

## 5. SECURITY STUDIES

# NATURAL DISASTERS AND CIVIL PROTECTION IN POLAND. RESPONSE TO LARGE SCALE FLOODING

WOJCIECH KRASIŃSKI

### ABSTRACT

The article discusses the changing nature of the threat caused by large scale floods in Poland and its impact on the country's economy and society. The threat of floods to Poland is discussed based on the existing legal framework and the governmental documents containing the risk assessments for crisis management purposes. Available statistical data have been collected to characterize the impact of large scale floods on Poland's economy and society. Lessons learned from two major floods of 1997 and 2010 serve as a basis for possible improvements in the field of civil protection against flood threat in the future.

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### KEYWORDS

Natural disasters, flood, crisis management, civil protection, Poland.

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## Introduction

Until recently, Poland was considered a country with almost no natural geological or severe hydrological hazards. It seems that this situation has been starting to evolve as the climate change contributes to increased severity of hydrological phenomena and alters the traditional patterns associated with natural disasters in Poland. Poland has to prepare to extreme weather phenomena, because they will be more and more intense and will occur more frequently<sup>1</sup>. It can be assumed with a high level of probability that the expected cli-

mate change will multiply the occurrence of extreme weather phenomena, which in turn may cause losses in the economy but above all expose people to loss of life and health. Floods will remain one of the most serious natural hazards to Poland, but the climate change will impact the factors that cause the floods, patterns of flooding, warning times and requirements for civil protection.

Poland's legal framework contains detailed regulations concerning natural disasters and floods. The act on the state of natural disaster elaborates on specific types of hazards which are described within a common framework of natural disasters. The

<sup>1</sup> H. Lorenc, Klęski żywiołowe a bezpieczeństwo wewnętrzne kraju, Instytut Meteorologii i Gospodarki Wodnej, Państwowy Instytut Badawczy, Warszawa 2012, s. 4.

act describes a natural disaster as events caused by the various natural phenomena such as thunderstorms, seismic shocks, strong winds, intense atmospheric precipitation, prolonged occurrence of extreme temperatures, landslides, fires, drought, floods, ice phenomena on the rivers and the sea, as well as lakes and reservoirs, the mass occurrence of plant, animal diseases or human contagious diseases.

Polish legal regulations in force define a flood as a temporary coverage by water of an area which, under normal conditions, is not covered with water. Floods may be in particular caused by rising water in natural watercourses, water reservoirs, canals and from the sea. According to current legal regulations in Poland the term floods is not applicable to the coverage of water caused by rising water in sewage systems<sup>2</sup>. Floods pose a direct threat to human life and health and an indirect threat to these values resulting from the unavailability of some services.

Both Poland's basic planning documents for crisis management, the National Crisis Management Plan<sup>3</sup> and the Risk Assessment for the Purposes of Crisis Management<sup>4</sup> consider flooding as a natural threat which risk assessment include serious effects and a high probability of occurrence. These documents state that the effects of flooding mainly concern three areas: the population; economy, property and infrastructure, and the environment. The most common effects of floods on the population include, among others, direct threat to life and health, periodic difficulties in movement, lack of access to food and drinking

water, and the need for evacuation. Flooding impact on infrastructure include among others damage to: flood embankments, hydro-technical devices, roads, bridges, viaducts, and sewage and water supply networks. In addition, flooding may result in disruption of the production, transmission or distribution of electricity and heating, as well as other public utilities. Residential premises and workplaces may be also damaged. As a result of flooding communication and IT systems may not function properly. Flooding can adversely affect the environment, e.g. as a result of damage to installations or technical devices, and the release of harmful substances.

## Nature of floods in Poland

Floods are common natural threat in Poland. Historically, most serious floods occurred early in spring as a result of combination of melting snow, heavy rains and ice jams on the rivers. Poland has also suffered quite often from floods caused by heavy and sustained rainfalls in late spring and summer. Mountainous parts of Poland see often flash floods resulting from the heavy rains and the coastal parts of the country are occasionally impacted by the flooding caused by the sea waters pushed against the land. For long time, the phenomenon of floods in Poland remained quite predictable and followed well known patterns thus providing the authorities and society with sufficient warning time and requiring a standard response. With the climate change, the situation is starting to change. Mild winters with a minimal or no snow coverage reduced the probability of early spring flooding. On the other hand the raise of temperatures led to the increased capacity of the atmosphere to store humidity, which raised the probability of significant rainfalls in spring and summer. That brings the potential for large scale floods if heavy rains sustain for sev-

<sup>2</sup> Ustawa z dnia 20 lipca 2017 r. Prawo wodne, Dz. U. 2017 poz. 1566 z późn. zm., art. 16 pkt. 43.

<sup>3</sup> Rządowe Centrum Bezpieczeństwa, Krajowy Plan Zarządzania Kryzysowego-część A 2017, s. 6.

<sup>4</sup> Rządowe Centrum Bezpieczeństwa, Ocena ryzyka na potrzeby zarządzania kryzysowego. Raport o zagrożeniach bezpieczeństwa narodowego, Warszawa 2013, s. 17.

eral days<sup>5</sup>. One must take into account also short rains of torrential nature, which leads to flash floods. They will be however limited in scale and short in duration. Such floods in urban areas may cause damage to property and services as the infrastructure there is not prepared for dealing with such intense precipitation<sup>6</sup>. Warning time for urban floods is very short and capabilities to forecast such phenomenon limited. Taking that into account one may argue that floods will require more attention in the future as their nature is changing and some adjustments in civil protection will be needed. For sure, as the climate is changing, the probability of a large scale flood resulting from prolonged spring and summer rains is on the raise. Such circumstances, combined with a potential scale of damage caused by a large scale flood, makes exploration of the topic desirable.

Poland has a long history of flooding and numerous lessons learned from actions to mitigate impact of such natural disasters. Two of the most devastating floods in Poland's history occurred as result of heavy and sustained rains in spring and summer. As the climate changes it is likely that such floods may occur also in the future. The turning point in crisis management and civil protection in Poland is directly linked to the so called millennium flood that took place in 1997. So, even if there were serious floods to refer to after that year, the millennial flood remained the benchmark for civil protection and crisis management until nowadays. The second largest flood in Poland occurred in 2010 and in some respect that particular flood has been always con-

sidered a new beginning for an effective response to this type of natural disasters<sup>7</sup>. Both floods brought caused significant human losses, which can be estimated e.g. in the form of the number of people who lost their lives, and material losses, which are difficult or impossible to express in economic terms, e.g. losses to the natural environment, slowdown of economic development, etc.. The 1997 flood that occurred in the Odra river basin caused economic losses of about PLN 5.8 billion. The flood waves stretched for over 500 km and the negative effects of the flooding exceeded the most pessimistic forecasts. Almost all cities and towns in the Odra and Nysa Kłodzka valleys were flooded. Around 50 thousand houses, 1893 bridges, 6523 km of provincial and national roads were destroyed. The flood impacted 4494 km of embankments and river banks, and 498 hydro technical constructions were damaged. The losses to agriculture were observed for 227 thousand hectares of arable land and 149 thousand hectares of pastures. In many cases, damages have not been removed to date. The flood also caused a several-fold increase in the load of pollutants discharged into the Baltic Sea by the Oder. Fortunately, these changes were temporary and short-lived. At the same time the flood losses in the Vistula basin amounted to PLN 2.1 billion. In total, the floods of 1997 in Poland claimed 56 fatalities and catastrophic material losses estimated at about PLN 12 billion. The floods of 1997 that stretched across the valleys of two major rivers in Poland impacted 2% of the country's territory

In contrast to events of 1997, the 2010 flood occurred predominantly in the Vis-

<sup>5</sup> Z. W. Kundzewicz, Adapting flood preparedness tools to changing flood risk conditions: the situation in Poland, Polish Academy of Sciences Institute of Oceanology 2014, *Oceanologia* 56(2), 2014, s. 391.

<sup>6</sup> E. Jarosińska, Local flooding in the USA, Europe and Poland – an overview of strategies and actions in face of climatic change and urbanisation, Infrastructure and ecology of rural areas, Nr III/1/2016, Polska Akademia Nauk Oddział w Krakowie, s. 808.

<sup>7</sup> M. Misterka, Analiza działań Państwowej Straży Pożarnej podczas powodzi w 2010 r. w świetle usprawniania ochrony przeciwpożarowej w Polsce – część 1, *Zeszyty Naukowe Szkoły Głównej Służby Pożarnej* w Warszawie nr 56 (4) 2015, s. 40.

tula river basin. It was one of the most tragic floods in the history of Poland, which claimed 25 deaths<sup>8</sup>. Around 266 thousand Poles suffered financial losses, and 30 thousand citizen needed to be evacuated. The flood caused damage to around 1300 kilometers of embankments and 59 bridges requiring their partial or complete reconstruction<sup>9</sup>. In addition, 811 municipalities (around 25 percent of all municipalities in Poland), 1300 companies, 800 schools and 160 kindergartens suffered losses. Again, 2% of the country territory had been flooded. The transport infrastructure losses included damage to around 1160 kilometers of roads and 400 kilometers of railway lines. Overall losses caused by the flood of 2010 were estimated at over PLN 12 billion. In the Vistula River basin alone, losses were of PLN 8.9 billion and accounted for over 87% of losses in voivodships on a national scale<sup>10</sup>. The value of preliminary estimated losses in agriculture after the floods in May and June 2010 amounted to PLN 1.5 billion (according to the Ministry of Interior and Administration). Over two hundred thousand of farmed and wild animals drowned. The largest financial damage of around PLN 6 billion were noted for municipal infrastructure such roads and drainage, river embankments and levees as well as bridges.

## Response to large scale floods

The crisis management system introduced by the legal act of 2007 continues to

be a basic legal and organizational framework for the governmental and territorial self-governmental administration actions related to the flooding prevention, rescue and mitigation of its consequences. The basic requirements for the crisis management and civil protection in Poland put an obligation on all levels of governmental and territorial self government administration to prepare detailed plans for a broad spectrum of natural disasters and man-made catastrophic events. The risk assessment is an integral part of every crisis management plan at all levels of administration in Poland. Natural disasters and man-made catastrophic events are assessed through the lens of probability of occurrence and severity of consequences. Flooding is assessed in most parts of Poland as a frequent natural disasters, and the severity of consequences varies for specific locations from medium to serious. The valleys of major rivers in Poland are considered as areas of a higher risk of flooding and consequences of floods caused by major rivers are considered serious under typical patterns of occurrence.

In order to minimize the above effects of flooding, the crisis management system has been set up and is operating on 24/7 routine. The crisis response plans assign appropriate state and municipal services and agencies to maintain readiness to respond efficiently to flooding. They are required to employ appropriate assets, following detailed procedures and crisis management plans. The crisis management and civil protection authorities are responsible for warning, conducting rescue operations, neutralizing sources of threats and informing the public opinion. The administration in Poland is obliged, based on the territorial authority, to prevent or minimize adverse effects flooding, conduct rescue actions throughout the flooding

<sup>8</sup> M. Komorowski, Kancelaria Sejmu Biuro Komisji Sejmowych, Biuletyn z posiedzenia Komisji Administracji i Spraw Wewnętrznych NR 225, Nr 4168/VI kad. 5.10.2010 r., Zastępca Dyrektora Rządowego Centrum Bezpieczeństwa, s. 9.

<sup>9</sup> B. Wieteska-Rosiak, Formy pomocy państwa dla poszkodowanych przez żywioł na przykładzie powodzi 2010, *Acta Universitatis Lodzianensis, Folia Economica* 259, 2011, s. 161.

<sup>10</sup> M. Maciejewski, M. S. Ostojki, T. Walczykiewicz, *Dorzecze Wisły monografia powodzi maj czerwiec 2010*, Instytut Meteorologii i Gospodarki Wodnej Państwowego Instytut Badawczy, Warszawa 2011, s. 171-173.

in a planned manner, respond in case of their occurrence, and then focus on consequence management and restoring public services and critical infrastructure. In the event of floods, prevention phase of crisis management consists primarily of monitoring the situation. Meteorological forecasts along with computer modeling are used to assess the probability of flooding and possible scope of its consequences. Prevention phase for flooding is in practice every day before it occurs, as it includes different long and short term actions by a number of stakeholders. Prevention phase is time of work on legal regulations and educating the society. This phase of crisis management is also a time for construction or repairs to protective structures, e.g. levees. The administration is also required to prepare and conduct exercises and training for rescue services and society. Alerting and notification systems are checked. The prevention phase is also used for validation of planning assumptions related to the mobilization of services, providing assistance, rescue and evacuation as well as support by the armed forces in rescue phase of crisis management operations. During prevention phase the costs of possible damage are calculated and calculations of requirements for reconstruction (short-term and long-term) are refined. There is no doubt that prevention phase for flooding is not just monitoring the status of water or precipitation. The requirements for investments in protective infrastructure are obvious, as expensive levees and reservoirs provide in most cases efficient protection against large scale flooding. On the other hand, the costs of such infrastructure are prohibitive to many territorial self government authorities, and they need support from central government agencies. Protective infrastructure requires time for construction, and the longer flooding does not occur, the lesser is the

incentive invest in water management infrastructure.

Preparation phase of crisis management operations related to flooding consists of planning the response and organizing the employment of crisis management and civil protection assets. The most important element of crisis management planning for floods is the development of crisis response plans. The plans assign responsibilities and detailed tasks to specified authorities, services and agencies. The plans determine what will be done, where and when, to optimize the response to flooding. Preparation phase is also used for providing specialized crisis management and civil protection services with additional assets as the situation dictates. During the preparation phase the check of crisis management command, control and communication system, alarm systems, availability of personnel, as well as materiel is conducted. A diligent conduct of activities in the preparation phase should result in having respective governmental and territorial self government authorities and crisis management and civil protection services in full readiness for response to flooding if needed.

During response phase related to crisis management in case of flooding, the most tasks are carried out by the national fire and rescue system organized on the basis of the State Fire Service. When the scale of flooding exceeds the response capacity of specific territorial authorities, they are supported by higher levels of governmental authorities and rescue services. As a rule the response to flooding follows a bottom up approach, with the lowest levels of affected administration in charge of crisis management activities. If municipal authorities are not able to respond to flooding in a timely and efficient manner, they may be supported by provincial, voivodship and central

authorities. Ultimately, it is the Ministry of Internal Affairs that is responsible for coordination of crisis management operations in case of flooding that stretches outside a single voivodship. That's will be the case for large scale floods that impact large parts of Poland. Military assets may support crisis management operations in response to flooding if requested by a relevant civilian authorities. Typically, military assets are used when there is no sufficient civilian crisis management capacity or when military offers unique capabilities that are routinely not available to civilian crisis management and civil protection services. For large scale floods military assistance will probably rather a rule than exception. The build-up of the Territorial Defense Forces in Poland seem to prove such assessment. The assistance to civil authorities in case of natural disasters is claimed to be one of the core mission of those forces and they have been already deployed to such missions in recent years.

Reconstitution phase deals with assessment of damage caused by flooding and aims at prompt recovery of basic public services, such as electricity, water supply, sanitation infrastructure, etc. During this phase, crisis management and civil protection services work along with governmental and territorial self government authorities to determine the scope of recovery to limit the damage caused by the flooding and rebuilding the necessary infrastructure to protect against future floods. When considered in a longer timeframe, the recovery phase is also more labor-intensive and expensive. Depending on how effective are actions in that particular phase of response to floods the resilience to future threats may improve or not. That's why reconstitution phase should be given due attention and resources over longer periods of time, not just after flooding waters have receded.

## Lessons observed during 2010 flood

The flood of 2010 was a real life check for the new crisis management framework that had been adopted in 2007. There were numerous lessons observed in relation to every phase of crisis management. Heavy rains in May and June 2010 that caused flooding needed a few days to develop culmination waves, so the time for initial preparation of crisis management and civil protection services was available. The flood endured for several weeks with new rains preventing recess of high levels of water<sup>11</sup>. That exposed the embankments of Vistula river to prolonged influence of water, and made some of them collapse. This in turn triggered evacuation of population at several locations along the river. The flood of 2010 developed steadily and soon required a coordinated nation-wide response. Around two third of the national rescue and fire-fighting system personnel, in total 18 thousand rescuers along with 18 foreign rescue groups, local community and entities cooperating with the state system emergency medical services were involved in the response phase to flooding<sup>12</sup>. The Armed Forces of the Republic of Poland were involved in response to flooding with about 8,400. soldiers and specialized equipment. Approximately 3.5 thousand police officers and the about 2.8 thousand of the Border Guard personnel were involved in the crisis management operations related to flooding. Due to the limited capacity of the State Fire Service to include insufficient number of personnel, the non-governmental sector,

<sup>11</sup> T. Tokarczuk, Analiza przebiegu sytuacji meteorologicznej i hydrogeologicznej oraz skutków powodzi 2010 w dorzeczu Odry, Instytut Meteorologii i Gospodarki Wodnej, Państwowy Instytut Badawczy Oddział we Wrocławiu, Warszawa 2011, s. 4-8.

<sup>12</sup> L. Marzec, T. Marzec, Powódź 2010 w Sandomierzu - Pierwsza pomoc ratowników Grupy Polskiego Czerwonego Krzyża, Anestezjologia i Ratownictwo 2011, 5: 118-123, s. 119.

including the rescue teams of the Polish Red Cross, was involved in the response to the flood. Unfortunately, the lack of legal solutions regarding the use of civil defense formations in peacetime prevented use of such formations during 2010 flood<sup>13</sup>. Pursuant to the Act on the Universal Obligation of Defense, civil defense in peacetime aims to cooperate in responding to natural disasters and threats to the environment, and to remove their effects. During the floods in 2010, the state of the natural disaster was not announced. The mass media justified this decision at the turn of June and July 2010 with presidential elections. Pursuant to the Constitution of the Republic of Poland, during the state of emergency (which includes the state of natural disaster) and 90 days after its conclusion, elections may not be held for the President of the Republic. It is hard to speculate right now whether such a state had been supportive to the crisis management activities. Nevertheless; one must observe this decision as a potential pattern for the future.

The preparation phase before flooding of 2010 was investigated by the state audit organizations and there are numerous assessments that point at shortcomings. In 2009 the Supreme Audit Office negatively assessed the functioning of the flood protection system in the Małopolskie and Świętokrzyskie voivodships, especially in the context of damage prevention. The auditors found that local authorities had neither reliable data on the technical condition of the flood protection structures such as embankments, roadside ditches nor detailed knowledge about the areas at risk of flooding. It was found that around half of the embankments in Małopolskavoivodship did not guarantee safety. In Świętokrzyskie voivodship the audit discovered deteriorat-

ing technical conditions of flood protection infrastructure. In 2007 27% of embankments were in poor technical condition while in 2008 that number rose to 30%. Before the flood of 2010 only 5% of levees in Małopolska and 12% in Świętokrzyskie voivodships passed technical inspections. In 2008, only 7% of streams and drainage channels were properly maintained in agricultural areas in Małopolska and 36% in Świętokrzyskie voivodship. None of the municipal authorities audited kept records of roadside ditches, and half did not clean them at all, while the largest losses and damages related to the flood were recorded in the road infrastructure<sup>14</sup>. Considering the above experiences, without doubt in the preparation phase the condition of protective structures (in particular flood banks) and legal regulations regarding the provision of assistance by military units in order to accelerate operations should be improved. For the response phase, there is a need to systematically invest in the personnel and technical assets of the national rescue and fire-fighting system and rescue non-governmental organizations, which will improve the response to future large scale floods.

## Conclusions

An increased frequency and raising severity of hydrological natural disasters in Poland has been observed in recent years as a result of the climate change. Floods remain the most frequent natural disaster in Poland and cause significant damage to national economy and environment. The raising temperature of atmosphere creates conditions in Poland for large scale floods caused by prolonged and heavy rains in spring and summer. The lessons observed

<sup>13</sup> Por. W. Krasieński, Ochrona ludności w Polsce w czasie pokoju. Ocena stanu., Zeszyty naukowe nr 1-2/2018 (34), Dęblin 2018, s. 215-216.

<sup>14</sup> Najwyższa Izba Kontroli, Informacja o wynikach kontroli, Ochrona przeciwpowodziowa w województwach małopolskim i świętokrzyskim, Kraków 2010, s. 9 i nast.

during large scale floods in 1997 and 2010 suggest that due attention should be paid to all phases of crisis management related to flood response and mitigation. Prevention efforts need being long-term oriented ones and focus on building resilience to future floods. The preparation phase for response to large scale floods requires truly interagency planning and a better coordination between crisis management and civil protection services with their non-governmental counterparts and military forces. Response to large scale floods will benefit from the capability to expand rescue efforts and employ both civilian and military assets in a coordinated manner. Finally, the reconstruction efforts should not be limited to recovery of previous services and infrastructure only, but also aim at building resilience to future threats tied to large scale floods.

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