Case study developed for GWP IWRM ToolBox

POLAND: SMALL RETENTION – BIG DEAL

National Program on Natural Small Water Retention Measures

Introduction

Climatic conditions of Poland are characterized by small amount of precipitation that is relatively favourable distributed during a year. The most of the precipitation occur during summer (a growing season) which is the period with the highest demand for water. Despite this fact, in most of the country (except the seaside and the highest mountains) a significant deficit of water can be observed. Over the last decades, agriculture intensification and unification of plants habitats, including forests, construction of drainage systems as well as urban development and resulting changes in surface character has caused intensification of water and matter cycle in river catchments contributing to occurrence of droughts and floods.

Taking into consideration points given above it is very easy to justify the need of water retention. Almost all specialists, starting from ecologists and ending on hydrotechnics and politicians claim that intensification of surface runoff occur due to human economic activity. It is also widely believed that the expected climate changes in Poland will cause decrease of precipitation in summer and increase in winter [Mioduszewski 2008]. Thus, the basic task of water management in coming years will be measures for decreasing the rate of water runoff from catchment. One of the important measures include the implementation of small natural water retention.

It is a method of storage of water to improve the water balance of small river basins and limit losses originating as a result of excess or lack of water becomes widely acknowledged. It is often stressed that small retention is a combination of technical and non-technical measures restoring the natural retention of small river catchments (Burek, Mubareka 2012; EU Commission 2012; Mioduszewski, 2009).

In Poland, there has been several attempts to improve the water balance through so called “small water retention measures”. It is in opposition to “great water retention” which is represented by water storage in big reservoirs. The objective is to increase the amount of water resources available for agriculture, to improve the state of the natural environment, and to protect both the rural and urban environment from the detrimental effects of floods. Small water retention measures have been promoted since the 1960s, although in the early days, there was a limited focus on the construction of small water reservoirs. Small retention means to store rain or snow melting waters in the place of origin. It means that it is necessary to limit its rapid runoff from the surface or small water courses (ditches, streams). At the end of the 70s the Polish government adopted a resolution which recommended the reconstruction of small reservoirs and hydraulic structures for raising water level in rivers. The Resolution on promoting the development of small hydropower comes from the same period. Some financial support was coming from the “Church Fund” as well. There are no data to assess the effectiveness of these measures.

Photo 1. Damming device on the channel constructed in the 1920s

This paper was developed as a part of the project on “Integrated Drought Management Programme”, conducted by GWP and WMO.

Actions taken

Policy and legislative response

In 1995, important steps to improve the structure of the water balance of small catchments in Poland was made. An agreement was to establish a cooperation between the Ministry of Agriculture and Food Economy, and the Minister of Environmental Protection, Natural Resources and Forestry to enhance small retention measures. In 2002, the need for small water retention measures was emphasised again in another agreement, "on cooperation to enhance the development of small water retention, and dissemination and implementation of environmentally friendly methods of water retention." This new agreement was signed by the Minister of Agriculture and Rural Development, the Minister for the Environment, the Chairman of the Agency for Restructuring and Modernisation of Agriculture, and the President of the National Fund for Environmental Protection and Water Management.

On the basis of the above agreement between two Ministers was established. The program was “The national small water retention development program” planned for the year 1995–2015 and covers the whole country, but it focuses particularly on rural areas. The Ministry of Agriculture was responsible for implementation of that program.

Fig. 1. Retention increase planned for years 1995–2015 and actual increase in years 1995–2010 [mln m^3]

Each voivodship was obliged to elaborate the programme of small retention development which would consist in the construction, reconstruction and modernisation of water storage facilities of a maximum capacity of 5 million m^3 (usually, however, not exceeding 1 million m^3). Moreover, it was agreed that particular programmes should:

- facilitate the reduction of surface runoff through planting forests and midfield woods,
- stop degradation of the existing and start the construction of new reclamation facilities, particularly those intended for irrigation, water lifting and hampering rapid water outflow,
- consider the possibility of flood control,
- locate the objects in places appropriate for increasing the recharge of aquifers,
- consider the acceptance of local communities (communes, farmers); and
- be agreed on with regional boards of water management.

Most of 49 programmes were prepared in 1996 with the consideration of the then administration division into voivodships. Programmes were mainly elaborated by voivodship boards of land reclamation and water facilities but also by construction design companies and scientific institutions associated with reclamation and water management.

The basic objective of the program is to improve the water balance on a national scale, with special focus on the needs of agriculture and natural environment. The agreement signed by the Ministers emphasises:

- reconstruction, modernisation, and construction of dams on the existing drainage facilities for the use of water for agricultural irrigation, decreasing runoff of surface waters, and the protection of peat soils; expansion and modernisation of drainage facilities – irrigation facilities on moors, designed to preserve the ecological balance of ecosystems;
- construction of dams on streams and ditches to raise the groundwater level in adjacent areas;
- construction of small water reservoirs, damming of lakes in order to retain water for agriculture and other activities of this type; and
- retention of spring water, snowmelt and precipitation in ponds, post excavation pits, and local depressions.

The various projects encompassed in the national programme are approved by the regional (voivodeship) parliaments. The Land Reclamation and Regional Drainage and Water Facilities Boards are responsible for elaboration of the small retention programs that had been approved by the voivodenship, and for developing action plans. The projects are of very diverse nature, due to the broad scope of water retention measures, the information provided, the various results of environmental impact assessments, and the costs associated with the different projects.

Photo 2. Stone threshold

Financing of small retention measures

The Board of Reclamation and Water Devices, which operates under the supervision of the Marshall of the Voivodeship, has been responsible for implementing the small retention projects. No separate fund has been established for the realisation of projects, meaning that those who initiate the project are obliged to obtain funds themselves.

Significant financial resources for some hydraulic works have been allocated to the voivodeships (23,8%) as well as to the Fund for Environmental Protection and Water management (Fig. 2).

For several years after the signing of the agreements, investors were able to obtained financial support, among others, from Fund for Environmental Protection and Water Management (NFOŚiGW). NFOŚiZW organised competitions for the best investment in field of small water retention.

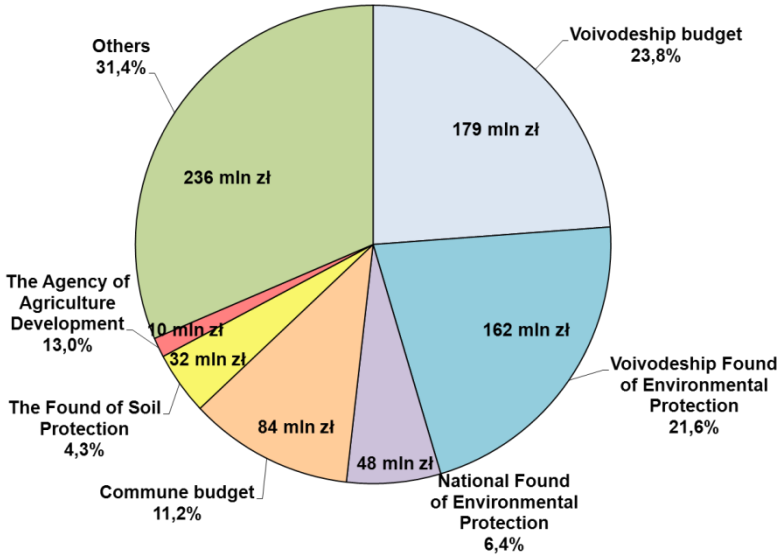

Fig. 2. The source of finance for small water retention programme during the years 1997–2010 (1 EURO ≈ 4,2 ZLOTY)

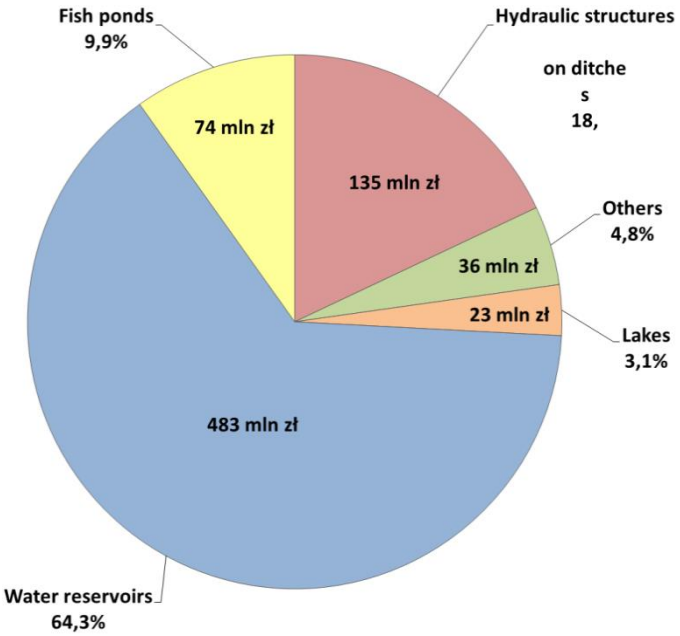

Fig. 3. The structure of investments in small retention objects in years 1997–2010

The largest funds are directed to the construction of reservoirs (64,3%) and damming constructions on channels and ditches of the canals and drainage network (18,0%) (Fig. 3). Details regarding the implementation of the small retention programme apply only to investments made in consultation with the provincial boards of drainage and water devices. There is still a challenge in a full implementation of the program. This includes the fact that the non-technical forms of water retention are almost completely ignored.

Functions of small retention systems

Summary of systems and methods are in Table 1 (Mioduszewski, 1997).

Table 1. Systems and methods of water retention in rural areas

Water Resources	Systems and methods
Landscape (habitat) retention	Systems shaping the proper structure of land use through: - System of arable fields, grasslands, forests, ecological lands and ponds - Afforestation, creation of protective belts, creation of bruises and terraces - Increasing the surface of wetlands bogs, swamps
Soil retention	Cultivation systems shaping water management in a soil profile: - Improvement of the soil structure, agricultural drainage, liming, proper agro-techniques, proper crops rotations, increase of organic matter in soil
Soil and ground water aquifers	Cultivation – drainage systems limiting surface runoff: - Limitation of the surface runoff - Increase of soil filtration capacity - Anti-erosion, phyto-drainage and agro-drainage measures - Regulated outflow from drainage system - Ponds and infiltration wells for storage of rainwater from sealed surfaces
Surface waters	Hydro-technical systems of division and storage of water: - Small water ponds - Regulation of outflow from ponds and small reservoirs - Water storage in drainage ditches and channels - Retention of water outflowing from drainage systems - Increasing of the valley retention including construction of polders

By using small water retention measures, the natural retention capacity improves, which contributes to the potential for an increased amount of water that can be naturally stored in the environment, and used for alimentation of water courses during droughts (Mioduszewski, 1997; EU Commission, 2014). The main goal of the water retention measures is improving the water balance, decreasing of threats of floods and drought.

There are number of other positive effect [Suchowolec, Górniak 2009; Burek, Mubareka 2012; EU Commission 2014; Marcinkowski et al. 2013]:

- Securing forest and wetland ecosystems needs for water and improvement of the state of the natural environment as a result of elevation of groundwater table level.
- Securing some of the economic objectives, e.g. reservoirs can be used as water intakes for fire secure purposes, swimming pools, extensive fish ponds, intakes for irrigation or waterholes.
- Improvement of natural values, increase of biodiversity of the agricultural landscape through restoration of wetlands and ponds, creation of water dependent enclaves for natural fauna and flora, shaping a micro climate friendly to human.
- Protection of surface waters from pollution, prevention of suspended material migration, purification of rainwater from nutrients (nitrogen and phosphorous).

The implementation of small retention measures can significantly contribute to the restoration of the natural water capacity of a catchment as it was prior to human activity. The increase of water retention capacity of a catchment can significantly limit unfavourable impact of climate change, as well as the investments (water structures) accelerating water runoff from the catchment (Querner et al., 2012; UNEP, 2014).

Replicability

Environmental organisations such as associations and NGOs also implement small water retention projects. Often, these programmes have the aim to restore wetlands and revitalise rivers.

In the past years, the need to integrate wider environmental concerns into water management has been highlighted. This is highlighted in the common European Water Framework Directive (EU WFD), which has a clear emphasis on integrated water management, and that seeks to protect aquatic and water dependent ecosystems, both for their intrinsic value but also as natural capital. The EU WFD thus conforms to the framework of the green economy, where the needs between economic growth and environmental protection are balanced [UNEP 2014; Water CoRe 2014, EU Commission 2012].

The GWP Poland plays an important role in the implementation of the National Program. Some meetings were facilitated by GWP Poland to explain the idea of small natural water retention and Guidelines for small retention measures were written and published [Kardel et al, 2011]. The proposal for some changes in the Polish Water Law has been prepared. It is a proposal to include some of these ideas in new version of the Water Law.

Photo 3. Pond supplied by drainage waters

Best practices examples

A number of hydraulic structures aiming to improve water retention for various purposes have been constructed as elements of small water retention programmes. Mostly, these objects have been constructed to retain water for agricultural purposes (irrigation, flood protection). Fish ponds are considered to be a part of agriculture. Most reservoirs are, in addition to their hydrological functions, also used for recreation.

Photo 4. Water reservoir with small power plant

Photo 5. Stone threshold – small retention in forests

The number of reservoirs and their water retention capacity is presented in Figures 4 and 5. Significant differences in constructed objects in the following years is clearly visible. The figures also indicate that there has been a reduction in the construction of damming devices. Moreover, the reservoirs constructed nowadays have a smaller water volume than the ones constructed in the past.

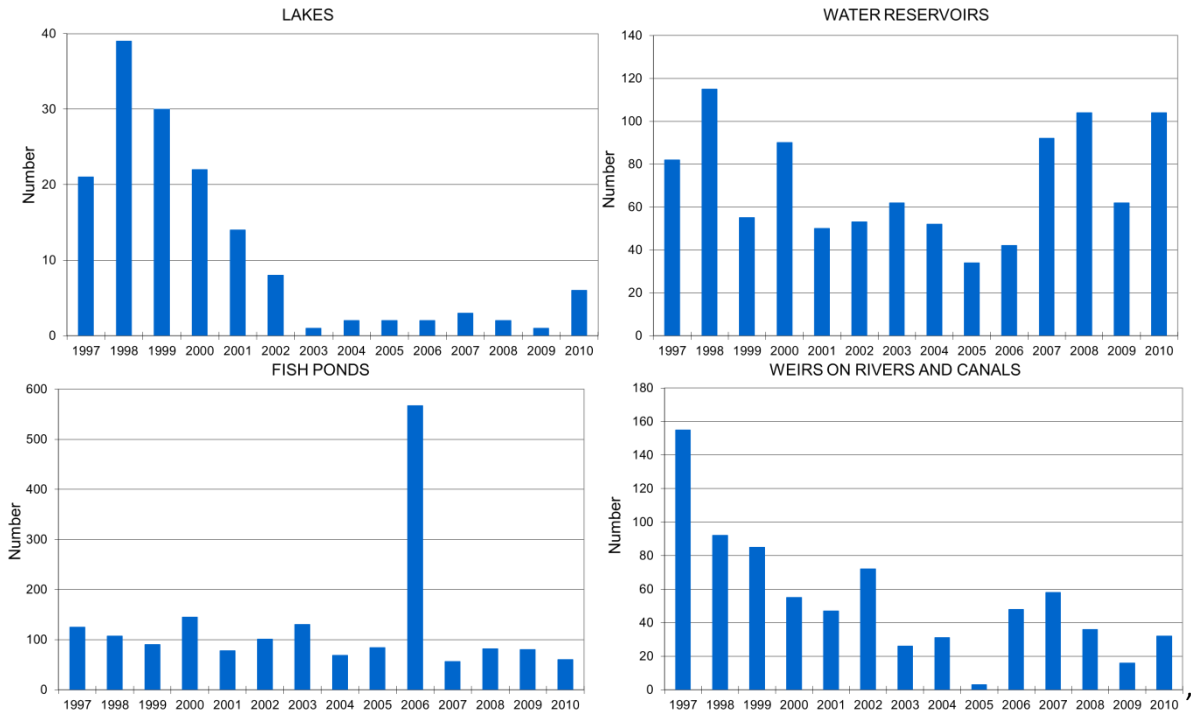

Fig. 4. The main structures constructed in 1997–2010 in the programme of small water retention (source: Kowalewski, 2013)

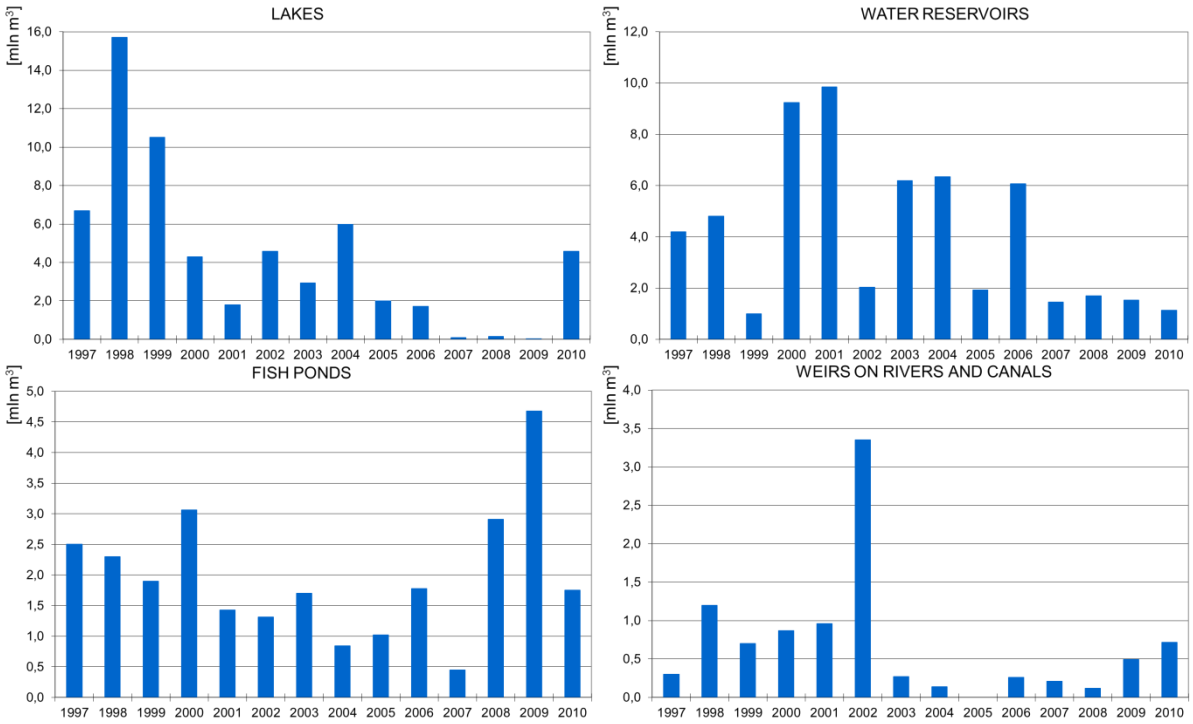

Fig. 5. Summary capacity of the main water retention objects constructed in 1997–2010 (source: Kowalewski, 2013)

Photo 6. Hydraulic structure in the Kampinoski National Park – wetlands protection

The planned increase in the volume of retention waters was based mainly on small water bodies (ponds), which is predicted to increase retention by 860 million m^3 (4789 reservoirs). Damming of lakes (620 pcs) is assumed to increase the retention by 263 million m^3, and damming of water in the drainage system (basic and detailed) is expected to increase it by another 18 million m^3. In total, the national retention programme is expected to increase water storage by 1,141 million m^3 by the end of 2015. It is estimated that the investments made has resulted in an increase in water retention in the country by an average of about 15 million m^3 per year, although in rural areas, the increase was planned to be approximately 60 million m^3 per year.

Photo 7. Construction of the reservoir in the river valley

Small water retention measures meet most of the ecological requirements for water management in agricultural landscapes, forests, and urban areas. Agricultural areas are of significant importance because they cover almost 60% of the country, and they are a crucial element for regulating the circulation of water in river basins. Increasing the retention capacity of agricultural areas can thus significantly contribute to the improvement of the water balance in the country.

Lessons learnt

The result of implementation of the small retention program has shown that it is a good and effective method to increase the ability to retain water in the small river basins. Construction of small water reservoirs and weirs on ditches and creeks and restoration of drained bogs can limit the fast outflow of precipitation and melting water from the catchment.

Despite their low capacity, they can be an important part of the floods protection system, particularly on watercourses experiencing rapid (flash) floods.

Apart from the improvement of the water balance of catchments, small retention objects perform also various economic functions, mostly on the local level, such as: small water power engineering, breeding of fish, source of water irrigations in farming and forestry and also in recreation.

The farmers are the most imported persons, who can implement the idea of small natural retention measures on their lands. Considering the great diversity of small retention measures, plans for small retention measures should be kept flexible, and should be adapted to the local context. However, an overarching framework ought to be developed.
This includes:

- the simplification of procedures for obtaining permits for the construction of small water reservoirs that capture drainage water;
- technical and organisational help for small investors (farmers), who undertake some retention measures;
- proposals for legislation requiring the inclusion of certain small retention issues in investment projects;
- financial assistance and the conditions for granting depending on the type of measure;
- identification of the institutions responsible for conducting training and information on issues of small retention.

Based on this overarching framework, small retention measures should be implemented. The strategy of implementation should include mainly stimulating activities that will be undertaken by different individuals or legal entities.

The idea of the Natural Small Water Retention Measures (NSWRM) is consistent with the Natural Water Retention Measures (NWRM), an initiative encouraged by the nature protection specialists. Natural Water Retention Measures are limited to tasks aiming at restoration of the natural water retention capacity of catchments. Active human involvement in maintenance and exploitation of the existing water systems has not been planned. According to the definition of NSWRM, it has been assumed that only small hydro-technical investments (e.g. small damming reservoirs, damming on water courses) will be implemented. Also, implementation of new methods of exploitation of water systems including drainage and irrigation – drainage systems in river valleys has been planned.

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