into account the local conditions and impact of climate change on hydrological conditions.

Tab. 6 List of measures selected by experts for the Kamiennacatchment

IdNSWRM	Name of NSWRM
A02	Buffer strips and hedges
A03	Crop rotation
A08	Green cover
D01	Regulated outflow from drainage systems
D02	Water damming in ditches, weirs with constant crest (valleys)
D03	Active water management on a drainage system (river valleys)
D04	Construction of micro reservoirs on ditches
F01	Forest riparian buffers
F06	Continuous cover forestry
F08	Appropriate design of roads and stream crossings
F13	Peak flow control structures
F14	Overland flow areas in peatland forests
N02	Wetland restoration and management
N03	Floodplain restoration and management
N06	Restoration and reconnection of seasonal streams
T01	Polders, dry flood protection reservoirs, sediment trapping dams
T02	Widening or removing of flood protection dikes
T03	Construction of small reservoirs on rivers (dammed reservoirs)

The choice of measures is very limited due to problems (like Climate Change) and the characteristics of the river basin. About 54 % of the pilot area consists of arable land and 30% is forest; therefore measures included in the agriculture and forest groups are of great importance. Conditions for preparing and setting NSWRM are presented in Tab. 7.

Tab. 7 Condition for planning the exact location of NSWRM using good occurrence of GIS database

Id	Measures	Condition for GIS analysis					
		Goal	Valorization	Land use	Soil	Landform	Others
A01	Meadows and pastures	flood&sediment&water quality	GeneralClas3,4,5	Arable	Poor soils Agricultural Complex 6 or 7 or 9 or 14		Flood extent p10% TWI
A02	Buffer strips and hedges	drought	DroughtClas3,4,5	Road near agriculture land			mostly on asphalt and concrete roads, where wind erosion occurs; buffer azimuth set by wind rose; along the long edge of the parcel, hedges between fields (hard to identify), ditches from one side;
A03	Crop rotation	flood&sediment&water quality	GeneralClas3,4,5	Arable			where wind erosion occurs according to the wind rose, large non-wooded areas of monocultures visible on the orthophotomap
A08	Green cover	drought& water quality	DroughtClas3,4,5	Arable	low permeable	Slope >20 deg	apply on good soils close to water bodies after heavily fertilized crops
A09	Early sowing	drought	DroughtClas3,4,5	Arable	Light soils	South exposition, Slope 20 deg	Heat units
A13	Mulching/fertilization	drought&flood&sediment	GeneralClas3,4,5	Arable	Sands (or other with lack of organic matter)	Slope > 20deg	
A15	Deep plowing (removing the plow's sole)	general; flood; drought	GeneralClas3,4,5	Arable	Sandy loam soils		
F01	Forest riparian buffers	drought&water quality	GeneralClas3,4,5	Not forest		<50% tree&bush areas in 20m river buffor (from Lidar)	river; channels, not ditches
F05	Land use conversion	flood&sediment&water quality	GeneralClas3,4,5	wasteland	Agriculture Complex N or RN	large slope, spring areas	
F10	Coarse woody debris	flood&sediment		Forest		SlopeRiver < 20deg	river&ditch
F14	Overland flow areas in peatland forests	drought&flood&sediment		Forest; Wetland		SlopeRiver< 6 deg	river&ditch
N02	Wetland restoration and management	general		flowing water; wetlands; meadow; pasture	low permeable		
N03	Flood plain restoration and management	general		flowing water; wetlands; meadow; pasture		SlopeRiver <3deg	Flood extent p10%

Id	Measures	Condition for GIS analysis					
		Goal	Valorization	Land use	Soil	Landform	Others
N06	Restoration and reconnection of seasonal streams	general		Not urban and arable land, flowing water		lowland	Flood extent p10%
N07	Reconnection of oxbow lakes and similar features	general		Not urban and arable land, flowing water, flowing water		lowlands	Flood extent p10%
N13	Restoration of natural infiltration to groundwater	general; drought; flood		agricultural land; forest; wasteland; urban	low permeable		
D01	Regulated outflow from drainage systems	general; drought; flood; sediment; water quality		agricultural land			
D04	Construction of micro reservoirs on ditches	general; drought; flood; sediment; water quality		flowing water; agriculture land; wasteland; before urban area			ditches with dynamic flow, in place of a small slope, natural enlargement of the valley
D05	Infiltration reservoirs and ditches (similar to N13)	general; drought; flood; sediment; water quality		agricultural land; road; urban; forest	low permeable		
D06	Construction of reservoirs on outflows from drainage systems	general; drought; flood; sediment; water quality		agricultural land		lowlands	
T01	Polders, dry flood protection reservoirs, sediment trapping dams	general; flood; sediment		flowing water; meadow; pasture; forest; wasteland; wetlands			
T02	Widening or removing of flood protection dikes	general; flood; sediment		flowing water; meadow; pasture; forest; wasteland; wetlands		lowlands	
T03	Construction of small reservoirs on rivers (dammed reservoirs)	general; drought; flood; sediment		flowing water			
T02	Widening or removing of flood protection dikes					lowland	Flood extent p10%

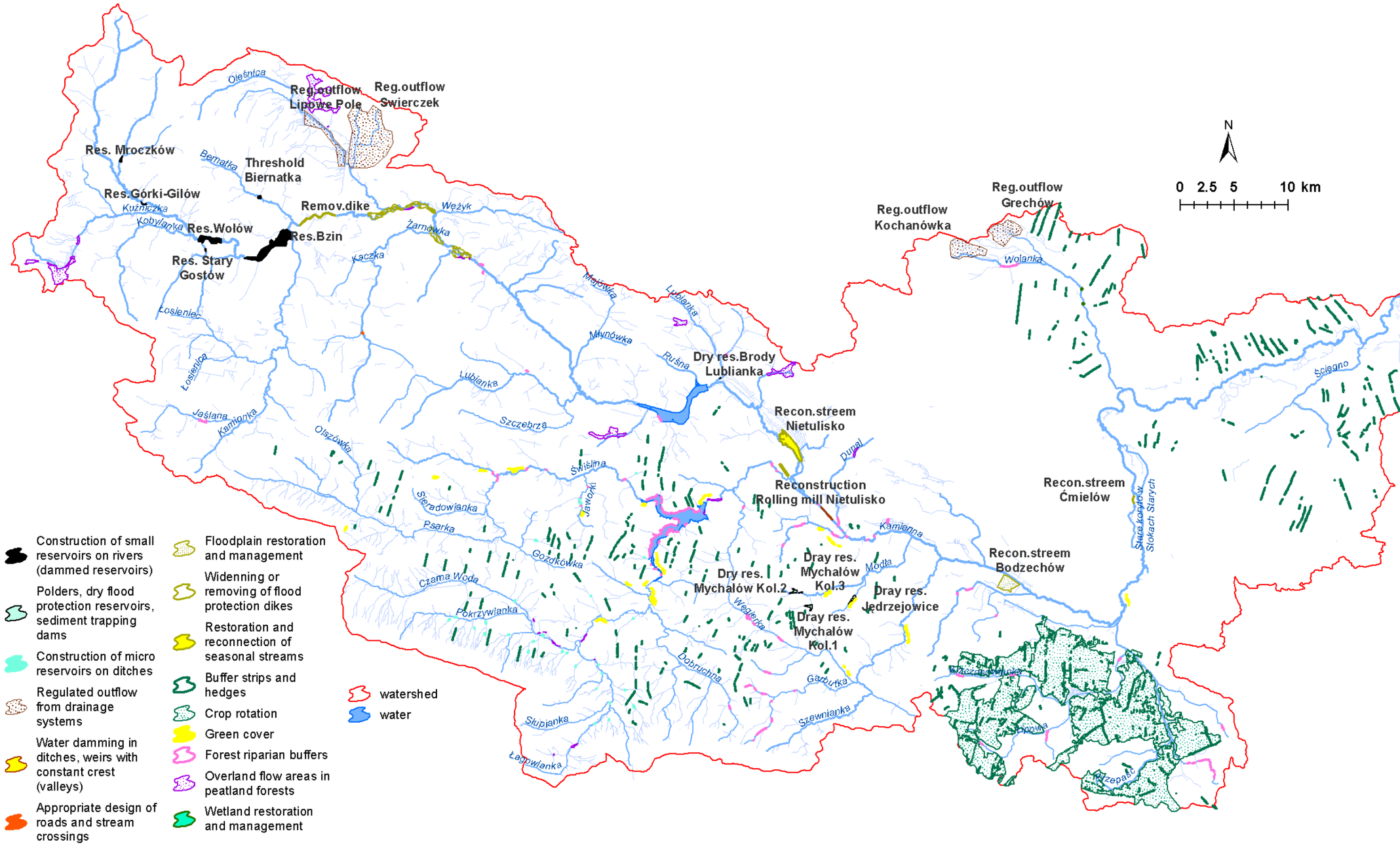


Fig. 12 Measures selected in the ecspert variant

6.3 The local preferences variant

The variant of local preferences was created by contacting, by means of a survey and official letter to the local community, authorities, organizations and agencies to present to them the strategy and target of the project and ask for proposals of measures in the area of interest. Annex 2 contains the survey along with instructions on how to complete it. The list of submited activities is available in Annex 1 and on the map in Fig. 13.

Results of consultations

Discussion about the proposed activities was conducted at each of the three National Meetings that took place in the Kamienna river basin in Brody (10.07.2018) and in Starachowice (10.07.2019 & 27.11.2019). At the meeting in Brody the organisers provided paper maps of the basin that were used to draw the proposed measures locations. During the meetings in Starachowice the participants had acess to computers and they were tought how to use the application, mark in the application the measures they propose and fill in the survey. Each meeting had about 20 participants from various institutions such as: Municipalities and the Communal Offices, Regional Directorate for Environmental Protection, Water Management Offices, State Forests National Forest Holding and Agricultural Chamber of the Region.

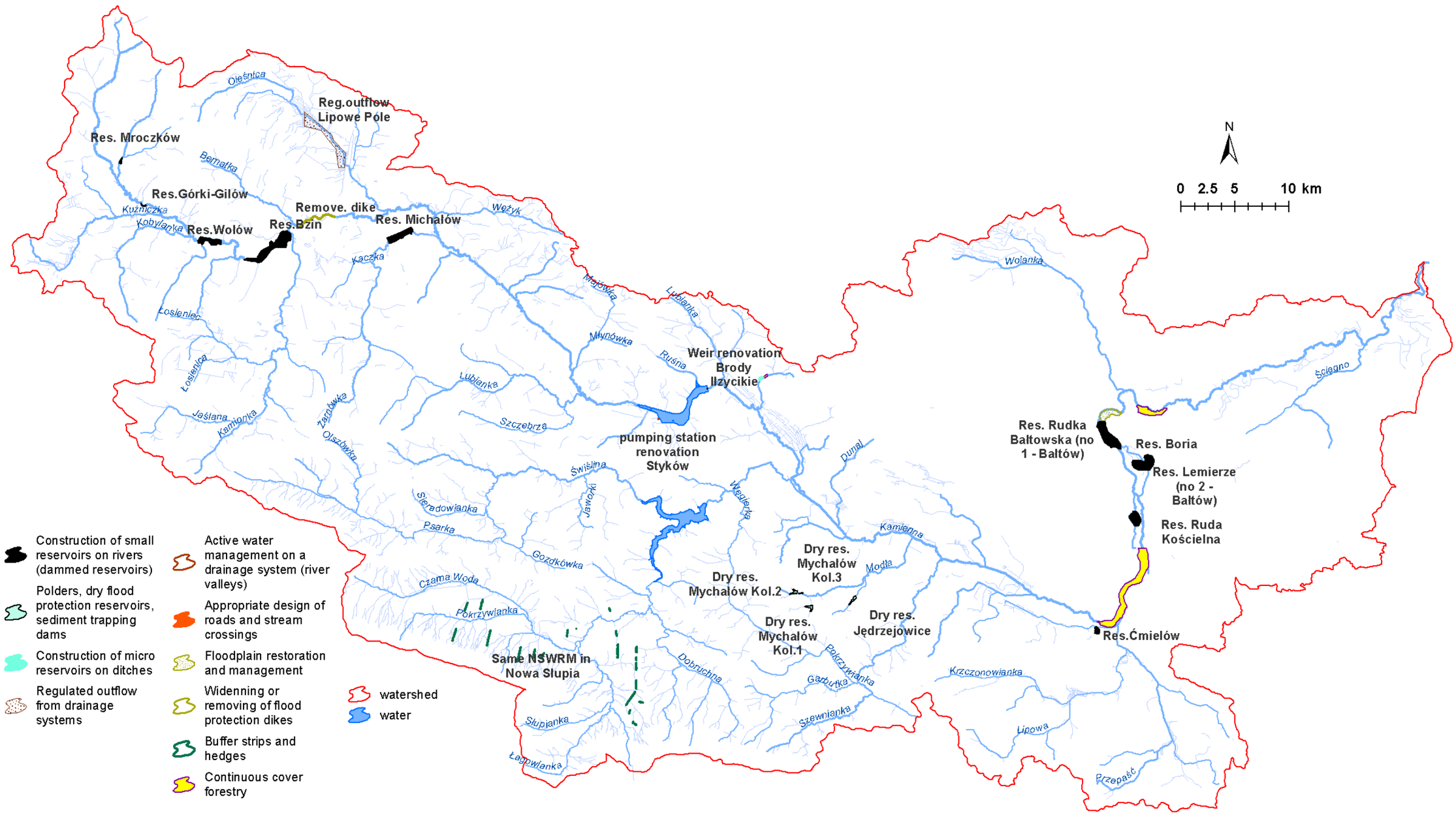


Fig. 13 Measures selected in the local preferences variant

7. COMMENTS

During the process of creating the plan it was important to maintain awareness about climate change and adaptation when selecting the measures.

It is not possible to point out the exact location for all measures. It is advised to suggest to the local decision makers which types of measure are recommended for their area by preparing a valorisation map and consultation/workshops/ web-tools / guidelines.

In the next step, selected NSWRM will be tested using the Static and Dynamic method. The results of those tests and the cost analysis will allow decision makers to choose the optimal set of activities. This information is gathered in the Action Plan.

8. ANNEX 1 LIST OF MEASURES FROM THE EXPERT AND LOCAL PREFERENCES

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
D03	Active water management on a drainage system (river valleys)	Reconstruction of the Stykόw pumping station	The pumping station drains the inhabitated areas lying in the backwater of the dam and reservoir. Its renovation includes: -Reconstructing and extending the compensating reservoir -Reconstruction and extension of the intake chamber -Reconstruction of the pumping station building -Reconstruction and extension of the discharge chamber and the discharge ditch -Replacement of the pumping sets.	1						Loc.
D04	Construction of micro reservoirs on ditches	Construction of micro reservoirs on ditches	Includes water damming (permanent damming) on existing ditches in sections with small slopes and wide valleys, including the construction of low dikes to allow water to spill, cutting down trees; changes in land use, such as the adaptation of cultivation practices in wetland areas.	29	20.61				0.3	Exp.
D04	Construction of micro reservoirs on ditches	Construction of micro reservoirs on ditches	Includes water damming (permanent damming) on existing ditches in sections with small slopes and wide valleys, including the construction of low dikes to allow water to spill, cutting down trees; changes in land use, such as the adaptation of cultivation practices in wetland areas.	1	5.23					Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Dam Biernatka	Changing the shape of the existing river step with stone protection so that it directs more water into the reservoir during the periods of high streamflow. Construction of a dike in order to direct the water to the ditch supplying the reservoir.	1	7.98					Exp.

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Weir Brody Iłzycikie renovation	Reconstruction of weirs (3 spans, water damming 6m) of reservoir Brody Iłżeckie together with the modernization of the closure structure in Brody (Świętokrzyskie voivodeship) including: Renovation of concrete surfaces of the weir and in the the exit basin together with painting of concrete surfaces. Replacement of the weir bottom discharge pipelines together with the replacement of sliders and the execution of emergency closures. Replacement of segment closures together with the replacement of segment drive mechanisms. Replacement of steel elements in the weir (chamber exit clamps, ladders, footbridges, security). Repair, maintenance and painting of steel components. Completing closing monitoring,execution of automatic control and measurement system. Modernization of electrical installation with lighting installation of weir chambers.	1	0.32					Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Boria	A 99 ha reservoir, 5 m high, which captures/collects rainwater to prevent the effects of drought.	1	99				2	Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Lemierze (2 - Baltow)	Retention reservoir designed to mitigate the effects of drought and flooding, about 1.9 km long and about 460 m wide.	1	89.34		460		2	Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Michałów	Reservoir whose primary function is storage of water, recreation and tourism; implementation from the start, length: about 2000 m; Average width: 180 m; the average height of 2.5 m; maximum height of 4.0 m.	1	125.34		180		2.5	Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Mroczków	Reconstruction of the dam and desludging of the old reservoir bowl, strengthening the embankments.	1	7.76				1.7	Exp.+Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Rudka Bałtowska (nr 1 - Bałtów)	Retention reservoir designed to mitigate the effects of drought and flooding, about 2.9 km long and about 400 m wide.	1	240.53		400		2.5	Loc.

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Stary Gostów	A small forest reservoir in the location of a small backwater area with an existing dike. Only a wooden spillway should be prepared.	1	2.86				1.5	Exp.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Bzin	Construction of the dam with a damming weir and reservoir.	1	100				2.5	Exp.+Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Ćmielów	The reservoir with an area of 24 ha, 2100 m long, 5 m high, capturing/collecting rainwater to prevent the effects of drought.	1	24	2100		5	2.5	Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Górki-Gilów	Removal of the existing dam build with concrete slab and railway sleepers and building in its place a new dam and desludging the existing reservoir bowl.	1	3.26			1.5	1.5	Exp.+Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Dry reservoir Brody Lu-blianka	Dry reservoir in a wetland area.	1	0.83				0.5	Exp.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Wołów	Construction of the dam with a damming weir and reservoir.	1	33.7				2	Exp.+Loc.
T03	Construction of small reservoirs on rivers (dammed reservoirs)	Reservoir Ruda Kościelna	The reservoir with an area of 78 ha, 5 m high for captur-ing/collecting rainwater to prevent the effects of drought.	1	78				2	Loc.
A08	Green cover/After-crops	After-crops	Cover crop harvested in the spring.	22	142.18					Exp.

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
A02	Buffer strips and hedges		Buffer strips or areas of natural vegetation cover (trees, shrubs) on the edge of fields or transport infrastructure. They can consist of several different configurations of plants, from grass to the usual combinations of grass, trees and shrubs. Proposed buffer zones along public roads after the analysis of the Digital Terrain Model (reject locations where shrubs are already present), and the rejection of roads in urban areas. Also sections of the communication network system which are parallel to the short side of the plot (cadaster composition) and those that intersect the parcel (when the road is parallel to the long side of the plot - min. on one side of the road) should not be considered. The reason for adopting the above mentioned guidelines is non-interference with any agricultural work carried out in areas (to avoid disturbing agricultural practices such as agricultural machinery operation). The azi-muth of the strips was dependent on the wind rose, which indicated the predominance of winds from the west (i.e., span from north-west to north-east)	1709		255245				Exp.
A03	Buffer strips and hedges		Buffer strips or areas of natural vegetation cover (trees, shrubs) on the edge of fields or transport infrastructure. They can consist of several different configurations of plants, from grass to the usual combinations of grass, trees and shrubs. Proposed buffer zones along public roads after the analysis of the Digital Terrain Model (reject locations where shrubs are already present), and the rejection of roads in urban areas. Also sections of the communication network system which are parallel to the short side of the plot (cadaster composition) and those that intersect the parcel (when the road is parallel to the long side of the plot - min. on one side of the road) should not be considered. The reason for adopting the above mentioned guidelines is non-interference with any agricultural work carried out in areas (to avoid disturbing agricultural practices such as agricultural machinery operation). The azi-muth of the strips was dependent on the wind rose, which indicated the predominance of winds from the west (i.e., span from half-west to half-east)	104		15655				Exp.+Loc.
A03	Crop rotation	Crop rotation	Removal of monocultures and introduction of crop mosaics of different heights.	1	15752.06					Exp.

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
T01	Polders, dry flood protection reservoirs, sediment trapping dams	Dry reservoir Jędrzejowice	Earth-filled dam with a concrete double spillway and pass, shaping the reservoir bowl and reinforcement of embankments.	1	1					Exp.+Loc.
T01	Polders, dry flood protection reservoirs, sediment trapping dams	Dry reservoir Mychałów Kol.1	Earth-filled dam with a concrete double spillway and pass, shaping the reservoir bowl and reinforcement of embankments.	1	0.82					Exp.+Loc.
T01	Polders, dry flood protection reservoirs, sediment trapping dams	Dry reservoir Mychałów Kol.2	Earth-filled dam with a concrete double spillway and pass, shaping the reservoir bowl and reinforcement of embankments.	1	4.9					Exp.+Loc.
T01	Polders, dry flood protection reservoirs, sediment trapping dams	Dry reservoir Mychałów Kol.3	Earth-filled dam with a concrete double spillway and pass, shaping the reservoir bowl and reinforcement of embankments.	1	4.9					Exp.+Loc.
D01	Regulated outflow from drainage systems	Regulated outflow Kochanówka	Modernization of the existing drainage facility	1	430.92			0.9		Exp.
D01	Regulated outflow from drainage systems		Modernization of the existing drainage facility	1	416.29			0.9		Exp.
D01	Regulated outflow from drainage systems	Regulated outflow Lipowe Pole	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.	1	351.87			1.5		Loc.
D01	Regulated outflow from drainage systems	Reg.Odpływ Swierczek	Modernization of the existing drainage facility	1	1796.21			0.9		Exp.
N02	Wetland restoration and management	Artificial wetland	Includes the creation of an artificial wetland for reducing nutrients, damming water (permanent) on the Wolanka River (whose lower riverbed is highly infiltrating and is a groundwater supply) on sections with a small slope, including the construction of small dikes allowing for water spillage, purchase of	2	5.48			0.5		Exp.

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
			land.							
N06	Restoration and reconnection of seasonal streams	Oxbow Stoki Stare	Implementation of a river step at the outlet of the oxbow lake to the Kamienna River in order to stop the outflow of water in periods of medium and low water levels. Construction of two culverts with damming or stone fords near existing backwaters on the oxbow lake.	1	3.76			0.5		Exp.
N06	Restoration and reconnection of seasonal streams	Reconstruction of the water supply mill Nietulisko	Execution of a river step and exit basin on the Świślina River and opening of old canals supplying the Staszicowski Canal and the reservoir.	1	22.26		35	2.5		Exp.
N02	Wetland restoration and management		Preservation of permanent grassland in the floodplain. Adjustable water outflow through existing ditches.	1	114.42					Loc.
D01	Regulated outflow from drainage systems	Floodplain restoration and management	These are mainly land purchases in order to stop the process of backfilling the floodplain (urbanisation) of the river.	14	342.57					Exp.
N03	Floodplain restoration and management									
N03	Floodplain restoration and management	Oxbow Bodzechów	Construction of a river step in the lower part of the oxbow lake to stop the outflow of water during periods of medium and low flow (in the case where the embankment lock has no water level control). Creating a spillway on the right embankment (in the upper section of the oxbow lake) to let the water enter the other side of the embarkment during winter and spring floods. Clearing the oxbow and ditches to allow faster drainage of water after the spring flood. Construction of three culverts with damming in order to limit the outflow of water from the upper and middle parts of the oxbow lake during the summer.	1	172.65					Exp.
F14	Overland flow areas in peatland forests		Construction of a stone ford or wooden river step.	19	1042.47		3	1		Exp.

NoNSWRM	Type NSWRM	Name	Desrciption	Count of NSWRM	Area [ha]	Length [m]	Width [m]	High [m]	Depth [m]	Variant
F14	Overland flow areas in peatland forests	Odrowążek	Construction of a stone ford or wooden river step.	1	13.94					Exp.
F06	Continuous cover forest-ry		Limiting the number and area of forest clearings.	3	685.94					Loc.
F08	Appropriate design of roads and stream cross-ings	Raising the elevation of the road	Protection of the asphalt road against flooding by Bobrów dam. Raising the asphalt road by 0.5 m. Modernization or replacement of the culvert, renovation of the two-lane road over a distance of 400 m.	1		400				Loc.
F08	Appropriate design of roads and stream cross-ings	The ferry Mostki	Raising the elevation of the existing transit ford by 0.3 m.	1		30	4	0.5		Exp.
D02	Water damming in ditches, weirs with con-stant crest (valleys)	Retention trough Kunów	Permanent river step (height 2 m) with a bipartite shape increasing the flooding and at the same time not changing the nature of the medium and low water flows (continuity).	1	5.09		30	1.5		Exp.
F01	Forest riparian buffers		Buffer strips of 5 m (areas of natural plant cover - bushes and trees) along watercourses (on both sides of the watercourse) and bushes along reservoirs were proposed. The watercourses were selected on the basis of DTM (Digital Terrain Model) analysis. No buffer strips were proposed for watercourses (or parts of watercourses) running through urban areas and for watercourses with dikes.	168		41005				Exp.
T02	Widenning or removing of flood protection dikes	Increasing the spaces be-tween dikes	Leading the dikes along the new route and limiting protected areas to a minimum. The new embankments will not narrow the bed of large water flows and will allow the elevation of flood waters to decrease.	1		3957				Exp.+Loc.

Loc. – Local preferences variants
Exp. – Expert variant

9. ANNEX 2 STAKEHOLDER SURVEY FOR LOCAL PREFERENCES VARIANT

9.1 Invitation to the survey

Temat: **Koncepcja łagodzenia skutków suszy i powodzi oraz poprawy jakości wód dla zlewni Kamiennej**

Szkoła Główna Gospodarstwa Wiejskiego w Warszawie (SGGW) przy wsparciu Gospodarstwa Wody Polskie (*list poparcia w załączeniu*) przystąpiło do realizacji opracowania pt. „Koncepcji łagodzenia skutków suszy i powodzi oraz poprawy jakości wód dla zlewni Kamiennej" w ramach Programu INTERREG CE pt. „Zasady poprawy bilansu wodnego i zmniejszenia outflowu biogenów poprzez stosowanie działań z zakresu małej retencji" (FRWAMWAT).
Celem opracowania jest rozpoznanie problemów związanych z okresowymi niedoborami jak i nadmiarem wód, identyfikacja najbardziej zagrożonych takimi problemami obszarów w zlewni Kamiennej oraz stworzenie podstaw do wyboru najbardziej potrzebnych inwestycji z zakresu małej retencji.
Opracowanie rzetelnego, uzasadnionego rzeczywistymi potrzebami programu działań umożliwiających poprawę stanu zasobów wodnych otwiera możliwości ubiegania się o fundusze unijne przeznaczone na ochronę środowiska i daje podstawy merytoryczne do tworzenia wniosków o pozyskanie takich funduszy.
Zwracamy się więc z uprzejmą prośbą o zgłoszenie (naniesienie na mapę interaktywną) działań z zakresu małej retencji na obszarze zlewni Kamiennej (mapa poglądowa zlewni).

Instrukcja zgłaszania/nanoszenia działań dostępna jest na stronie internetowej:
https://docs.google.com/document/d/1Q7B46ORbT-pcSd0GAg5gEBGXS4wrgpcrvetK1VQZSMY/edit

Aplikacja mapowa do zgłaszania/nanoszenia działań jest dostępna po zalogowaniu się pod adresem
http://sggw.maps.arcgis.com/apps/webappviewer/index.html?id=4942252106ec42be9666dd8fd043e5a0
Użytkownik: planer019
Hasło:Kamienna2019
Informacje zebrane od Państwa zostaną przekazane Gospodarstwu Wody Polskie celem wprowadzenia do stosownych programów gospodarowania wodą.
W wykonywanym opracowaniu przez pojęcie małej retencji rozumiemy przedsięwzięcia mające na celu: wydłużenie czasu obiegu wody (poprzez zwiększenie zdolności terenu do zatrzymywania wód opadowych), zatrzymanie zanieczyszczeń, ograniczenie ruchu rumowiska i strat energii wody. Mała retencja oznacza więc nie tylko zatrzymywanie wód za pomocą zbiorników i stopni wodnych, lecz także zalesienia, zabiegi agrotechniczne i fitomelioracyjne dla zwiększenia retencji gruntowej, remeandryzację małych cieków, zwiększanie pojemności naturalnych terenów zalewowych oraz właściwe gospodarowanie wodą na obiektach melioracyjnych. Katalog działań jest dostępny pod adresem:
http://levis-framwat.sggw.pl:8080/#/measures-catalog
Jednostką odpowiedzialną za przeprowadzenie ankiety jest Zakład Hydrologii i Zasobów Wodnych SGGW. W razie jakichkolwiek pytań lub niejasności prosimy o kontakt telefoniczny lub e-mailowy z mgr inż. Pawłem Osuchem, tel.: 22 59 35 304, e-mail: p.osuch@levis.sggw.pl

Z GÓRY DZIĘKUJEMY ZA POMOC!
Prof. Dr hab. inż. Tomasz Okruszko

9.2 A letter of support from the Head of Warsaw Regional Water Management Authority

Państwowe Gospodarstwo Wodne Wody Polskie

Warszawa, 28.10.2019 r.

List poparcia

Szkoła Główna Gospodarstwa Wiejskiego w Warszawie (SGGW) przystąpiła do realizacji:

Koncepcji łagodzenia skutków suszy i powodzi w zlewni rzeki Kamienna.

Zadanie realizowane jest w ramach Programu INTERREG CE pt. „Zasady poprawy bilansu wodnego i zmniejszenia odpływu biogenów poprzez stosowanie działań z zakresu małej retencji" (FRAMWAT), którego Państwowe Gospodarstwo Wodne Wody Polskie Regionalny Zarząd Gospodarki Wodnej w Warszawie jest partnerem stowarzyszonym.

Wobec powyższego, zwracamy się do Państwa z prośbą o podjęcie współpracy z przedstawicielami SGGW, w zakresie pozyskiwania informacji dotyczących planowanych lub przewidzianych do modernizacji przedsięwzięć z zakresu małej retencji, na terenie zlewni rzeki Kamiennej.

Z poważaniem,

DYREKTOR

Robert Chciuk

Dyrektor
Państwowe Gospodarstwo Wodne Wody Polskie
Regionalny Zarząd Gospodarki Wodnej w Warszawie
ul. Zarzecze 13 B, 03-194 Warszawa
tel.: +48 22 58 70 211 | faks: +48 22 58 70 202 | e-mail: warszawa@wody.gov.pl
www.wody.gov.pl

9.3 Instructions on how to complete the NSWRM survey

Instrukcja zgłaszania działań z zakresu małej retencji
w ramach
Koncepcji łagodzenia skutków suszy i powodzi oraz poprawy jakości wód dla zlewni Kamiennej

Działania należy zgłaszać **do dnia 16.12.2019 .** Do wyboru są dwie metody do wyboru:

1. Wprowadzając działania bezpośrednio do aplikacji mapowej znajdującej się pod adresem: http://sggw.maps.arcgis.com/apps/webappviewer/index.html?id=4942252106ec42be9666dd8fd043e5a0
2. Wysyłając na adres p.osuch@levis.sggw.pl zgłoszenie zawierające wykaz proponowanych działań oraz dane osoby do kontaktów:
   Imię Nazwisko: ……. e-mail: …… tel……..
   Wykaz proponowanych działań z zakresu małej retencji

Nazwa działania	Typ*	Szerokość Geog.**	Długość Geog.**	Wymiary: dł.= [m]; szer.= [m] wys.= [m] pow.= m2	Status (nowy/do moderniza-cji)	Cel (susz, po-wódź,jakość wód, erozja)	Opis za-kresu prac

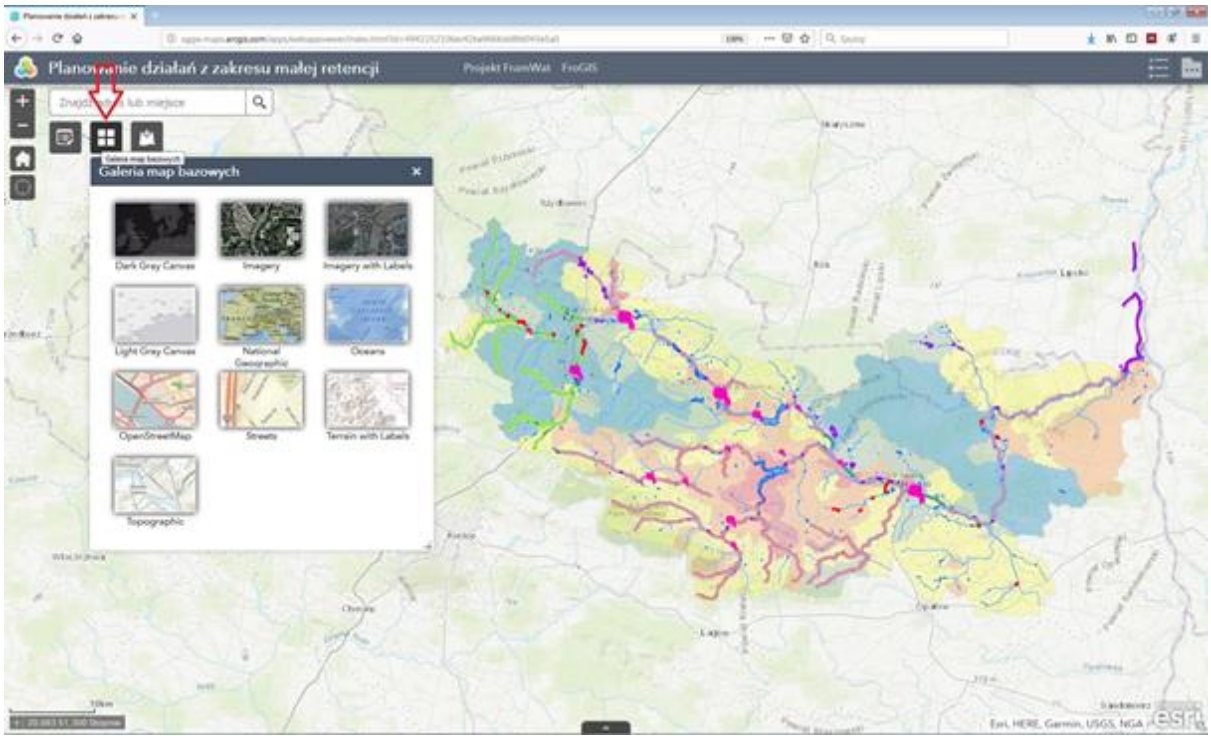
* typ działania można znaleść na stronie http://levis-framwat.sggw.pl:8080/#/measures-catalog
* *można odczytać ze strony wymienionej w pkt. 1 (lewy dolny róg) lub http://geoportal.gov.pl

Instrukcja bezpośredniego nanoszenia działań do aplikacji mapowej

1. Wybór typu działania

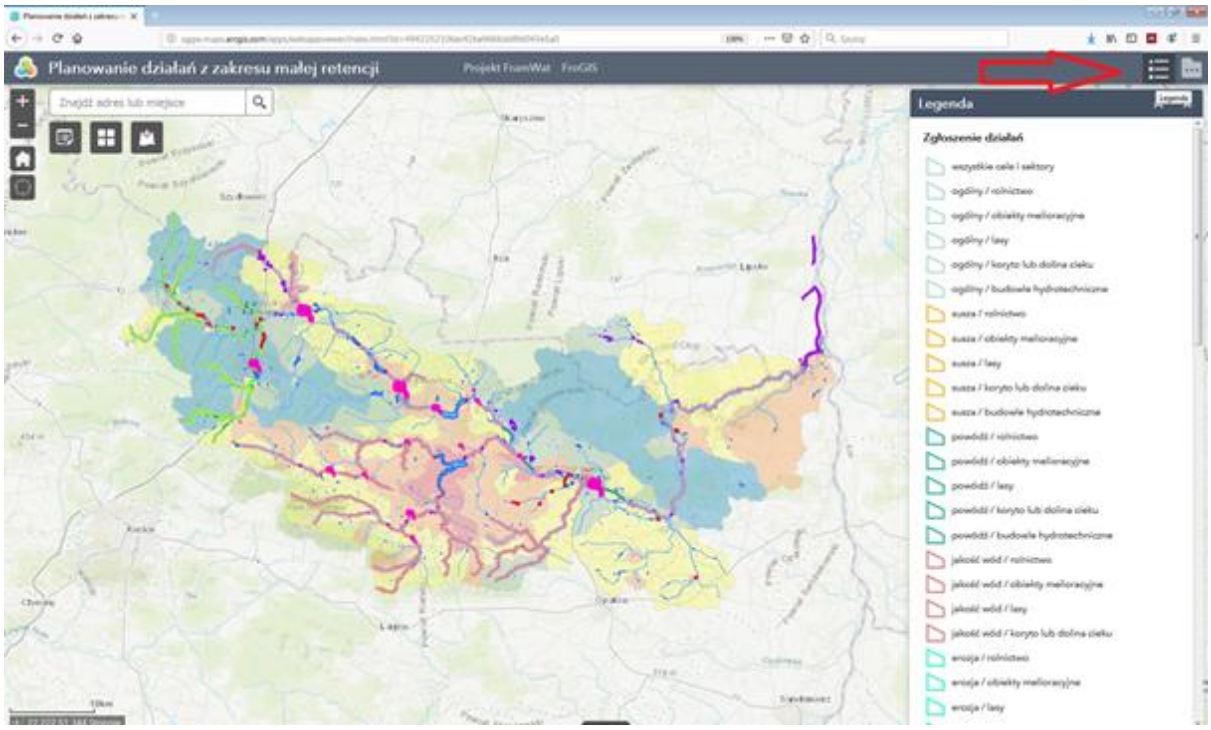
W celu przeglądnięcia listy działań z zakresu małej retencji przejdź do strony "**katalog działań**", której link umieszczony jest w górnym pasku. Dodatkowo w celu wyboru typu działania używając metody wielokryterialnej możesz przejść do kolejnego linku "**Wybór działań**".

2. Włączanie/wyłączanie warstw podkładowych
   Warstwy podkładowe w aplikacji mapowej można wyświetlić naciskając przycisk: "**Galeria map bazowych**" (Rys. 1). Z wyświetlonego okna można wybrać dowolną mapę podkładową.



Rys. 1. Galeria map bazowych.

Legendę mapy można wyświetlać naciskając przycisk “**Legenda**” w prawym górnym rogu (Rys. 2) - lewym przyciskiem myszy.



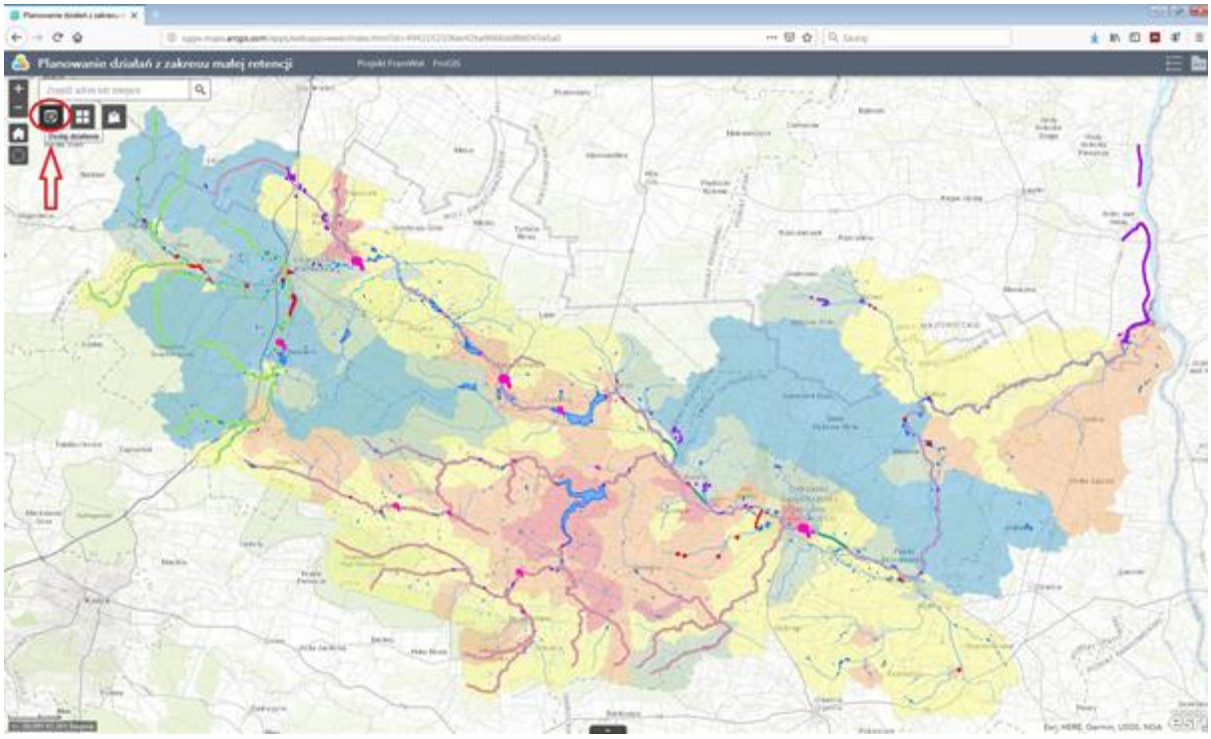
Rys. 2. Widok aplikacji mapowej/wyświetlanie legendy.

3. Wgląd do innych propozycji działań.

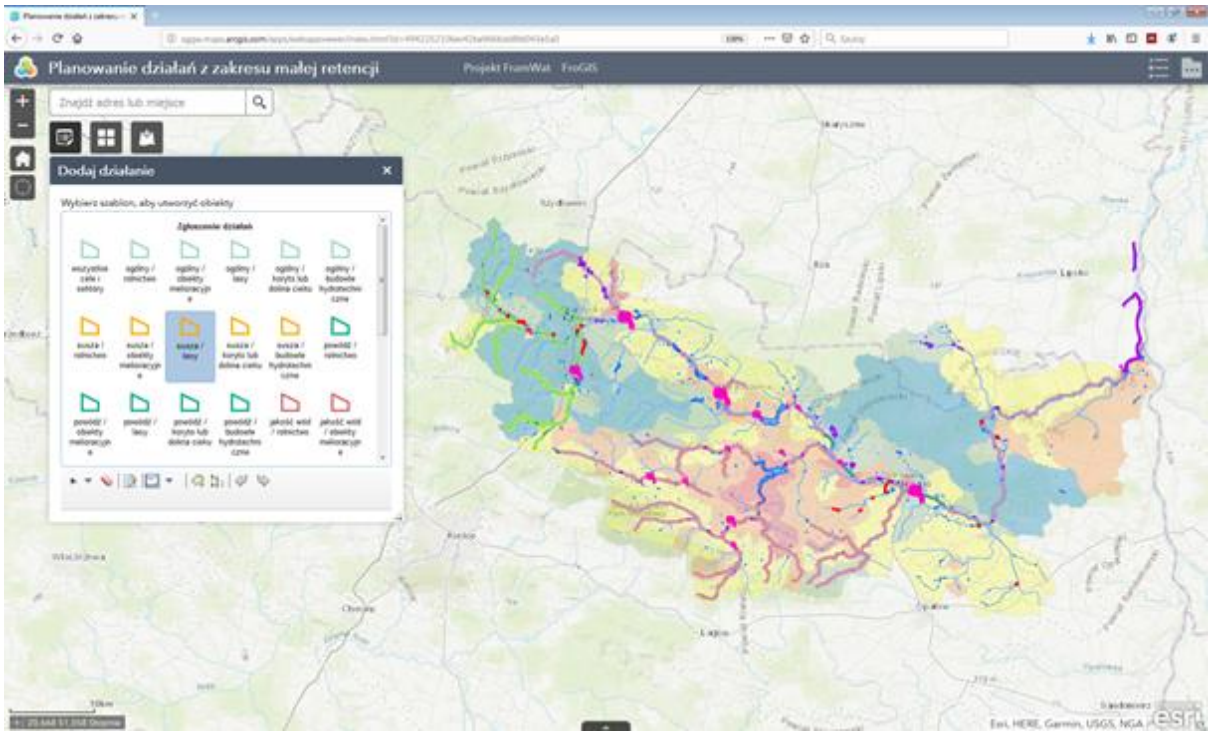
Następujące warstwy zawierają wcześniej zgłaszane działania, które Państwo mogą zgłosić ponownie:

Nie zgłoszenie ponownie działania oznacza brak zainteresowania nim z Państwa strony.

4. Zgłaszanie/nanoszenie działania na mapę
   Celem naniesienia działania z zakresu małej retencji w aplikacji mapowej należy lewym przyciskiem myszy nacisnąć ikonę: “**Dodaj działanie**” - w lewym górnym rogu ekranu (Rys. 3) oraz wybrać szablon, który umożliwi dodanie obiektu (Rys. 4).

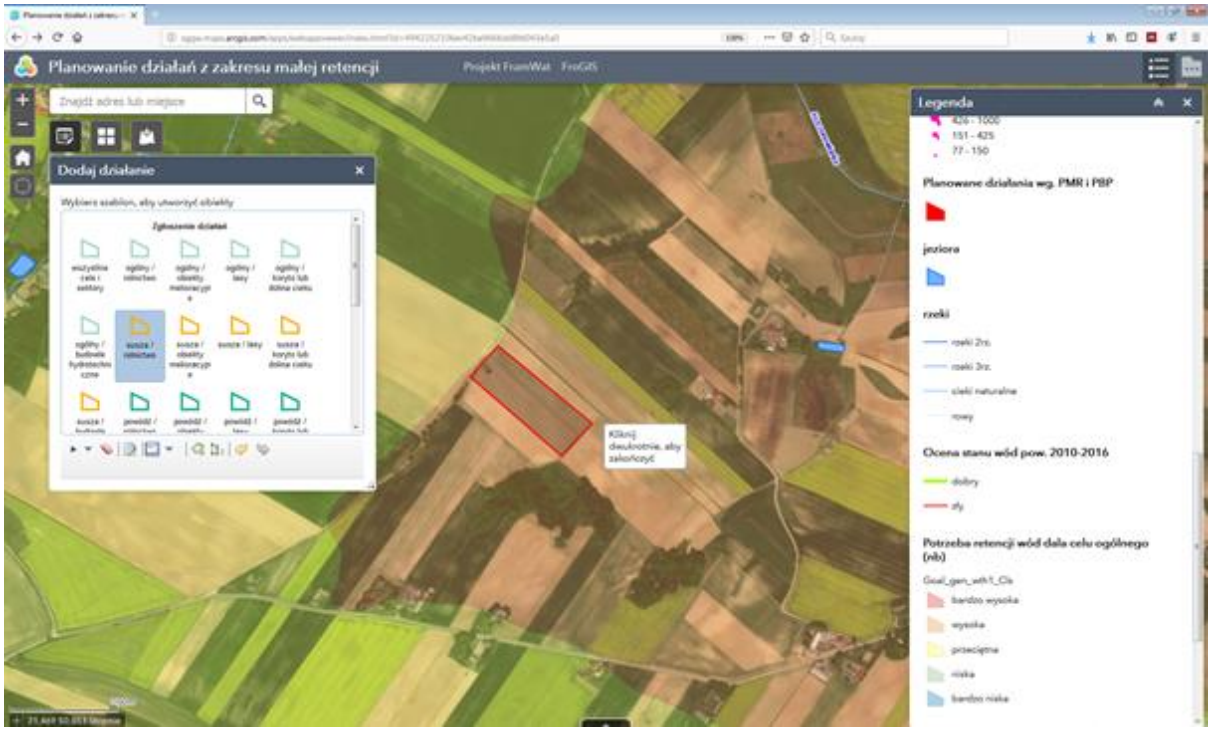


Rys. 3. “Dodaj działanie” - przycisk w aplikacji mapowej.



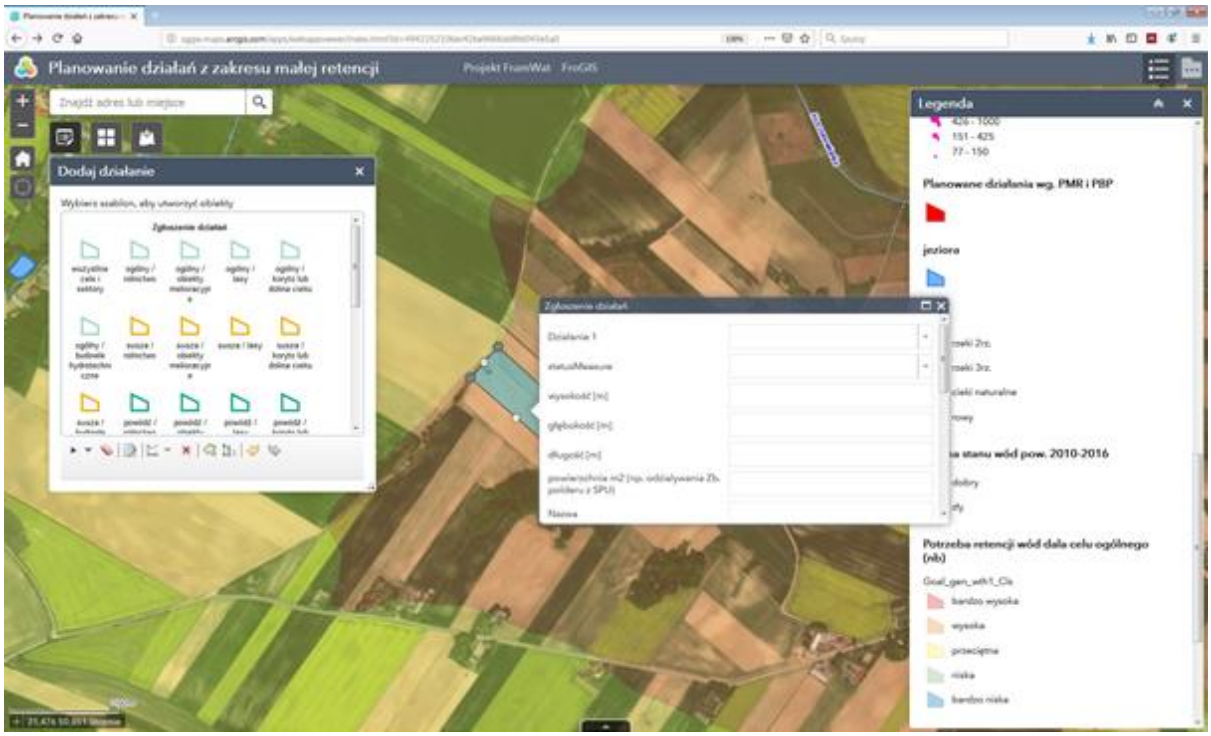
Rys. 4. Wybór szablonu umożliwiającego dodanie obiektu.

Aby rozpocząć rysowanie należy nacisnąć lewy przycisk myszy (włączenie przyciągania do obiektów na mapie - przycisk Ctrl). W celu zakończenia rysowania należy dwukrotnie nacisnąć lewy przycisk myszy. Ten sposób pozwala na dodanie obiektu/działania z zakresu małej retencji (Rys. 5).



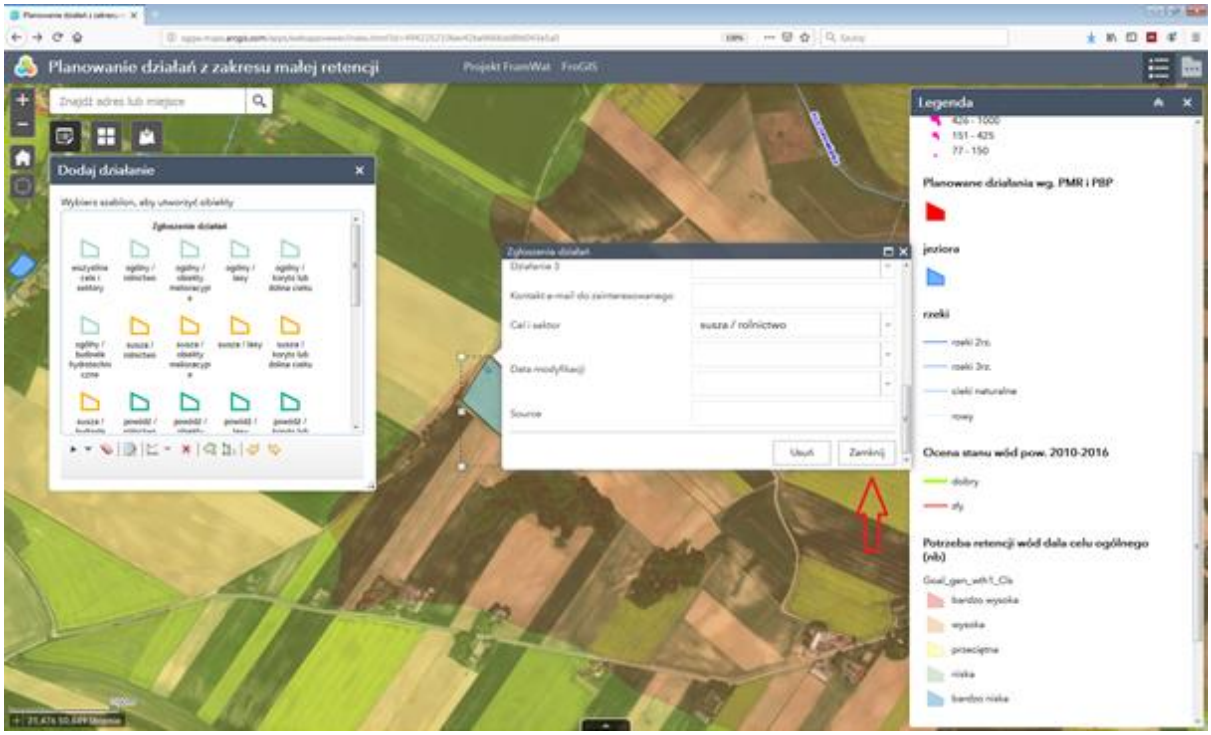
Rys. 5. Dodanie obiektu w aplikacji mapowej.

Po dwukrotnym kliknięciu kończącym rysowanie na ekranie pojawia się tabela atrybutów “Zgłoszenie działań”, którą należy uzupełnić wybierając dane z list rozwijanych (np. w polu “Działanie 1”) lub poprzez wpisanie (np. pole “Nazwa”) - Rys. 6.



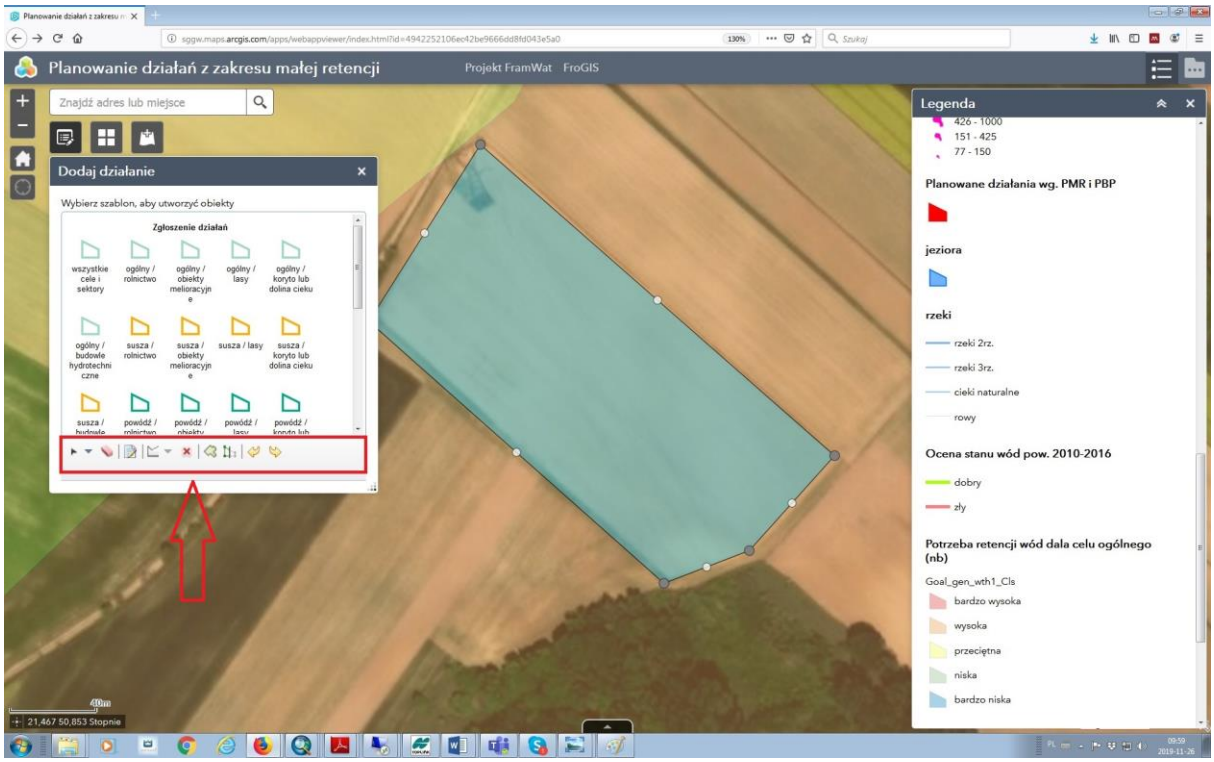
Rys. 6. Tabela atrybutów dotyczących działania do wypełnienia.

Po uzupełnieniu danych w tabeli należy nacisnąć przycisk “Zamknij”, znajdujący się na końcu tabeli (Rys. 7). Na tym etapie możliwe jest również usunięcie działania przyciskiem “Usuń” (Rys. 7).



Rys. 7. Zakończenie zgłoszenia działania.

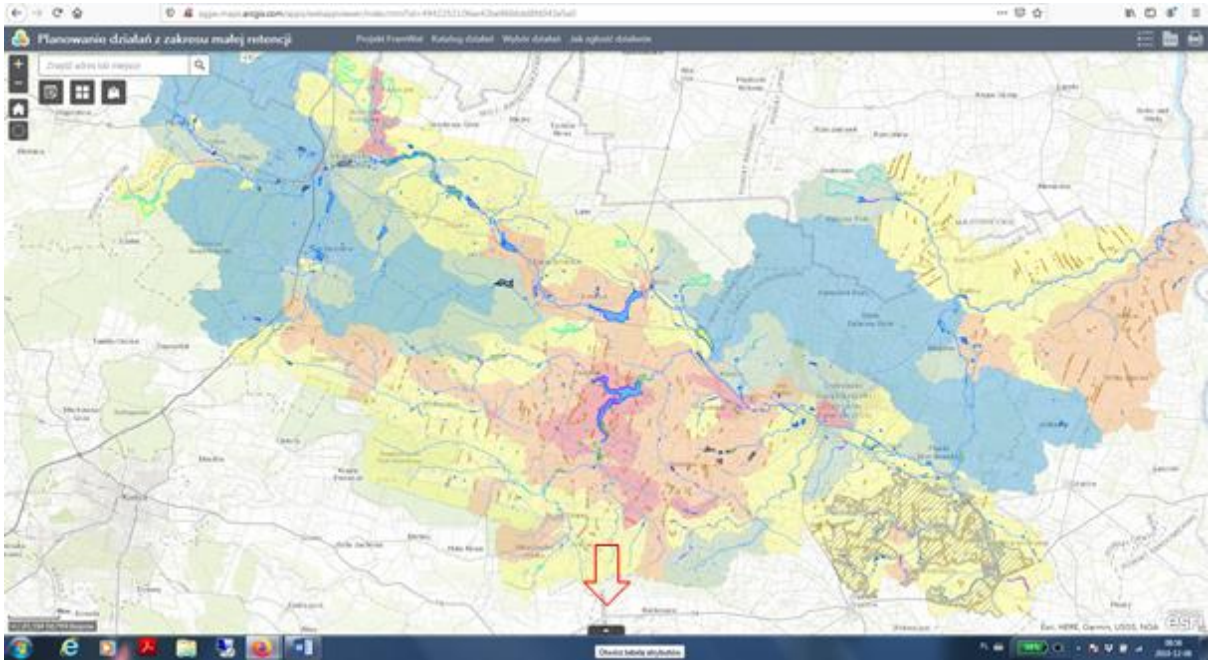
Dodany obiekt do zgłoszenia można edytować za pomocą paska narzędzi zaznaczonego na Rys. 8. Geometrię obiektu można zmieniać za pomocą punktów węzłowych (Rys. 8).



Rys. 8. Narzędzia edycji.

Eksport mapy do pdf oraz tabeli atrybutów zgłoszonych działań do csv.

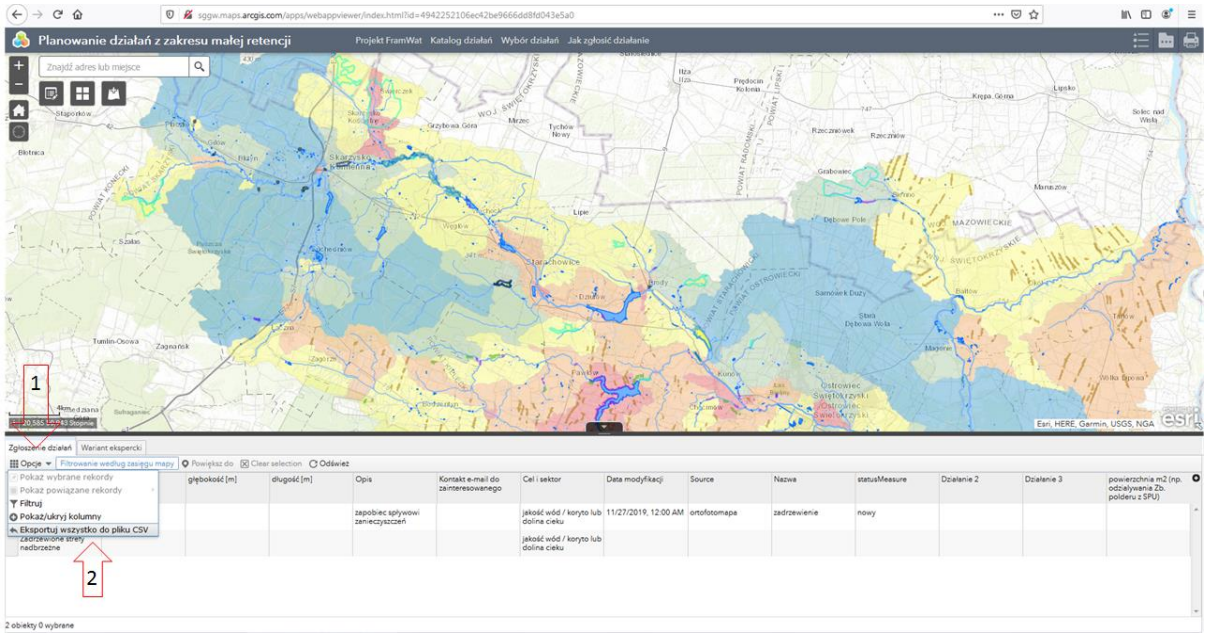
Wyświetlanie tabeli atrybutów zgłoszonych działań możliwe jest poprzez rozwinięcie strzałki w dolnej części ekranu (Rys. 9).



Rys. 10. Wyświetlenie tabeli atrybutów.

Tabelę atrybutów zgłoszonych działań można wyświetlić również klikając lewym przyciskiem myszy na ikonę “Warstwy” (w prawym górnym rogu widocznego ekranu). W kolejnym kroku w wyświetlonym oknie w polu “Edycja” przy warstwie “Zgłoszenie działań” należy wybrać: “...” a następnie z rozwijanego okna “Wyświetl w tabeli atrybutów”.

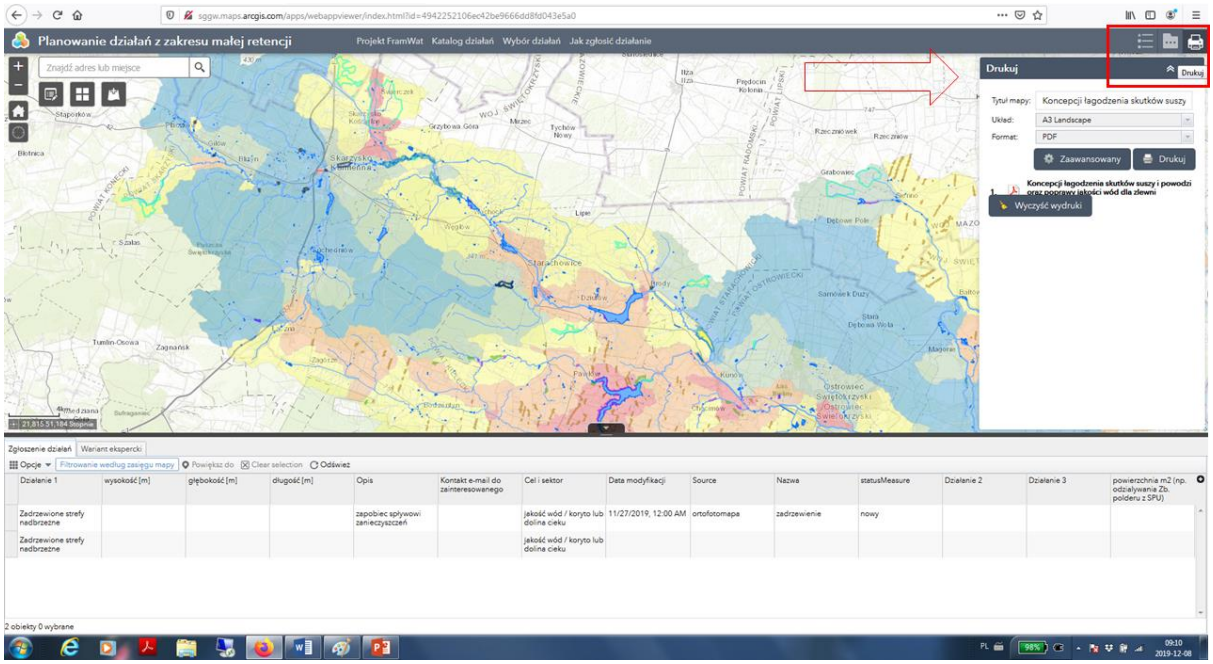
Eksport tabeli atrybutów możliwy jest poprzez wybranie przycisku “Opcje” oraz z rozwijalnej listy “Eksportuj wszystko do pliku CSV” (Rys. 10). W kolejnym oknie należy potwierdzić eksport oraz zapisać plik w preferowanej lokalizacji na dysku.



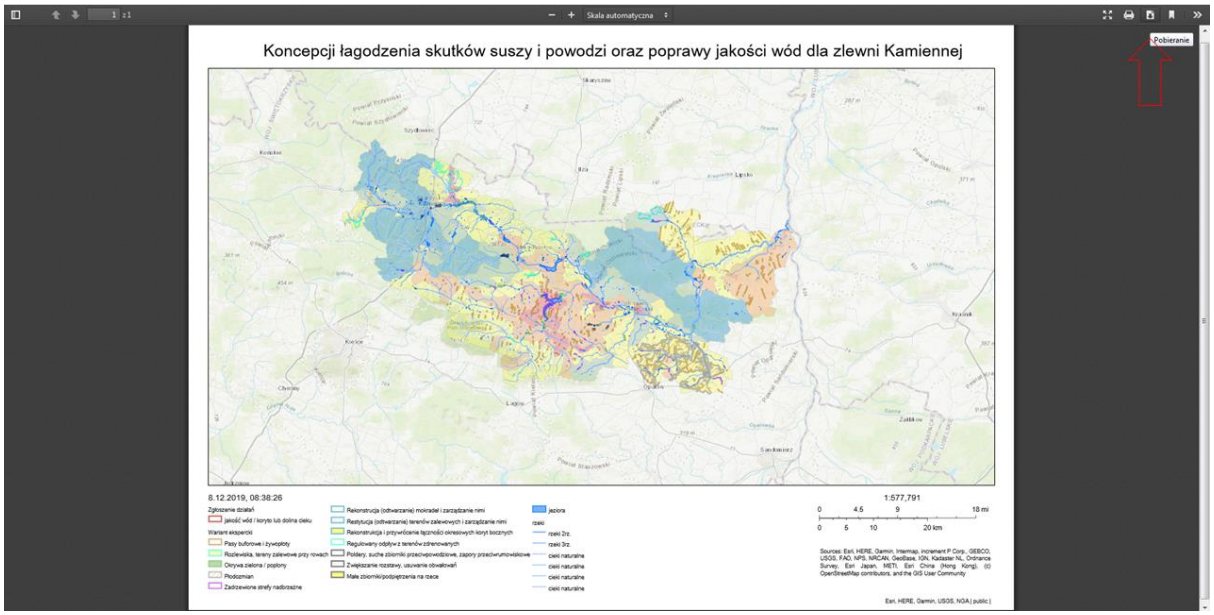
Rys. 10 Eksport tabeli atrybutów do pliku CSV.

Widok mapy można wyeksportować do pliku PDF za pomocą ikony “Drukuj” w prawym górnym rogu ekranu (Rys. 11). Po wpisaniu tytułu mapy, wybraniu układu oraz formatu mapy (np. PDF) należy wcisnąć

przycisk Drukuj. W tym samym oknie pojawi się ikona PDF oraz tytuł mapy. Po naciśnięciu ikony PDF w widoku przeglądarki pojawi się mapa, którą można pobrać oraz zapisać w preferowanej lokalizacji (przy użyciu przycisku “pobieranie”, Rys. 12).



Rys. 11. Eksport mapy do pdf.



Rys. 12. Pobieranie pliku - mapy PDF.