

Original article

## Planning the evacuation of animals from large objects

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### INFORMATIONS

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### ABSTRACT

The article addresses the specificity and issues related to the evacuation of animals in an emergency situation. The author focused on the basic undertaking which is planning the evacuation of animals, mainly from large objects such as ZOOs, farms or studs. The article presents proposals for structures of evacuation teams, their competences and procedures. The attention was paid to the effectiveness of evacuation taking into account time relations, including distance during the occurrence of an event. The author indicates important parts of the planning, namely the development of the right documentation and the verification carried out in terms of the feasibility of the implementation of the projects assumed in the plan. The article describes the structure concept of evacuation plans of animals from a large facility.

### KEYWORDS

evacuation, animals, danger



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“The fate of animals is inextricably linked with the fate of man.”

*Emil Zola*

## Introduction

During Hurricane Katrina, over two hundred and fifty thousand animals were killed or lost. More than ten thousand fish were lost in the New Orleans Aquarium. Hurricane Harvey killed six hundred thousand animals. Two million livestock died as a result of Hurricane Floyd in North Carolina. Each threat, apart from the primary effects, generates secondary effects to a greater or lesser extent, which are no less tragic than the original ones – Figures 1 and 2.

Only these numbers indicate how important the safety of animals is during all kinds of threats. Hence the necessity, in addition to developing management plans in emergency situations (crises) for people, of working out – in parallel or as annexes – animal safety plans. The basic element of such a plan should be evacuation procedures related to animals.



**Fig. 1.** The secondary effects of Hurricane Floyd, flooding of lands – North Carolina – 1999  
*Source: Photo by Romuald Grocki.*



**Fig. 2.** The secondary effects of Hurricane Floyd, flooding of lands – North Carolina – 1999  
*Source: Photo by Romuald Grocki.*

Evacuation is one of the means to reduce losses in an emergency. Depending on the distance of the time of the event occurrence, its effectiveness may vary. Distance in time [1] is understood as the possibility of preparing an evacuation, i.e., the implementation of activities included in the plan and the time of occurrence of the event. In general, one can talk about a direct, not-too-distant in time and remote in time event. Regardless of the distance in time, the effectiveness of the evacuation will be closely related to the implementation of the undertakings and procedures included in the evacuation plan. In

many cases, the lack of an evacuation plan caused huge losses among animals in an emergency situation (fire, flood). The absence of procedures, preparation of transport, evacuation places prevented proper evacuation. It is enough to mention that during the floods in 1997, zoological gardens were threatened. In some of them, the problem of evacuation was the cause of the death of a significant number of animals. In a critical situation, in order to alleviate or avoid suffering or to shorten the suffering of animals, the possibility of killing (euthanasia) parts of animals was considered. It is to be realized that large and heavy animals of large mass and size can be evacuated, such as the rhinoceros from the Serengeti National Park (Germany) shown in Figure 3.



**Fig. 3.** The rhinoceros in one of the zoological gardens – the Serengeti National Park – Germany

*Source: Photo by Romuald Grocki.*

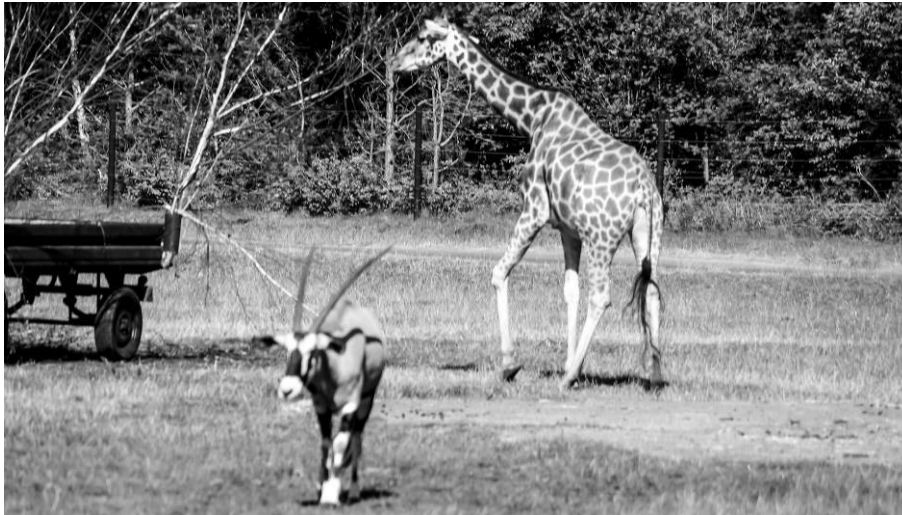
The scale and diversity of sizes of animals in the zoo (Fig. 4) is one of the main transport problems during the evacuation. It may be necessary to evacuate both small and large animals at the same time.

Logistics solutions, including those concerning animal transport, are very important for the evacuation. During the organization of the evacuation and its start, health and safety of people should always be taken into account. Evacuation of animals can be carried out when human life and health are no longer endangered.

### **1. Stage of readiness**

The foreground undertaking at the stage of readiness is to develop a plan for crisis situations. It is true that the plan itself will not prevent a catastrophic event, but the planning process will increase the safety of both people and animals. One of the most important elements of planning is identifying threats that may occur in a specific area and performing a detailed risk analysis. It is only on this basis that one will be able to plan

forces and measures to reduce the risk of danger and minimize the effects of the threat. After defining the exposure, it will be possible to determine the vulnerability of individual animals, considering both the character of the animals and their location. One should consider whether they are livestock, domestic animals or animals for show (as in the ZOO). The number of animals will be an important factor conditioning the scope of evacuation. For example, there are 10,502 animals belonging to 1132 species in the ZOO in Wrocław. It is easy to see in Figure 5 that one or two species of animals can form a significant group of animals that will have to be evacuated in the event of an emergency.



**Fig. 4.** Different sizes of animals – the Dortmund Zoo  
*Source: Photo by Romuald Grocki.*



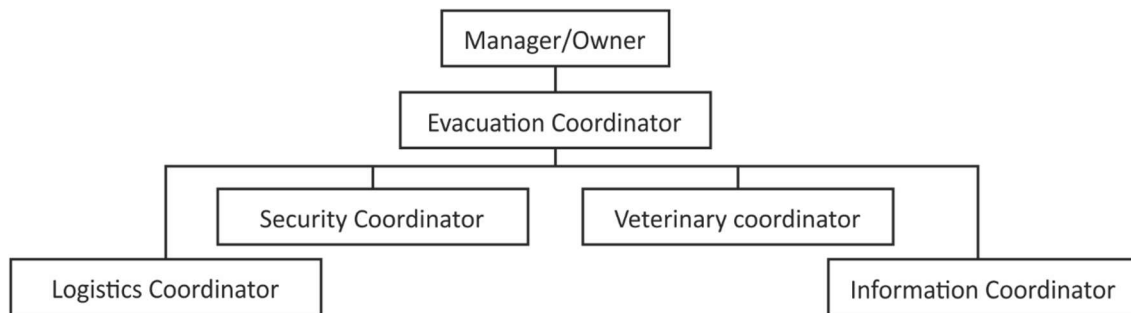
**Fig. 5.** Animals – the Safari Dvur Zoo  
*Source: Photo by Romuald Grocki.*

The main threats to animals include:

- natural hazards, such as fire, flood, etc.,
- epizootic – an epidemic may be the secondary effect,

- escapes of animals at and from the ZOO,
- purposeful human activity.

It is necessary to include the organizational structures of the evacuation team in the animal evacuation plan. Figure 6 presents the concept of such a structure. It is designed for larger entities, however, in the case of small studs or households, some of these structures may be combined. However, it is necessary, albeit to a lesser extent, to implement all measures related to evacuation procedures.



**Fig. 6.** Organizational structure of the evacuation team  
*Source: Own study.*

After having established the structures of the evacuation team, the next step will be assigning the scope of tasks and responsibilities to individual organizational units. These tasks should be distributed to all stages of management in emergency situations (readiness, response and recovery). The tabulated summary of tasks and responsibilities is presented in Table 1. The stage of readiness combines the stages of preparation and prevention, as both stages are carried out in parallel.

**Table 1.** The model table for the scope of tasks and responsibilities/example

Tasks/responsibilities/procedures			
Function	Stage		
	Readiness	Response	Recovery
Manager			
Evacuation Coordinator			
Security Coordinator			
Veterinary coordinator			
Logistics Coordinator			
Information Coordinator			

*Source: Own study.*

It is required to develop evacuation procedures at individual positions, in accordance with the scope of duties and responsibilities. The plan is frequently confused with the standard procedure. What is the difference between a plan or a schedule of activities and a standard operating procedure?

In simple terms:

- the plan defines processes of what should be done in a given situation,
- the procedure describes how to implement these processes: – how, who, what, when [2, p. 1].

Each procedure has a specific format, structure and content.

The Standard Operating Procedure (SOP) – this is a document describing the stages of a given process, including the materials and methods used, and the expected final product. It describes in detail the method of implementation of repetitive processes and defines:

- what should be done in a given situation,
- who is competent to perform specific activities,
- who is responsible for their implementation,
- where activities are carried out,
- when activities are carried out,
- logical order of activities,
- based on which documents actions are performed,
- what tools are necessary to complete the task,
- principles of documenting the activities carried out and control over their conduct [3].

Each procedure has its structure, format and content. For simple identification and quick finding of the right procedure, it should have a headline with basic information – Figure 7.

Topic: ..... Contractor: .....	<b>Standard Operating Procedure No. ....</b>
Approved by: ..... Date of implementation: .....	Update date: ..... Approved by: .....
	Page ..... out of .....

**Fig. 7.** Example of the heading of Standard Operating Procedure  
*Source: Own study.*

In order to ensure efficient evacuation of animals, it is indispensable to have a list of the livestock with the characteristics of individual animals. To identify animals, each of them ought to have an identification card, which should include the following information (example):

- personal data of the owner of the animal,
- the name of the animal (horse, rhinoceros, giraffe, ...),
- the ordinal number of the animal in the register,
- the animal identification number,

- the date of birth of the animal (dd.mm.yyyy),
- sex of the animal,
- the breed of the animal,
- the identification number of the mother (enter if known),
- the identification number of the animal’s father (enter if known),
- the date of arrival of the animal at the herd’s place (dd.mm.yyyy),
- health status (remarks about possible medications, injuries, etc.),
- weight (applies to large animals).

The register of animals should include not only a quantitative inventory, but also the data listed above.

The register of farm animals (i.e., cattle, sheep, goats and pigs) based on applications submitted by animal keepers kept by the Agency for Restructuring and Modernization of Agriculture is a quantitative census and concerns mainly farm animals. ZOO animals are also subject to the obligation of identification and registration. (e.g., the International Species Information System).

To prioritize potential threats, it is necessary to conduct risk assessment. On this basis, it will be possible to specify the most serious threats to a specific area or object. The primary purpose of risk estimation is to assess the likelihood of an event occurrence, the effects it may cause, and an attempt to answer the following questions:

- what can happen?
- how can this happen?

To estimate the risk, it is necessary to have specific information. Losses can be forecast based on the predicted nature of the threat and the location and technical conditions of the facilities. Taking the values of such parameters as probability and predicted losses, the risk of danger can be determined. In the initial analysis, descriptive terms are generally used instead of numerical ones. This applies to both probability and losses. The terms “small”, “medium”, “large” are usually used, which, however, can only be a preliminary indicator for the analysis, but not for the development of the final results of the risk management process. One of the forms of presenting the magnitude of risk is the “3x3” risk matrix. This means that both probability and losses are expressed in three descriptive quantities [3]. Table 2 shows the risk matrix for which the risk parameters (probabilities and losses) were determined by the afore-mentioned terms.

**Table 2.** An example of the risk analysis matrix

Effects Probability	Negligible	Medium	Significant
Significant			<b>Flood</b>
Medium	Fire	Strong winds	
Negligible	Bomb threat		

Source: Own study.

It is advisable to develop a risk matrix for individual animal species using the exemplary division of animals, presented in Table 3, due to the evacuation process. The matrix is created for a given area and species of animals. Table 2 is of illustrative nature.

Logistic activities will include the preparation of evacuation through:

- organization of transport,
- arrangement of substitute places,
- providing equipment (including for workers – animal care-takers),
- providing conditions in a new place of residence,
- providing veterinary care,
- the communication system.

Being aware of the diversity of species, character, sizes, it is necessary to pre-divide animals taking into account their individual characteristics. Table 3 below provides the suggestion of such a division considering the possibilities of preparing animals for transport. Transport and means of transport should be understood as:

- means of transport – these are parts of road vehicles, rail vehicles, ships and aircraft used for transporting animals, as well as containers during land, sea or air transport,
- transport – all movements of animals with the use of a means of transport, which includes loading and unloading of animals [4].

**Table 3.** Sample division of animals for evacuation purposes

		Animals/division																							
		safe												dangerous											
		small				medium				large				small				medium				large			
Sector		crawling	swimming	flying	walking	crawling	swimming	flying	walking	crawling	swimming	flying	walking	crawling	swimming	flying	walking	crawling	swimming	flying	walking	crawling	swimming	flying	walking
	1.																								
2.																									
3.																									
4.																									
5.																									
..																									
Total																									

Source: Own study.

The suggested division of animals:

- small, medium, large,



- safe, dangerous,
- crawling, swimming, flying, walking.

Additional classification:

- sick, healthy,
- unique/protected species.

Various means of transport can be used for the evacuation of animals – Figures 8 and 9. Vehicles most often used in large-scale transport, such as the evacuation of animals from the zoo, include:

- specialized animal transporters,
- public transport,
- trailers,
- agricultural vehicles,
- box vans.

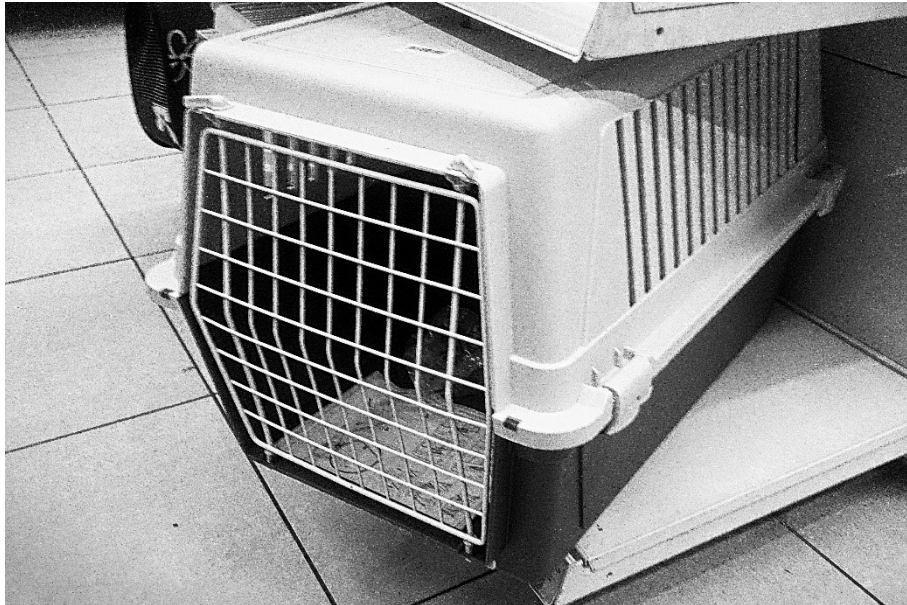


**Fig. 8.** Trailers for transporting horses

*Source: Photo by Romuald Grocki.*

When planning transport means for the evacuation of animals, the characteristics of the animal (weight, size, behavior, health status, etc.) should be taken into account. Many factors affect safe transport, including

- service-caretakers of the animal,
- veterinary care,
- quality and type of transport (area, ventilation, temperature, height),
- transport time,
- weather,
- topography.



**Fig. 9.** The container for transporting small animals

*Source: Photo by Romuald Grocki.*

During transport, the conditions of transport must be checked periodically if there is any doubt, a break should be taken because it is much better to add an hour or two to the trip than lose an animal.

For a more efficient organization and preparation of transport, it is crucial to prepare at the stage of planning the initial distribution of animals for individual means of transport – Table 4.

**Table 4.** Model table for planning means of transport for evacuating animals from the ZOO

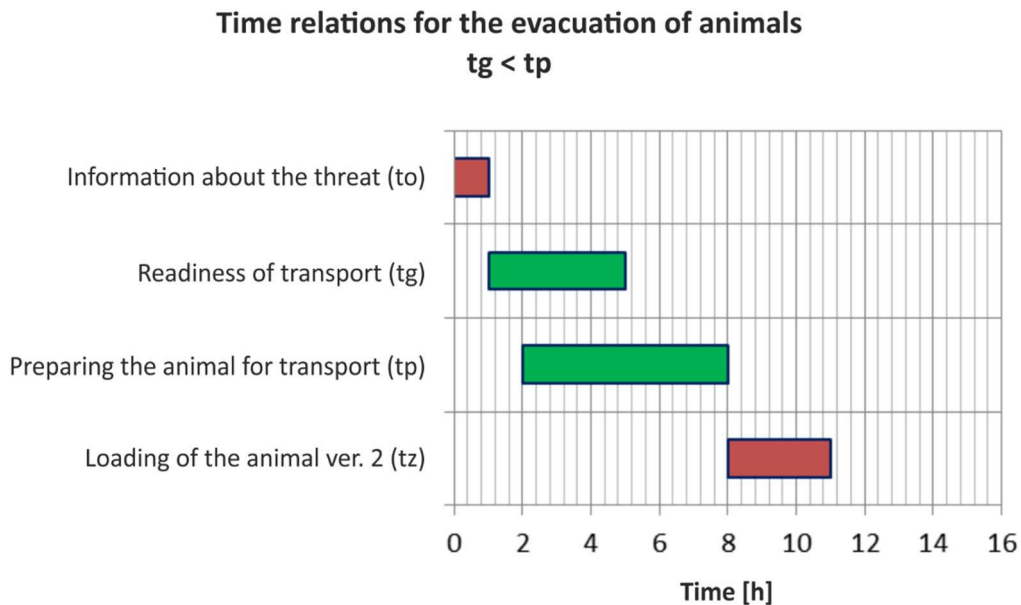
Type of transport/ carriage	Time of readiness	Owner	Fuel	Number of animals		
	[h]			small	medium	large
Specialized vehicle						
Modernized vehicle						
Box van						
Trailer						
Agricultural vehicle						
Private transport						
Boxes/containers			not applicable			
others						

*Source: Own study.*

In crisis situations, in the decision-making process and the implementation of tasks, time is one of the factors limiting the effectiveness and efficiency of operations. Hence, considering the time relationships necessary to complete the task is an essential element of planning. Planning should comprise:

- time of receiving information about the threat,
- time of readiness of transport means (access, preparation),
- time of preparing the animal for transport,
- time of loading the animal,
- transport time.

Simple examples of time relations (Gantt chart) are shown in Figures 10 and 11.



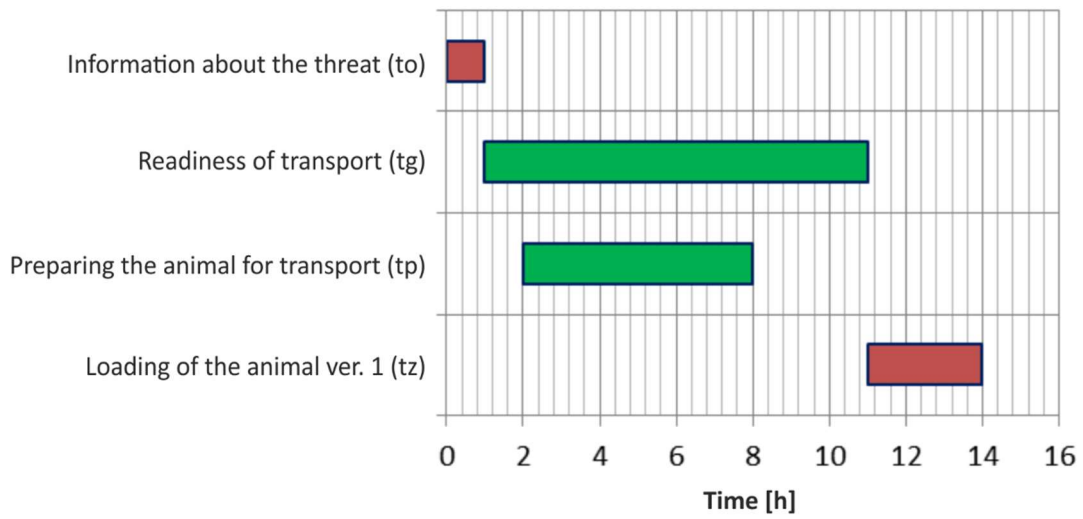
**Fig. 10.** Time relations for the evacuation of animals – the time of readiness of means of transport is shorter than the time of preparing the animal for evacuation  
*Source: Own study.*

In practice, Figure 10 should be pursued. This means that animals can be evacuated as soon as they are ready for that and do not wait for transport. This solution shortens the time of evacuation. The planning should take account of the equipment of the ZOO staff responsible for preparing the animals for evacuation with the necessary things, which will increase the safety of the personnel, care-takers, but also facilitate the preparation of the animal for transport. Depending on which animal will be prepared for evacuation, the range of personnel equipment will be different. Nets, gloves, syringes, sleeping cartridges, chests, and darts are examples of basic equipment for an employee preparing large animals, such as chimps, for evacuation.

An important element in the evacuation process is to plan roads leading to the destination and substitute places. Substitute places can be as follows:

- other zoological gardens,
- previously prepared and adapted areas, rooms,
- boxes and rooms in studs, farms, etc. – Figure 12.

**Time relations for the evacuation of animals**  
**tg < tp**



**Fig. 11.** Time relations for the evacuation of animals – the time of readiness of means of transport is longer than the time of preparing the animal for evacuation  
*Source: Own study.*



**Fig. 12.** A substitute place in the stud or the so-called hotel for animals  
*Source: Photo by Romuald Grocki.*

Preparation and development as well as practicing the evacuation plan will allow for more effective evacuation in an emergency situation and facilitate the decision-making process.

## 2. Stage of responding

The stage of responding is to take practical action after receiving information about the threat. It is the launch of procedures included in the plan and the commencement of evacuation. Depending on the time it takes to accomplish particular tasks until a threat occurs, the scope of these activities will vary. It may prove necessary to take extremely difficult and drastic decisions, among others due to the lack of time to evacuate all animals. It may be a problem which animals and in what order to evacuate. Which animals are to be evacuated and which of them left and sheltered in a different way? Numerous factors will affect the decision on the evacuation or sheltering animals on the spot. For example, the size of a species or the difficulty in accessing a safe place may prevent immediate evacuation. Species of special value (e.g., protected) can be evacuated as soon as information about the threat has been obtained. It is related to, among others, to the fact that the loss of individuals with high genetic values can mean a significant loss of the entire population. Another drastic problem and a very difficult decision will be actions concerning sick animals with various injuries that cannot be evacuated. Some of them will have to be euthanized. The decision to euthanize animals and choose the appropriate method of euthanasia requires careful consideration in all possible scenarios, but the urgency of taking such decisions in an emergency should be borne in mind.

In the absence or limited possibilities of caring for animals, including veterinary animals, especially of sick or experimental ones, euthanasia may be the only way to relieve their pain and suffering.

It is unacceptable to leave an anesthetized animal in the clinic unless the staff is in imminent danger.

“Animals that cannot be transferred or protected from the consequences of an incident must be humanely neutralized” [1].

At the evacuation point, each animal will still need care. Guardians should be assigned to stay with the animals while in the evacuation places.

## 3. Stage of reconstruction

The playback stage begins right after the first information received that the threat has passed. It should, among others, refer to the assessment of the impacts of the event, the possibility of liquidation of these effects, and the time required for the re-adaptation of the facility for use. A short-term, medium-term and long-term action plan should be developed to restore the functioning of the facility. It is necessary to develop analyses on the causes of the event and evaluate the actions undertaken during the event.

## Conclusion

Planning is one of the basic undertakings determining the effectiveness of evacuation of animals during the threat. Before the plan has been drawn up, several fundamental questions must be addressed:

- what the possible threats are,
- how to minimize the effects of the threat,
- whether a register of animals exists,
- whether the transport of animals is ensured in logistical terms,
- whether and how substitute places are prepared,
- whether the personnel know the emergency procedures.

Without answering these questions, it will be difficult to talk about a real action plan, and it will only be a dead document.

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### **Conflict of interests**

The author declared no conflict of interests.

### **Author contributions**

The author contributed to the interpretation of results and writing of the paper. The author read and approved the final manuscript.

### **Ethical statement**

The research complies with all national and international ethical requirements.

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domestic and foreign universities. He specializes in the issues of risk reduction, flood protection and crisis management. Author of many books and publications in Poland and abroad, concerning crisis management, risk analysis and protection against floods. Participant in training in crisis management in, among others, the USA, Sweden, Greece, and Germany. As part of cooperation with NATO, he participated in the work of the NATO Crisis Management Assessment Team in Macedonia. Consultant and international expert in projects of the World Bank and the European Union, and other international research programs on risk prevention.

### Planowanie ewakuacji zwierząt z dużych obiektów

#### STRESZCZENIE

W artykule przedstawiono specyfikę i problemy ewakuacji zwierząt w sytuacji zagrożenia. Autor skupił się na podstawowym przedsięwzięciu, jakim jest planowanie ewakuacji zwierząt, głównie z dużych obiektów, takich jak: ZOO, ферmy czy stadniny. W artykule zostały przedstawione propozycje dotyczące organizacji struktur zespołów ewakuacyjnych, ich kompetencji oraz procedur działania. Zwrócono uwagę na skuteczność ewakuacji z uwzględnieniem relacji czasowych, w tym odległości w czasie wystąpienia zdarzenia. Autor przedstawił jak istotną częścią planowania jest opracowanie właściwej dokumentacji oraz weryfikacja pod względem realności wykonania założonych w planie przedsięwzięć. W artykule przedstawiona została koncepcja struktury planu ewakuacji zwierząt z dużego obiektu.

**SŁOWA KLUCZOWE** ewakuacja, zwierzęta, zagrożenie

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