



THEORETICAL AND PRACTICAL ASPECTS OF EVACUATION IN CRISIS SITUATION ON THE EXAMPLE OF FLOODS

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ABSTRACT

Evacuation is one of the main tasks for administration and assets owned by it in various types of crisis situations both natural and anthropologic. The most significant example of execution of this task for the security of the population is flood. For the past decades, the risk of flood in Poland was minor, therefore the houses and even the whole districts were built in floodplain areas, the areas potentially in flood risk. There was even a fashion to build houses by the river. Nowadays, when floods became one of the main threads to security, one of the key aspects is to help population living on areas endangered by flood and on flooded terrain. The main type of help is an evacuation from endangered regions. In the paper, author presents the phenomenon of flooding, types and methods of conducting an evacuation under applicable legislation and achievements of the theory and practice of crisis management, also relating to the process of self-evacuation.

Key words: flood, evacuation, self-evacuation

INTRODUCTION

According to constitution of Republic of Poland, the legal reference in Poland are the Act and Regulation as well as ratified international agreements. Therefore, the establishment contained therein are the basis for planning the organized population movements in case of security threats. Among international legal arrangements ratified by Republic of Poland concerning evacuation are: Fourth Geneva Convention and its additional protocols. In the domestic law of Republic of Poland elementary establishment about evacuation can be found in regulations of the Council of Ministers in which it has been determined that competent for the preparation, organization and

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management of the evacuation process are proper for specific region heads of civil defense [1].

Resolutions regarding deadlines, evacuation routes and evacuee distribution area, should be agreed with relevant military and police authority. Whole preparation and its execution ought to be consistent with regulations of the state chief of Civil Defense. In Poland during floods it has special significance in crisis situations of natural origins.

1 TERM AND TYPES OF FLOODS

Theoretically flood is being defined as the rise of water in natural watercourses, still water basins, canals or on sea, during which water after exceeding river banks or coast level, flood over to river valleys or terrains in depression and causes a threat to population or property [2].

This definition refers directly to rise of waters, which is a hydrological phenomenon. Rise of the water level occurs and will occur in the future, despite taken countermeasures and along with civilization development and will bring severe ecological, material and cultural damages. In Poland, due to climatic and geographical conditions, there are different types of floods, occurring in accordance with the hydrological seasons (details shown in table 1.)

Table 1. Types and period of flooding in Poland

Types of floods	Area of occurrence	Hydrological winter						Hydrological summer					
		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Regional floods	storm on the Baltic coast	storm						storm					
		Stall-storm											
								precipitation					
Local floods	rivers river basins and sub-basins	meltdowns											
		meltdown-precipitation											
		stalls											
		failures											
Local floods	in small river basins	meltdowns											
		meltdown-precipitation											
		stalls						stalls					
Local floods	in small city basins	failures											
								precipitation					
MONTHS		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII

Source: own elaboration, based on: Ochrona przed powodzią, Instytut Melioracji i Użytków Zielonych, Falenty 1992, p. 22.

Complete elimination of floods is impossible. As history indicates, only its effects can be reduced. Efficient prevention and protection against the flood, are primarily appropriate regulations, adapted to existing social and economic situation. Polish legislation in this area has been adjusted to the law of the United Europe, including in particular to Water Framework Directive (WFD) from the year 2000, which does not mean, that this law will not be changed and adjusted to occurring, new conditions [3].

Biggest floods in Poland according to the chronicle sources, were: flood in Krakow in years 1475, 1593 and 1697, in Warsaw in 1635 and flood from the year 1774 which affected both Krakow and Warsaw as well as flood of Toruń in years 1570, 1584, 1719. [3] The greatest floods in our times happened in years 1903, 1997 (so called Flood of the Century), 2001 and 2010. Last three massive floods will be used to illustrate the effects of flood. Flood of 1997 was the biggest natural disaster in the history of Poland. It took dozens of human lives, flooded thousands of villages and cities [4]. Material losses were estimated at 12 billion Polish Zloty. As a result 56 people died, 7000 men lost their houses and approximately 40 thousand lost everything they owned. 9000 companies suffered losses due to destruction of property. The water destroyed or damaged 680 000 homes, 843 schools, 100 of which were completely destroyed, 4,000 bridges, 45 of which were completely washed out by water, 14400 km of roads, 2000 km of railways, 613 km of flood embankments and 665 835 hectares of land, more than 2% of the country. Another flood hit the country in July 2001 and the losses were estimated at 4 billion Polish zlotys, and the next one in May 2010 generated a loss of 8 billion Polish zlotys. One of the endeavors to limit negative effects of floods, and also a logistic need, is an evacuation which in polish legislation is regulated by a number of laws, regulations, and instructions.

2 ESSENCE OF EVACUATION

Evacuation (Latin *evacuatio* – draining, emptying, weakening) is one of the basic measures taken to protect live and health of people, animals and rescue of property, including monuments and significant documents, in case of all kinds of threats. Is usually performed as form of displacement from the endangered region (place) to the safe area. Most often it means carrying out an evacuation of people injured or directly threatened (as well as endangered property) upon the occurrence of an incident (ex. flood, fire, explosion or other local threats) in facilities or areas within the area of coverage of mentioned incident. Evacuation may also have preventive nature, for example can be carried out from the area and building in case of imminent danger associated with the spread of the dangerous happenings (such as flood, disasters, chemical dangers etc.), or the threat of conducting military operations in the event of threats of war [5].

Everybody in the endangered region (area of danger) shall be evacuated. The priority should have mothers with children, pregnant women, handicapped people, people in nursing homes, people in orphanages, hospitals for the chronically and

terminally ill, protégés of social care etc. Depending on the kind of evacuation, some people might not be a subject of an evacuation, these are:

- People who are part of rescue organizations, civil protection and law enforcement officers;
- People necessary to ensure the continuity of existence of the local community
- People with mobilization assignments to armed forces or armed formations which are not a component of armed forces
- Officers of armed formations that are not a part of armed forces (Homeland Security Agency, Border Control, Government Protection Bureau etc.)
- People who has been allocated to unit scheduled for militarization or militarized units;
- People, who has been allocated to Civil Defense formation
- People essential in region, due to the execution of tasks by the armed forces [6].

Notifying population about the evacuation should be in the form of statement. To announce that statement mass media can be used (radio, television) as well as notices, flyers, and mobile information points. The authority which announces evacuation specifies which forms of notifications will be used.

For evacuations, all available means of transport are being used. In case of lack of required amount of those assets, evacuation can be carried out in a combined method (with the resources allocated or own) or on foot. It is assumed that the main means of transport during the evacuation are wheeled vehicles. During planning evacuation on wheeled vehicles, it is necessary to know how many people can be taken by the vehicles, the column speed is assumed to be 20km/h and the transportation of 50kg of luggage per person also has to be taken into account. Evacuation on wheeled vehicles should be conducted in columns up to 10 vehicles.

In the evacuated population distribution areas, health care field offices takes care of evacuees. Sanitary and epidemiological care is organized by sanitary and epidemiological stations. Their task is to supervise over sanitary conditions during evacuation and conducting laboratory analyzes in the event of appearance of the symptoms of poisoning or epidemic.

Social-living conditions are being organized by heads of Civil Defense, on area where evacuated population is planned to be distributed. Social-living conditions includes accommodation and providing necessary consumer goods (food, water, clothes and electric energy etc.). To accommodate evacuated population holiday resorts, holiday homes, hotels, dormitories, common rooms and other premises suitable for this purpose are being used. If necessary evacuated people can be housed with local population. The standard is 2-3 square meters of living space per person.

The most important factor determining survival of the population is securing appropriate amount of water for evacuated population. It is correct to assume 15 liters/person/per day as minimum amount of water.

Animals' evacuation is being conducted simultaneously with the evacuation of people. Organizational units that are involved in this process provides, among others, veterinary care, transportation, living conditions and maintain order and security. To evacuation all available means of transport are being used (for short distance - wheeled vehicles) and ultimately, herding animals [7].

Unique equipment and scientific documentations as well as technical and technological documentation are also a subject of evacuation.

While conducting evacuation, depending on the degree and scale, it is necessary to keep record of both people, animals and property.

An attempt to systematize the process of evacuation, is an overview of an evacuation process including: dispersion; co-location; withdrawal; evacuation transport, anarchic evacuation.

Dispersion is being defined as independent trips (self-evacuation, spontaneous evacuation) from high population density regions to places chosen by the evacuees themselves before the announcement of evacuation and in the first stage of evacuation. Presence of this form of evacuation should be taken into account during peace, crisis or war as the first and possibly only stage.

Co-location means residents trips to selected and identified places, which are organized and directed by civil protection authorities on citizens own vehicles and mass transportation. Might be planed and conducted during peace time, crisis and war as a main method of civilian evacuation.

Withdrawal understood as exodus of the people in the period of preparation to military action and during military operations, carried out in the direction of habitation – according to arrangements of leaders who are in charge of those military operations, as well as the body in charge of rescue operations after natural disaster or catastrophe. Only selected groups of inhabitants might be evacuated, for example only women with children, the sick and wounded to established sanitary zones or safety zones.

Evacuation Transport – including population which arrives in the evacuated population distribution areas from another area also covered by an evacuation. Its purpose is to seek for short-term shelter and supplies or only transit, which should take place on the roads designated to evacuation purposes.

Anarchic Evacuation – includes population not familiar with rules of evacuation and organized movements, those people during risk of war or during the

course of wartime operations do not subordinate to the principles of evacuation. The consequence of such actions and behavior might be mass panic.

3 COMMENTS TO THE PLANNING AND EXECUTION OF EVACUATION DURING FLOODS

The base for all preparations to planned evacuations of various areas is formal recognition of evacuation as a method of protection resulting from the legal acts. The managing authority, directing and organizing the evacuation of the population are heads of civil defense. Apart from them, workplace management and residential building managing authority has a duty to establish task forces for evacuation of population during the flood hazard or flood itself as well as organizational elements in the area covered by the evacuation, evacuation routes and target destinations.

Due to circumstances related to type and scale of threat, evacuation of 1st, 2nd and 3rd degree can be recognized.

1st degree evacuation – conducted after occurrence of sudden, not expected and direct threat in order to save life and health of persons injured or in the area of direct risk. Supervisor of the rescue operation is required to notify competent authority of each local government about the decision of evacuation, indicating in particular [6]:

- Area, terrain, buildings or group of buildings for which the evacuation has been ordered
- Type of threat, which was a determining factor for announcement of evacuation
- Number of evacuees
- Location of evacuated population distribution areas

2nd degree evacuation – carried out due to a threat of occurrence or occurrence of large-scale, non-military threats (e.g. floods, serious industrial accidents, radiation hazards, forest fires etc.). It is based on previously prepared planned displacement of people, animals, property from workplaces, hydro-technical facilities, from the floodplain areas and areas adjacent to other object posing potential threat to the population, animals or property in case of damage or malfunction. Characteristic quality of 2nd degree evacuation is situation when basic available assets are insufficient. Because 2nd degree evacuation applies to areas of potential threat, to conduct one, all entities that perform tasks of population protection, equipped with specialized safety equipment and knowledge, might be used in conditions of during direct threat to life and health [6].

3rd degree evacuation – is based on previously planned dislocation of population, animals, property, during increasing the defense readiness level of the state. It is conducted during threat of state safety and war. [6] Preparing the evacuation during wartime includes:

- evacuation from predicted regions of military operations

- evacuation of population, which express the desire to leave areas that will be potentially affected by military operations

Within the 1st, 2nd and 3rd degree evacuation, both organized evacuation and self-evacuation, involving the movement of people from areas that might be possibly exposed to actions that might be a thread of life and health, has to be planned. In such case, directing the evacuation will be limited to announcing recommended directions, roads and areas. The rule that has to be made while displacing population is not to separate families. Evacuation of the population should be conducted within given organizational unit. In order to increase the effectiveness of evacuation, on evacuation roads and in evacuated population distribution areas following units are being organized [6]: inventory-information unit, evacuees collective units, transport loading units, medical units, logistics units, including technical assistance units, unloading units and distribution units.

Due to the conditions varying from the nature of the danger **planned evacuation and emergency evacuation** can be distinguished. Planned evacuation is prepared in advance, and is based on organized displacement of people from endangered areas to adjacent areas and is conducted on the grounds of evacuation plan. Emergency evacuation on the other hand is immediate displacement of people from areas where unforeseen direct threat to life and health occurred.

During the flood, evacuation role will relate to people, animals and property evacuation. In such cases, evacuation can be conducted as mentioned before **planned evacuation or emergency evacuation**.

Planning in case of evacuation is a duty of all authorities responsible for general safety. Evacuation plan should specify in particular [6]:

- objects and areas intended for evacuation
- criteria by which people should be appointed, including order in which they would be evacuated
- estimate the possible scale of self-evacuation
- criteria for making the decision of evacuation
- people (entities) authorized to announce the evacuation and methods of announcing evacuation
- routes and destination of displacement of evacuated people and property
- person (group of people, teams, formations etc.) responsible for conducting an operation
- spots (points) of assembly of evacuees, loading onto the means of transport
- unloading spots (points), distribution spots (points)
- detailed lists and manner of implementation of the tasks carried out at designated spots (points) by individual teams
- way to secure and protect evacuated areas

- summary of planned means of transport, places selected for temporary residence and sources of materials, logistical means and procedure of their acquisition
- way of return of property and people to domicile or location after cessation of the threat
- organization of communication and traffic control

Tasks relating to the preparation and conducting the evacuation and projects associated with it, are carried out by a number of entities whose expertise are defined in applicable legislation. Their functions are among others: ensuring the conditions for survival of evacuated population by meeting the social-living needs, organizing and providing the means of transport for the purposes of evacuation, protecting the evacuated property and securing the abandoned property.

Although evacuation of population endangered by the impact of the flood is necessary, many people are surprised by the flood and very often act irrationally, because person in panic often makes mistakes, which may endanger not only his life but his family as well by rescuing their property in wrong order.

Empirical studies¹ shown that conducting evacuation in conditions of unexpected flood is the hardest possible situation. Because of that, it is necessary to acquaint earlier with building evacuation exits and movement order to designated places where the possibility of safe evacuation exists.

Each family planned for evacuation should secure the house and its equipment mostly by turning off power supply and turning off all gas installations. If both the situation and possibilities allows, it is advisable to transfer all devices that require power supply or gas to higher floors. Everything that could be destroyed by the water should be moved from the cellars.

Evacuees in every type of evacuation should be prepared to bring along their personal equipment (warm and waterproof clothing), depending on season, necessary medicines, food, means of communication and identification documents.

In farmstead the pesticides should be secured, because when being flooded might cause significant land contamination, therefore securing it is exceptionally important. In case if on the farm there is livestock, owner is obliged to participate in process of the evacuation and provide necessary help, a neighbor assistance might also be indispensable.

Animal evacuation is complex process, requiring proper planning and necessary skills. For conducting an animals evacuation are responsible the hosts of the facilities where livestock is located. Often it is conducted along with people evacuation and only then, when it does not pose a direct threat to people conducting the evacuation.

¹ Both authors were in charge of military assets during flood in Wrocław in 1997 and were part of liquidation of consequences of the floods on the local scale between 1975 and 1989.

The principle rule is that first should be evacuated breeding animals, then farm animals. Most frequently during planned self-evacuation these activities are done by the farmers themselves. Problem arise when animals need to be evacuated from already flooded areas. In such cases, it is often necessary to use motorized water equipment. To save animals endangered by flood the simplest solution and often the best one is to release them from confinement or tethering. Freed animals will save themselves. Providing feed and water for animals is also necessary and need to be provided mostly for first three days.

4 SELF-EVACUATION

Self-evacuation is based on independent movement of population from areas where direct life and health thread occurred or might occur, beyond the danger area. Self-evacuation is being conducted primarily based on own capabilities (transportation, accommodation etc.) [6].

Due to the rapid development of automotive industry, having their own car by more and more families has to be taken into account as important factor in self-evacuation and in overall evacuation procedures. Self-evacuation can occur even before the decision about evacuation, as well as during its curse. In this context, particular attention should be paid to estimate possible scale of self-evacuation.

Being in charge of self-evacuation will be limited to announcing recommended directions, evacuation routes and destination of displacement areas of evacuated people and property. This kind of evacuation is characterized by poor organization, uncontrolled movement of population, lack of documents etc. Rule that has to be implemented is not to separate families. Evacuation of the population should be conducted within given organizational unit. If the need of displacement of population outside the organizational unit occurs, it has to be agreed upon between authorities of both organizational units.

With partnership agreements between neighboring local governments they can agree to have joint communication systems, trained personnel, specialized equipment, etc. [6]

However studies and observations indicate that unlike other developed countries, self-evacuation in Poland is not a smooth and collision-free process. For an example in USA, after receiving a signal of danger, citizens secure their homes and move to designated place. Assets owned by local authorities can be used to evacuate institutions that cannot self-evacuate (hospitals, nursing home, archives, offices, etc.). In Poland though, in people minds lies the fear of their wealth and property and a sense that government is obliged to conduct evacuation of everybody. Therefore, authority needs to spend its resources and assets, which should be spend on helping those, who cannot self-evacuate.

CONCLUSIONS

Evacuation in normative acts and plans is categorized and defined precisely both in organizational aspects and techniques of evacuation. The key element remains the planning of evacuation, indicating necessary elements to carry it out.

In Poland, the majority of residents' lives and works in areas threaten by floods. The results of inspection by Supreme Audit Office indicates that condition of food embankments, mostly the old ones, is not satisfactory and in many places threatens to break. In such situation, the positive effect of rescue operations depends on correct response to the warnings. Well prepared and verified evacuation plans affect the safety of population as well as those taking part in rescue operations. The analysis of rescue operation shows that animals are more often evacuated than people, because part of population does not want to be evacuated and stay to protect their belongings.

It is beyond any doubt, that simultaneously with improving active and passive flood protection, measures to change people mentality and improve education in this area should be taken.

Authors are well aware that they have not fully presented the problem of evacuation during the floods, because the aim of the article was to show only the essential aspects of the problem.

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