

Chapter 16

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Strategic Planning of Flood Protection: A Case Study of „Programme for Żuławy Region – to 2030 Complex Flood Protection”

Introduction

For the last several years, the issue of flood protection, has been, due to more frequent disastrous floods (Fig. 1), the topic for a vast number of public debates, scientific studies as well as political undertakings performed by public administrations at various levels. Within the last 15 years, ca. 100 people have lost their lives in Poland as a result of floods. The increased frequency of floods is attributed to both natural and anthropogenic causes (Diagnosis ...2010) resulting, most often, directly from a rise of the water level in the watercourses of various sizes.

The greatest potential or real danger occur in the valleys of the big rivers and in the areas, where there is concentration of different causes of floods. The Lower Vistula Valley with Vistula Żuławy is one of such regions. This specific natural-anthropogenic system, which has been created by man in the estuary of the Vistula since the end of the XIIIth century, is characterized by – due to its origin and location – the high risk of occurrence of flood of various genesis; such as storms, glacier thaws, rainfalls, ice jams and floods occurring within polder areas. There was an attempt to stop the increased intensity of flood by building the trench of the Vistula River, which came into operation in the year 1895. However, the achieved effect contributed mainly to decrease threat of flood caused by ice jam (Cebulak 2010). In recent years the Żuławy region has been haunted by floods resulting from storms (1983, 2009) and rainfalls (2001).

The sensitivity of Żuławy region to the effects of hydrological-climatic processes is particularly high in the context of the occurring natural and cultural values as well as the conditions of land management. The Żuławy region covers mainly most of the fertile soils for farming in the country (alluvial soils I and II evaluation class) and has the most dense natural and artificial water network.

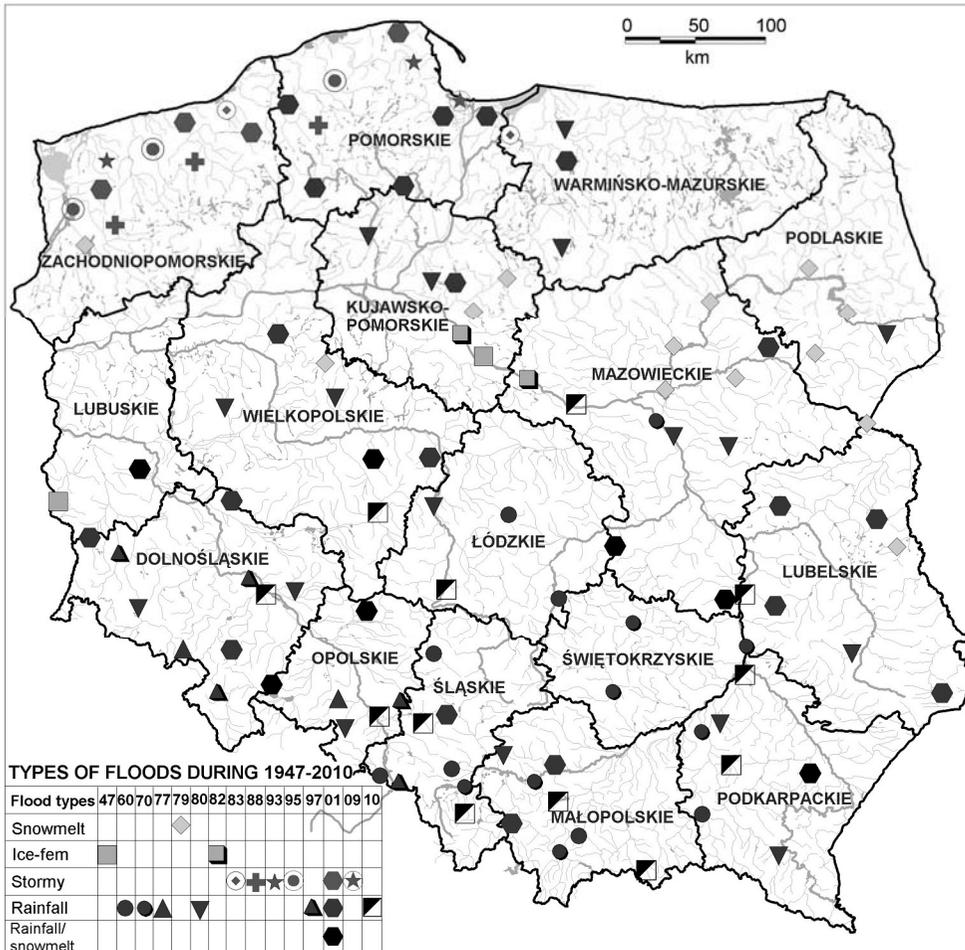


Fig. 1. Regional importance disastrous floods in Poland during 1947-2010 (after Diagnoza ... 2010, changed)

The relict water body of Druzno Lake is situated in the eastern part of Żuławy region (the former bay of the Vistula Lagoon), which, along the Vistula and its valley, covers numerous protected habitats and animal species connected with the water environment or dependent on the waters. There are a lot of cultural resources of the European and national values (Malbork, Gdańsk, Elbląg, Truso, hydro-technical constructions, residential-farming and sacral buildings of the interior region of Żuławy) as well as the unique polder cultural landscape with rural housing exceptionally dispersed in some parts and congested in others, along with the remains of windmills and irrigation afforestation, which are considered as one of the most valuable in this part of the country (Kistowski *et al.* 2006). At the same time, the Żuławy region is inhabited by a quarter million people and in some places it is intensely industrially developed (in the area of Gdańsk, Elbląg, Tczew and Kwidzyn), and along the Vistula and in the area of Elbląg there are important

corridors of technical infrastructure (road, rail, pipelines and electrical power engineering).

The coexistence of the above-mentioned values and the occurring problems have been an incitement for planning actions in favour of limiting flood risks over a few decades now. However, due to financial barriers, none of the vast action plans established was implemented before the year 2009. In the years 1999-2006 a few plans of this type were formulated. Some of them were approved by the Pomeranian and Warmian-Masurian Voivodeship councils (Kompleksowy, regionalny... 1999, Kompleksowy, regionalny ... 2001, Program poprawy ... 2002, Program dla Żuław ... 2005, Program Rewitalizacji ... 2006). In 2008, there was availability of funding for planned undertakings from the EC in connection with the establishment and realization of the Infrastructure and Environment Programme (IEP) priorities. In the second half of the year, along with the Regional Water Management Board in Gdańsk (RWMB), the team headed by the author of the article carried out a project „Programme for the Żuław Region – to 2030 Complex Flood Protection”, known as Żuław Programme – 2030. This project became a basis for acquiring the financial means of IEP in years 2008-2015, altogether 550 mln PLN, i.e. 85% of the planned resources for the realization of the Programme tasks in its first stage, which is until 2015.

In the later part of this article I have presented the most important conditions, aims, tasks and problems associated with the realisation of this Programme.

2. Conditions, principles and general aims of realisation of Żuław Programme

Strategic planning of flood protection in the Vistula Żuław region required taking into consideration many factors, both the general and specific ones – referring mainly to the Żuław region. The main challenge for the team was to take into consideration the principles of strategic planning, which in the case of previous programmes were not fully considered. Since the flood protection ought to be realised in the environment and in connection with other functions of the landscape, it was believed that it should be planned as an element broadly understood as sustainable socio-economic development of the Żuław region. It was supposed that this protection cannot be fully successful without taking into consideration, in context, the social, economic, spatial and ecological development of this region.

The main general conditions for the realisation of the Programme took into consideration:

- the process of introducing EC and national ecological policy, including the policy referring to the waters, especially Framework Water Directive and Flood Directive,
- acquired experiences in the scope of formulating and implementing various actions in the region included in the Programme,
- the course of realisation of undertakings co-financed from the EU funds,
- commonly accepted directions of sustainable socio-economic development of the Vistula Żuław.

It shall be emphasized that in the process of formulating the Programme, the Directive 2007/60/EC of the European Parliament and of the Council of 23 October on the assessment and management of flood risks, was already in force, although it had not been introduced into Polish legislation at that time. The introduction took place only along with amendment Water Act from 5. January 2011. The Directive which obliges the implementation of flood protection means far beyond the technical ones, on one hand enabled to perceive the whole issue in a broader way, but on the other hand, RWMB Gdańsk, as an institution governing the Programme, was afraid to introduce the tasks (e.g. the ones referring to the monitoring of spatial development), which realisation is beyond their competences as well those of other beneficiaries of the Programme. This situation significantly restricted the scope of planned actions.

It was also decided, on the basis of experiences from the realisation of projects financed from EU funds, that each of the beneficiaries of the Programme shall apply for funds for particular projects individually, and RWMB Gdańsk shall be the unit overseeing the whole Programme. In order to do so, an appropriate agreement was concluded between RWMB and the other partners, among which were: Land Drainage Board of Pomorskie Province, Żuławy Land Drainage Board (being under the Marshals of Provinces) and the councils of: Gdańsk, Elbląg and the District of Gdańsk. Such a structure of the Programme was considered to be the most optimal from the point of view of assurance achieving its goals.

It was recognized, that in the process of formulating the Programme, it is essential to take into consideration the following principles and stages of realisation of the strategic documents:

- formulation of the strategies for action realisation, which shall enable to achieve the aims, for which the Programme is to be implemented,
- indicating eligible goals to be achieved, the principles of their realisation, which should be defined in a clear way, appropriate for the needs,
- defining the available funds, which would ensure reaching the set goals and realising the planned actions,
- agreement (cohesion) with the EC, national and regional policies,
- defining the appropriate indicators, which would enable monitoring and assessment of Programme realisation in order to estimate the effectiveness of reaching the goals in the future,
- planning the system of the Programme implementation, which would enable effective achievement of the goals.

The last three elements above are the key ones for the effectiveness of Program implementation.

Making the whole process more social is an essential condition for modern strategic planning. In order to do so, a Consulting Team was appointed – consultative-advisory body operating during the next four sessions and in between them. It consisted of representatives of local government administration (4 persons), administration of water management system (7 persons), administration of environmental protection (2 persons), maritime administration

(1 person), scientific-research institutions (2 persons) and two experts in the field of cultural environmental protection and flood protection. The Programme project also underwent public social consultations along with the prognosis of its influence on the environment. Using the methods of active strategic planning (MAPS), the Team carried on the SWOT analysis, which became an integral element of the diagnostic part of the Programme. It showed, among others, that the greatest strength of the Programme is the present possibility to obtain the EU funds, while the greatest threat for its realisation are the collisions and conflicts between the requirements for environmental protection and flood protection.

Working on the operational part of the Programme, the main goals of sustainable development of the Żuławy region were established. Certain actions of flood protection should be performed in order to support the realisation of the Programme and they include:

- protection of the natural resources and values (soils valuable for farming, habitats, swamp species and species depending on the water),
- better protection and reconstruction of objects of cultural heritage, connected both with Żuławy settlements as well as hydro-technical actions, which regulate water circulation,
- maintaining the unique harmonious cultural landscape of the Żuławy region,
- securing the material property of industrial buildings and other branches of the economy and technical as well as housing infrastructure,
- better application of the instruments of spatial development – restrictions in managements of lands endangered by floods,
- more complete diversification of the trends in economic development of the Żuławy region; especially development of the forms of tourism connected with waterways and cultural heritage.

Direct fulfilment of the assumptions of the Programme should be supported by introducing particular aims of flood protection, which include:

- improvement in recognition and prevention of flood threats by drawing maps of lands under flood threats and flood risk as well as plans for flood risk management,
- improvement of the already existing system of flood protection by reconstruction and construction of the flood protection devices,
- renaturalization of some water environments and those depending on water with the aim of flood protection,
- social education and publicity on the issues of flood protection.

The outlined background of strategic planning for flood protection of the Żuławy region was a starting point for the formulation of the operational part of the Programme.

3. Objectives, courses of action and tasks of Żuławy Programme

There were 14 variants of the presented Programme in the first half of the year 2009. The initial versions established a broad approach, as mentioned above. Thus, both the number of levels of the operational indications as well as the courses of actions and tasks were relatively great. Six strategic goals were formulated, 31 operational goals, 79 courses of action, among which 48 tasks planned for realisation between 2010 and 2015 were selected. As a result of discussions and suggestions by beneficiaries considering the limitations of the scope of actions, the final version of the Programme did not include one level of the strategic indications (operational goals), so the Programme was limited to 5 specific objectives, 21 courses of action and 48 tasks planned for realisation by 2015. It was acknowledged that the level of uncertainty of the objective scope and financial funds of the Programme after the year 2015 is high enough not to define in detail the tasks expected to be introduced in the further stages of the Programme. The content of the aims and courses of action formulated on the first two above-mentioned levels are presented in Table 1. The localization and the kinds of 48 tasks are presented in Fig. 2.

The main objective of the Programme was formulated as follows, „Increase the effectiveness of the flood control and protection directly affecting the increase in sustainable development of the Vistula Żuławy potential”. However, while discussing the content, many courses of action were excluded, which could contribute to the sustainable development and, at the same time, could contribute to decrease of the flood threat. Among such actions, are the following:

- consideration of localization restrictions in the flood endangered areas in local and regional documents referring to spatial development,
- increasing the level of renaturalization of some depression polders and the adjacent areas as well as natural compensation leading to an increase in the habitat acreage and water species and species depending on water,
- sustenance of the hydrological and climatic functions of the lineal and cluster midfield and roadside afforesting.

As a result, a set of indicators used for monitoring the effectiveness of Programme implementation was limited. The following indicators were taken into consideration, e.g.:

- number of formulated plans referring to the management of river-basin (including the water management plans, water-environmental programme as well as occurrence of flood risk management),
- number of buildings of small retention,
- volume of water retention within the scope of small and great retention,
- number of publications, conferences, workshops, formulated documents on flood protection,
- number of reconstructed and constructed devices used for flood protection, embankments or beds of water courses (including channels and trenches).

Table 1

The specific objectives and activity directions of Żuławy Programme

Specific objectives	Courses of action
I. Improvement of flood threat identification and prevention using the best available techniques and the best practicable means according to the EU directives and national policy	<ul style="list-style-type: none"> • formulation and implementation of the Monitoring System of the Flood Risk (SMoRP), • formulation of the mathematic prognostic models enabling prediction of maximal level of the flood waters, • elaboration of the initial flood risk assessment, • drawing the maps of flood threat and flood risk, • formulation of the plans connected with flood risk management, • implementation of modern systems of gathering, processing and dissemination of information (including the ones in frame of hydro-meteorological services), • formulation of the documents connected with flood protection for the Żuławy region (researches, studies, modelling researches, action scenarios).
II. Increase in the importance of 'natural' flood prevention methods	<ul style="list-style-type: none"> • allowing to flood some polders of lower economic value, • realisation of small water retention, publicizing and implementation of the pro-ecological methods of water retention.
III. Increase in the awareness of the local communities as well as in the representatives of administration departments and institutions within the scope of the flood threat and prevention	<ul style="list-style-type: none"> • propagating the principles of flood protection in the Żuławy region, • building and updating the Internet website devoted to the issues of flood in the Żuławy region.
IV. Improvement in the organizational structures of the flood control and the flood risk management on the regional and local level	<ul style="list-style-type: none"> • improvement of actions of Information-Coordination Centre of Flood Protection (OKI) within the scope of actions of RWMB Gdańsk, • improvement of coordination of planning for flood threat management, • improvement in information exchange referring to the flood threat and flood risk as well as flood protection between the institutions.
V. Reconstruction and construction of water engineering facilities against flood	<ul style="list-style-type: none"> • reconstruction and construction of embankments and river bank reinforcements, • reconstruction and construction of river groins, seawalls, flood gates, dams, anti-storm gates, bridges, drainages pump stations and pump aggregates, • construction of water reservoirs, • reconstruction and construction of drainage systems, including water courses, channels, ditches etc., • organization of a new icebreaker fleet.

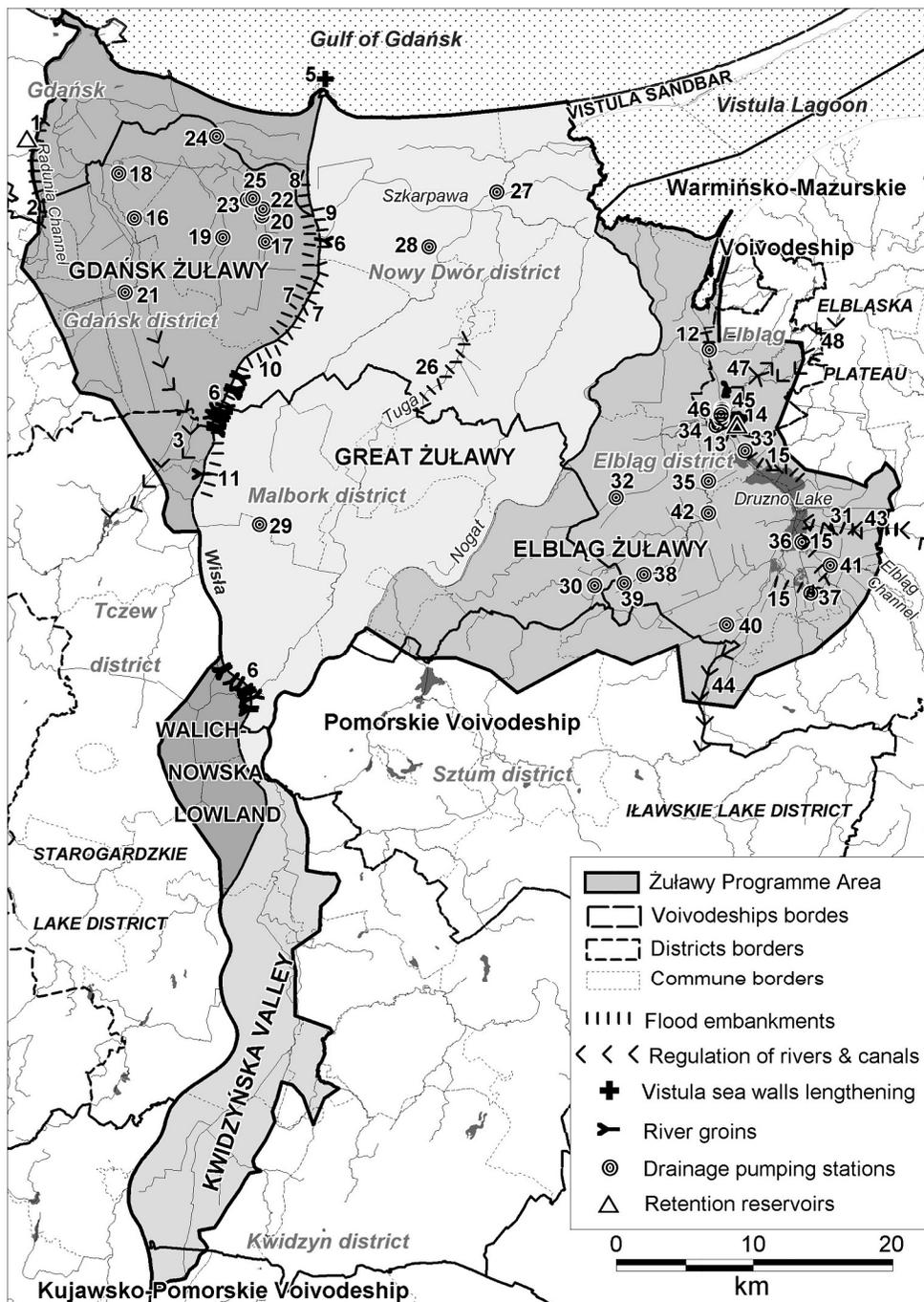


Fig. 2. Investment actions of Żuławy Programme planned during 2010-2015

However, in the Programme version approved by the chairman of the National Water Management Authority, there were no indicators of:

- number of residential building construction permits issued on the depression (below sea level) and adjacent areas (0-2.5 m a.s.l.),
- ecological condition of the water courses defined according to the biological criteria,
- number of companies and institutions, which have plans for flood protection.

This situation can contribute to limitations of the complementarity of flood protection actions and restrict the effectiveness of introducing the investment tasks, which are basic for the activities described in the frame of the Programme until 2015, and considering the financial aspect (realisation of these tasks shall use ca. 95% of all the funds). Among the non-technical tasks, the undertakings resulted from the regulations introduced by the Flood Directive are considered to be the most important (preliminary assessments, maps, plans of flood threats and flood risk management). Realisation of these tasks is obligatory, anyway, whether the Programme would be implemented or not.

4. Main environmental problems of implementation of the Żuławy Programme

Due to the presence of many natural values, characteristic for the transitional environments in the Żuławy region and the adjacent areas, numerous forms of environmental protection were created, especially wildlife reserves and Natura 2000 areas as well as less rigorous (considering human impacts) landscape parks and landscape protected areas. The key areas of the concentration of such forms are: the Vistula Valley between Nowe and Tczew, Lake Druzno with its surroundings and the Vistula estuary (Vistula Przekop and Vistula Śmiała nearby Górki). A number of wildlife reserves are also located in the area of the Vistula Lagoon, and the Lagoon itself and Vistula Spit are regarded as part of the Natura 2000 areas. These regions are, at the same time, the key ones considering the realisation of the technical forms of flood protection. The reconstruction of river groins and embankments is planned in the Vistula Valley and the Vistula bed, while in the Vistula estuary – reconstruction of the Vistula seawalls leading the river waters and ice floats into the Gdańsk Bay and reconstruction of the head embankments around the Lake Druzno. All these actions are to be realised within the areas of Natura 2000, in very dynamic habitats created under the influence of flowing waters and peat-creating processes.

Implementation of these actions will require a great foresight considering the great probability, and in some cases, certainty of irreversible loss of "natural" habitats and species of plants and animals. In situations other than flood-protection actions, the realisation of investment – in the light of article 6 of Habitat Directive would not be possible. However, the realisation of tasks within the scope of flood protection, can be included mainly into a group ensuring the protection of so-called superior public interest (Brodecki *et al.* 2010). That is why the realisation of these tasks, despite more complicated administrative procedures, shall be possible,

although the lost habitats and species will require compensation, to be realised in other nearby places. Both planning and the performance of this compensation is, in Polish reality, innovative and will require considerable financial funds. Unfortunately, within the scope of Żuławy Programme there is no indication of financial means for this realisation, despite the fact that it is the investor himself, who is responsible for its realisation. This situation may cause delays in the course of realisation of the Programme, for which one will not blame the regulations on environmental protection according to EU legislation (which refunds the majority of the characterized actions), but most of all the administration and the investors, who along with the planning of the undertakings, should attempt to find financial means for the goals of natural compensation.

5. Conclusions

The resulting experiences from the conditions of formulation and main arrangements as well as the problems with implementation presented in the draft of „Programme for the Żuławy Region – to 2030 Complex Flood Protection”, enable the formulation of the following conclusions:

- establishing the Programme was an interesting experience in the scope of strategic planning of water management – it increased the knowledge on the possibilities of planning flood protection according to the principles of sustainable development and elaboration of strategic documents,
- despite the problems encountered, the Programme seems to be one of a few complex regional plans in Poland in the field of water management, which has a chance, with no greater obstacles, to use the European Community budget in years 2007-2015,
- a delayed amendment of Water Act which takes into consideration the Flood Directive seems to be a negative factor connected with the realisation of the Programme, which resulted in insufficient consideration of the “soft” methods of flood protection; some of these backlogs can be compensated for, however, it requires relatively fast actions,
- it seems that without far-reaching changes in the legislation connected with spatial management, which would restrict the localization of many buildings (e.g. residential ones) in the areas directly and potentially under flood threat; the possibilities of reducing flood threat in the Żuławy region shall be limited,
- the specific case of the Vistula Żuławy creates the situation, that the technical part of the flood protection undertakings will be considered as serving superior public interest – it results in the need for realising expensive natural compensations, and there are no financial means for such actions yet.

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