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Safety of the civil society and the choice of the type of evacuation

1. Introduction

“**I**n connection with the threat to people's health and life caused by the found unexploded bomb from World War II in the city of Police at 3 Tanowska Street, I hereby order the evacuation of all people staying in the city of Police except for streets such as Piaskowa, Bursztynowa, 26 Kwietnia, 1 Maja, Okulickiego, Roweckiego, Roweckiego, Kresowa, Korczaka and the estates such as Mścięcino and Jasienica. The evacuation will be carried out on December 09, 2018, between 6:00 and 9:00 a.m. The residents will return after the action on December 9, 2018, after 12:00 p.m. following the signal by the crisis management services. (...)”⁷⁸ This is the excerpt from the announcement by the Mayor of the city of Police, Poland, on the evacuation of the population in connection with the threat occurred. Every person who were staying in a certain area at a certain time, and city residents, had to undergo an evacuation. This meant that each of the residents had to decide whether they would self-evacuate or take advantage of a collective evacuation organised by crisis management services.

Civil society is a group of people with special character traits. This is a group that critically evaluates the actions of the authorities and other groups involved in the organization of evacuation and does not always follow the recommendations issued. Civil society makes

⁷⁸ “Powiat Policki,” Komunikat Burmistrza Polic w sprawie przeprowadzenia ewakuacji z obszaru zagrożonego eksplozją niewybuchu [The Announcement by the Mayor of the city of Police on the evacuation from the unexploded bomb], accessed January 26, 2020, <http://policki.pl/wp-content/uploads/2018/12/Komunikat-Burmistrza-Polic-ws.przeprowadzenia-ewakuacji-z-obszaru-zagrozonego-eksplozja-niewybuchu-1500m.pdf>

various decisions on its own, also including the case of evacuation: whether to evacuate, at what time and how.

The importance of civil society in building and maintaining a democratic society has attracted the attention of concerned researchers⁷⁹. The importance of civil society is also of paramount importance in maintaining the security of the general population. Therefore, it is essential to learn about its features and methods of operation, and consequently to develop recommendations for evacuation conducted in a planned manner.

It should be emphasized that in emergencies, social coordination is particularly critical and challenging. People who are connected to each other may react better or worse to undefined dangers than individuals⁸⁰. Connected people are the members of civil society for whom the exchange of information as well as participation in social life is crucial, also with the use of social media.

Different kinds of collective threats⁸¹ challenge human coordination and communication. Needless to say, in case of threats, fast and reliable exchange of information, as well as coordinated conduct and dedication are vital for individual and collective security⁸². Therefore, it is of paramount importance to present recommendations for evacuation activities, taking into account behaviour characteristic for civil society.

Moreover, it should be highlighted that gathering of information is of great significance for the safety of the population and frequently turns out to be crucial for making accurate judgments⁸³. This is particularly important due to the vagueness of information that may cause confusion or delay the decision to evacuate⁸⁴.

⁷⁹ Jean Cohen, Andrew Arato, *Civil Society and Political Theory* (Cambridge: MIT Press, 1992); Ernest Gellner, *Conditions of Liberty: Civil Society and Its Rivals* (New York: Allen Lane/Penguin Press, 1994).

⁸⁰ Hirokazu Shirado, Forrest W. Crawford, Nicholas A. Christakis, „Collective communication and behaviour in response to uncertain ‘Danger’ in network experiments,” *Proceedings of The Royal Society A*, no. 476, 20190685 (2020), doi: <https://doi.org/10.1098/rspa.2019.0685>.

⁸¹ Feng Fu, Nicholas A. Christakis, James H. Fowler, “Dueling biological and social contagions,” *Scientific Reports*, no: 7, 43634 (2017), doi: 10.1038/srep43634; Dirk Helbing, Dirk Brockmann, Thomas Chadeaux, Karsten Donnay, Ulf Blanke, Olivia Woolley-Meza, Mehdi Moussaid, Anders Johansson, Jens Krause, Sebastian Schutte, et al., “Saving human lives: what complexity science and information systems can contribute,” *Journal of Statistical Physics*, no. 158 (2014): 735–81, doi: 10.1007/s10955-014-1024-9; Rebecca R. Thompson, Dana R. Garfin, Roxane C. Silver, “Evacuation from natural disasters: a systematic review of the literature,” *Risk Analysis*, no. 37(4) (2016): 812–839, doi: 10.1111/risa.12654.

⁸² Carlos Castillo, *Big crisis data: social media in disasters and time-critical situations*, (Cambridge: Cambridge University Press, 2016).

⁸³ Eva Regnier, “Public evacuation decisions and hurricane track uncertainty,” *Management Science*, no. 54(1) (2008): 16–28, doi: 10.1287/mnsc.1070.0764.

⁸⁴ Thomas E. Drabek, *Human system responses to disaster* (New York: Springer, 1986).

Making the right choices in a situation of imminent threat where people have little time to make decisions and act is key for protecting their lives and health. It becomes imperative in situations when an evacuation needs to be conducted. The spectre of an imminent threat can make the actions taken unreasonable and people will ignore the authorities' recommendations and will act on their own. Therefore, it is necessary to determine what type of evacuation should be recommended.

The aim of the study was to determine what type of evacuation (collective or individual) is recommended to ensure the safety of civil society. The aim of the study was not to lead to the participation of civil society in negotiations concerning the process of planning and organizing the evacuation, as the literature emphasizes that increasing the number of groups participating in the negotiations complicates the process of reaching an agreement⁸⁵. With more discussion and planning groups, varying stances are created, which is not conducive to decision making⁸⁶. When planning an evacuation, it is necessary to consider the specific characteristics and nature of civil society and, consequently, its behaviour and conduct. As a result, it is possible to develop recommendations for evacuation planning.

2. Materials and methods

No publication devoted entirely to the analysed topic was found, only publications referring partially to the issue under study. The authors mentioned the ones most useful from the point of view of the analysed topic in this article.

During the research, the following main research problem was solved: What kind of evacuation (collective or individual) is recommended to ensure the safety of civil society? The main research problem was supplemented with the following specific problems:

- 1) What is evacuation and what are its types?
- 2) What are the advantages and disadvantages of individual and collective evacuation?
- 3) What are the features of civil society and how do they determine the choice of the type of evacuation?

⁸⁵ Desiree Nilsson, "Anchoring the peace: Civil society actors in peace accords and durable peace," *International Interactions*, no. 38(2) (2012): 243–66.

⁸⁶ Anthony J. Wanis-St, Darren Kew, "Civil society and peace negotiations: Confronting exclusion," *International Negotiation*, no. 13(1) (2008): 11–36; Jonathan K. Zartman, "Negotiation, exclusion and durable peace: Dialogue and peacebuilding in Tajikistan," *International Negotiation*, no. 13(1) (2008): 55–72.

4) What effects does the choice of a particular type of evacuation have for the safety and security of civil society?

The following working hypothesis was assumed for the main research problem: It was assumed that in an emergency, collective evacuation should be used, then it is possible to guarantee the safety and security of civil society. This is since it is an evacuation properly prepared in advance, as opposed to an individual evacuation, which is usually carried out spontaneously.

3. Results

3.1. The concept and types of evacuation

Evacuation is one of the basic activities that aim to protect the life and health of people, animals and property in the event of various types of threats. Evacuation can be carried out at different stages of threat. Most often, evacuation is carried out after a hazardous event occurs. There are also evacuations that are carried out in a preventive manner, i.e. before a threat occurs. All persons present in the place where threat occurs are evacuated⁸⁷.

Evacuation is conducted in various situations. “The greatest threat that an evacuation may entail is an armed conflict and a fire in peacetime. Other threats include terrorist attacks, natural disasters other than fire, technical failures, radioactive contamination, biological and chemical hazards”⁸⁸. Whether there will be a state of war or peace, people will have to choose whether they leave the place where the threat would occur or whether they do so together with others in a manner organised by the relevant civil defence or crisis management authorities.

In order to undertake an evacuation, it is extremely important to observe the symptoms of threat in advance and to inform the public about the threat and the recommended course of action. “Depending on the type of disaster, prewarning of sudden-onset disasters may leave enough time for evacuation prior to the event”⁸⁹. The activation of early warning systems can be crucial for preparing for evacuation, for example by packing the necessary things (recommended by the relevant authorities).

⁸⁷ *Instrukcja w sprawie zasad ewakuacji ludności, zwierząt i mienia na wypadek masowego zagrożenia* [Instruction on the principles of evacuation of people, animals and property in the event of mass threat], (Warsaw: 2008), 3.

⁸⁸ Krzysztof Przeworski, *Ewakuacja jako sposób ochrony ludności* [Evacuation as a method to protect the population] (Warsaw: Akademia Obrony Narodowej, 2002), 8-10.

⁸⁹ Wenmei Gai, Yan Du, Yunfeng Deng, *Decision-making Analysis and Optimization Modeling of Emergency Warnings for Major Accidents* (Beijing: Springer, 2019), 151.

According to the Dictionary of the Polish language, the term evacuation should be understood as: "transporting people, animals and property from areas threatened by war or haunted by a natural disaster"⁹⁰. The concept is not very precise. First, it indicates that evacuation takes place by displacing the population, which would imply the use of means of transportation, and this is not always the case. In some situations, people can move on foot. Secondly, the use of the formulation of displacement of people, would indicate that someone (some subject) is carrying out such deportation. Which would exclude self-evacuation from the definition of evacuation.

Evacuation "involves the movement of people, animals and transport of property from districts where threat occur to safe places"⁹¹. The definition presented is quite universal. It points to the essence of evacuation consisting in the displacement of people, which can take place in various ways, e.g. by means of transportation or on foot. Another important element of the definition indicates that the displacement of the population takes place from a place that is under threat to a place where no threat is identified. This would mean that the relevant authorities would mark individual areas by indicating whether the area is covered by a zone under threat. Evacuation should take place to the nearest safe place.

The concept of evacuation as set out above can be further specified. It is "the organised displacement (removal, carrying out, exportation, exit) of the population, all kinds of material goods and livestock from areas or facilities under threat and affected by armed actions or disasters in order to protect them, provide assistance (rescue) and limit material losses"⁹². Which is worth seeing. The definition indicates that evacuation does not only apply to humans, but also covers their material goods and breeding animals. The first thing to do is to protect people's lives and health. Only then should we take care of their material possessions. For the time of war, however, another definition of evacuation was proposed: "taking out of the area of war the injured, sick and paralyzed soldiers, removing civilians, military equipment and materials, prisoners of war, as well as state and conquered property that is important for further actions"⁹³.

⁹⁰ Słownik języka polskiego [Dictionary of Polish language], accessed March 08, 2020, <https://sjp.pwn.pl/slowniki/ewakuacja.html>

⁹¹ *Instrukcja w sprawie zasad ewakuacji ludności, zwierząt i mienia na wypadek masowego zagrożenia* [Instruction on the principles of evacuation of people, animals and property in the event of mass threat], (Warsaw: 2008), 5.

⁹² Przeworski, *Ewakuacja jako sposób ochrony ludności* [Evacuation as a means of civil protection.], 8-9.

⁹³ *Mała encyklopedia wojskowa* [Little military encyclopedia], Vol. 1 A-J (Warsaw: Published by the Ministry of National Defence, 1967), 380.

Self-evacuation means the displacement of people from areas where the threat may occur or has already occurred outside the area under threat. It is conducted on the basis of its own capabilities, e.g.: transportation and accommodation capabilities⁹⁴. It can be assessed that self-evacuation is a special kind of evacuation. It means moving people from a place where threats have been identified to a safe place. It differs from a simple evacuation in the way it is carried out. People who carry out a self-evacuation use their own means of transportation and they take care to secure the housing, food, and hygienic and medical needs on their own.

Evacuation can vary in many ways. “[...] by scale, starting time of evacuation, and level of authorities control”⁹⁵.

All the types of evacuation described below relate to natural hazards such as earthquakes, hurricanes, tsunamis, floods, etc., and man-made hazards, examples of which include terrorist attacks, technical failures.

Considering the time of approaching the threat, two types of evacuation can be distinguished. “In emergency evacuation for accidents, the evacuations can be categorized into “precautionary evacuation” or “responsive evacuation” based on the time the dangerous event approaches (...). If the danger can be sensed, and the accident happens before the evacuation decision is made, the action should be taken as “precautionary evacuation”, otherwise, the evacuation action belongs to “responsive evacuation”⁹⁶. Conducting a preventive evacuation is much more beneficial because it allows people to avoid threat. In the case of a reactive evacuation, the threat has already occurred, which may mean that people have already suffered from it. In practice, this will make it very difficult to carry out the evacuation because the injured will require special conditions necessary for their safe displacement.

Preventive and reactive evacuation can also be described as planned and emergency evacuation. Scheduled evacuation is characterized by prior preparation of the process to displace population from dangerous areas to safe areas. It is prepared during peacetime. It is implemented depending on the situation, either during war or after the occurrence of a natural disaster and/or a threat caused by human activity. In turn, emergency evacuation is carried out immediately after the occurrence of an unforeseen threat to the life and health of the population.

⁹⁴ *Instrukcja w sprawie zasad ewakuacji ludności, zwierząt i mienia na wypadek masowego zagrożenia* [Instruction on the principles of evacuation of people, animals and property in the event of mass threat], (Warsaw: 2008), 5.

⁹⁵ Gai, Du, Deng, *Decision-making Analysis and Optimization Modeling of Emergency Warnings for Major Accidents*, 151.

⁹⁶ *Ibidem*, 9.

"Due to the conditions related to the type and scale of the threat, we can distinguish the 1st, 2nd and 3rd degree evacuation" (see Table 1)⁹⁷.

Table 1. Types of evacuation

Type of evacuation	Characteristics
1 st degree	Evacuation involves the immediate displacement of people, animals, property from areas or places where there is a sudden and unforeseen threat to a place where there is no threat. This means that this evacuation is carried out immediately after the threat occurs. It is organized based on the decision of a commune head, a mayor or a president of a town. The person who manages the rescue operation in a given area also has the right to make a decision on evacuation.
2 nd degree	It is implemented because of prior preparation. It involves the planned displacement of people, animals, property from areas adjacent to plants, hydro-technical facilities, from flood zones and areas adjacent to other facilities posing a potential threat to people, animals, or property. Evacuation is carried out when symptoms of threat are observed.
3 rd degree	It is prepared in advance. It consists in the planned displacement of people, animals and property while increasing the state's defensive readiness. It is carried out only in times of threat to state security and war.

Source: developed on the basis of: Instrukcja w sprawie zasad ewakuacji ludności, zwierząt i mienia na wypadek masowego zagrożenia [Instruction on the principles of evacuation of people, animals and property in the event of mass threat] (Warsaw, 2008), 5.

No separate plan is being developed for the 1st degree evacuation. It is generally accepted that due to the urgency of the event, organisational elements are not developed. For the 2nd and 3rd degree evacuation, appropriate plans are prepared. This would mean that the 1st degree evacuation can be equated with a reactive evacuation. the 2nd and 3rd degree evacuations could be identified with a preventive evacuation.

⁹⁷ Instrukcja w sprawie zasad ewakuacji ludności, zwierząt i mienia na wypadek masowego zagrożenia [Instruction on the principles of evacuation of people, animals and property in the event of mass threat], (Warsaw: 2008), 5.

The issue of choosing the type of evacuation discussed in the article refers to the 2nd and 3rd degree evacuation. This is the time to think about the action and decide whether to run away alone or use the collective form.

With regard to civilians, taking into account the criterion of the form of evacuation, it can be divided into five types (see Table 2).

Table 2. Types of evacuation according to the form of the evacuation course

Type of evacuation	Characteristics
Dispersion	It takes place before the planned evacuation and in its initial phase. It means independent leaves of people from places where there is a significant population density to places chosen by the evacuees themselves.
Spreading out	Displacement of the population to places specified by the competent authorities using their own transportation vehicles or collective means of transportation.
Withdrawal	These are the leaves of the population that are organised during military operations or natural disasters. These leaves may concern only selected population groups.
Evacuation pass	Applies to people who pass through the place of threat to find shelter or replenish supplies.
Anarchic evacuation	Means a chaotic escape of the population.

Source: developed on the basis of: Krzysztof Przeworski, *Ewakuacja jako sposób ochrony ludności* [Evacuation as a method to protect the population] (Warsaw: Akademia Obrony Narodowej, 2002), 8-10.

The best way to carry out an evacuation is dispersion, because it occurs before the threat occurs. A characteristic feature of dispersion is that it is carried out in an individual manner by the evacuees. People are therefore most likely to save their lives and health. When spread out, people can decide whether they displace by themselves to a safe place or use a collective evacuation. Withdrawal takes place after the threat has occurred. An evacuation journey should only be made when necessary, i.e. when there is no other route to be followed, only through the area where the threat exists and when there is no possibility of replenishment in another place that would be considered safe. Anarchic evacuation is carried out in a situation where the threat is significantly intensified, and people are not prepared for it.

"In military terminology, we distinguish the medical, veterinary, material, technical, civilian and essential goods evacuation, as well as evacuation of prisoners of war and conquests"⁹⁸. These are types of evacuation for the subject and object to be displaced.

3.2. Comparison of collective and individual evacuation – advantages and disadvantages

The analysis of the pros and cons of collective (organised) and self-evacuation is of particular importance for the population, which has to decide which type of evacuation to choose when necessary. Collective evacuation is organised by the relevant authorities and planned in advance, which should reduce the risks associated with possible uncertainties. However, as it is usually carried out on a large scale, practical problems of different nature may arise.

Self-evacuation, on the other hand, is usually carried out without prior planning (people are unlikely to make plans in case of various threats) and preparation. Which could mean the evacuation will be accompanied by chaos. On the other hand, sometimes individual, flexible action to react quickly to changes (deterioration) in the situation can save lives. However, those responsible for conducting a collective evacuation usually follow the guidelines received and may not be flexible enough to make independent decisions and change the action plan if the situation deteriorates rapidly.

“Urban evacuation can be viewed as a process in which evacuees are moved from dangerous areas to safe zones utilizing transportation resources. This massive movement of residents typically exceeds normal demands on transportation resources and thus requires careful planning and optimization. The greatest risk of a poor evacuation plan is that people may lose their lives if they are not given the chance to evacuate on time. Another less severe consequence is a massive number of people trapped for hours on the road”⁹⁹. Mass exits from the area under threat are very likely to cause traffic jams. The size of the traffic jams and the associated time of the escaping persons is dependent on several factors of particular importance: the number of routes from the place of evacuation and their capacity, the number of means of transportation, the directions of escaping persons. The last factor is the one that is most difficult to predict and plan. It is most likely that a large proportion of those carrying out self-evacuation will not decide on the direction of escape until the evacuation has taken place.

⁹⁸ Magdalena Masłowska-Szczerba, “Ewakuacja – pojęcie, zasady i podstawy prawne [Evacuation - a concept, principles and legal basis],” *Ostry dyżur [Emergency Room]*, no. 2(8) (2015): 37.

⁹⁹ Arab Naser, Ali Kamrani, *Intelligent Transportation and Evacuation Planning. A Modeling Based Approach*, (New York: Springer, 2012), 37.

“Evacuation planning involves an iterative process to identify the best routes and to estimate the time required to evacuate the areas at risk”¹⁰⁰.

Furthermore, people do not plan their evacuation activities in response to the threatening or existing threats, they also make good decisions from their point of view, i.e. they save themselves and their family, not strangers. This may mean that they will make decisions and actions that are beneficial to themselves and not to other people. Fighting for survival one can sometimes even hurt others. “People can make their own decisions about where to go and when to leave, but these decisions will most probably not be system-optimal for the following reasons: (1) people have a lack of information about, and a lack of experience with, the extreme situation (i.e., the demand is high as compared to the daily situation and the hazard may cause in accessible roads) and (2) people act out of a user instead of system-optimal thinking. If people act out of a user-optimal thinking, each evacuee acts such that it is the best for himself, for example by minimizing his own travel time. This will probably be not optimal for the system. If they act out of a system-optimal thinking, each evacuee acts such that it is the best for the system, meaning that an evacuee accepts a higher travel time than his minimal travel time, to achieve a better system performance”¹⁰¹.

The self-evacuation of the population with the use of automotive transport causes many organizational problems. Avoid carrying out mass evacuation in a one-time manner. This can have the opposite effect and put the population at risk by staying in one place for too long time. This could be the case, for example, in a radioactive emergency. “One of the main problems of civil defence is evacuation of people by motor transport from regions contaminated with radioactive substances during a serious accident at a nuclear power plant. (...). Besides organizational problems, this problem is complicated by the fact that it is necessary to take into account the required number of vehicles, the fuel, the number of routes which one driver can follow without being re-irradiated, and others. A one-time mass evacuation, besides excess cost, can lead to the opposite result - the overloading of the roads, traffic jams, and ultimately re-irradiation of all or some of the people standing in these jams. Thus, besides optimizing the route out of the radioactively contaminated region during

¹⁰⁰ Ibidem, 38.

¹⁰¹ Olga L. Huibregtse, Serge P. Hoogendoorn, Andreas Hegyi, Michiel C. J. Bliemer, “A method to optimize evacuation instructions,” *OR Spectrum*, no. 33 (2011): 595–627, doi: 10.1007/s00291-011-0245-4.

evacuation, it is also necessary to estimate the optimal number of vehicles, which will also determine the rest of the parameters of the problem”¹⁰².

The problems to leave the zones under threat were in the United States. “However, one of the several emerging problems in the hurricane evacuation is transportation. Transportation issues have become more important in coastal evacuations as traffic problems impinge on people’s ability to get out of harm’s way and ultimately influence their decisions to evacuate (...). One of the major issues has been the stalling and congestion of evacuation traffic reported during all major hurricanes such as Hurricane Floyd and Hurricane Rita. Not only does this lead to risky evacuation conditions, but also can lead to non-evacuation of households which may lead to higher loss or damage to life”¹⁰³. Transport problems are a key element that can affect the lives and health of evacuees. When evacuation is carried out on a large scale, it is important to guarantee road capacity. From this point of view, the best form of evacuation would be a collective evacuation. The vehicles would have the exact direction of the route indicated and would be prepared to travel it, both for the sake of efficiency and to be equipped with the necessary operating fluids and fuel. Secondly, the number of vehicles on the road would be much smaller than the number of vehicles with passenger cars, which would most likely be used for self-evacuation. Thirdly, collective evacuation is usually carried out using larger vehicles, e.g. buses, so that a large number of people can be taken. These recommendations would have to be followed by all those fleeing. The greater the number of people evacuating by themselves, the more likely it is that there will be congestion on the road, that someone will leave the vehicle due to lack of sufficient fuel, etc. The chances of everyone escaping in this situation are diminishing.

It should also be remembered that the introduction of mandatory evacuation for all will cause that people who provide services allowing to carry out the evacuation, e.g. supply of fuel and other services related to the sale of medical and hygienic goods, will also leave the affected area. This situation occurred during Hurricane Rita in the United States in 2005. “Changes in the statute had recently occurred, and on the evening of the 21st, as we faced a record setting hurricane, I called for the first ever “mandatory” evacuation of the city. To their credit, the citizens took the mandatory order seriously, and the evacuation of the city began. We quickly

¹⁰² A.P. Elokhin, “Optimal route for evacuating people from a radioactively contaminated region,” *Atomic Energy*, no. 4(87) (1999): 776, doi: <https://doi.org/10.1007/BF02673270>.

¹⁰³ Praveen Maghelal, Xiangyu Li, Walter Peacock, “Highway congestion during evacuation: examining the household’s choice of number of vehicles to evacuate,” *Nat Hazards*, no. 87 (2017): 1399–1411, doi: <https://doi.org/10.1007/s11069-017-2823-5>.

realized that the term “mandatory” created its own set of problems as essential employees such as pharmacists, bank employees, gasoline sales clerks, baggage clerks, and others quickly evacuated as well, leaving citizens with little ability to obtain cash, medicines, or fuel”¹⁰⁴. No access to fuel caused that people who carried out self-evacuation were unable to travel the desired distance and left the cars on the road, thus blocking other people from passing. Main and frequently used road routes can then become a threat and a trap for civilians wanting to get out of the zone under threat quickly.

In the course of organising a collective evacuation, the State shall bear the costs associated with organising the evacuation and guaranteeing the goods necessary for the survival of the population. Which would seem to be advantageous for the citizens evacuated because they do not bear the cost. This situation occurred after Hurricanes Katrina and Rita in the United States in 2005. “By implementing portions of our own hurricane emergency plans, and with the assistance of city employees and volunteers, we were able to rapidly provide essential services including food, medical, financial, travel, clothing, housing, sanitary facilities, and even a Wi-Fi café. The Parks and Recreation Department manages the Meals and Wheels program daily and was the logical choice to manage the evacuee food program. The strategy was to utilize existing contracts as much as possible for this event, including food preparation. The city has a contract with a local vendor to provide food services for the newly opened Convention Center, and this contract was expanded to provide food to the Katrina evacuees. During the next few weeks, local restaurants provided free meals, and a former resident who now owns a chain of restaurants donated a mobile kitchen, complete with food staff to conduct meal operations for several days”¹⁰⁵. From the point of view of the population this should be a good solution because they do not have to worry about anything and do not have to care about securing their needs on their own. However, it often turns out that, after a threat and its aftermath, after evacuation, the authorities dealing with post-emergency response are insufficiently prepared, then they rely on the help of residents and other aid providers. It turns out then that their basic needs are not fully secured. In the case of self-evacuation, they can either use their resources, but this is a solution for the more affluent who, for example, have their own second home and can move to it, or can go to family or friends. They will then largely bear the costs associated with the temporary storage of the evacuees. From the point of

¹⁰⁴ Henry Garrett, “Sheltering and Evacuating from Hurricanes Katrina and Rita,” in *Safeguarding Homeland Security. Governors and Mayors Speak Out*, ed. Simon Hakim, Erwin A. Blackstone, (New York, Springer, 2009), 84.

¹⁰⁵ *Ibid*, 82.

view of the authorities, given the financial argument, self-evacuation is a better solution, as it entails costs associated with transporting the population from a dangerous place to a safe place, the cost of accommodation, food and hygiene and medical security. However, when preparing for a possible evacuation, the financial criterion of the costs incurred is not the only one to be considered, and the number of people rescued is of primary importance.

“Evacuating a large population due to natural or man-made emergency situations is a complicated and costly task. Over the years, many researchers have been developing models for emergency planning and evacuation. These include traffic simulation and route-schedule planning, but none in an integrated form. The focus is on developing a model that finds optimal routes and schedules for evacuees in order to minimize total evacuation time”¹⁰⁶. The lack of an integrated form of planning and evacuation is reflected in the duration of an evacuation, which is crucial in an emergency situation. Such a situation may be unfavourable both for persons using collective evacuation and those performing self-evacuation. Those who are the first to decide to leave the zone under threat and do so efficiently will have the best chance of protecting their lives and health.

3.3. Features of civil society and their influence on the choice of the type of evacuation

Civil society relates primarily to relationships and institutions not created or controlled by the state. The basic task of civil society comes down to supporting the competences and character of individuals, building social trust, and helping children to become decent people and good citizens. Ultimately, civil society is a sphere of our community life in which we answer together the most important questions: what our goal is, what is the right way to act and what is the common good. In other words, it is an area that deals with morality and purpose, not with the administration or maximization of resources¹⁰⁷. The concept of civil society refers to voluntary (unconstrained) collective action regarding the common interests, goals and values of a specific group of people¹⁰⁸. Broadly speaking, civil society can be described as composed of a rich network of different but voluntary associations, movements

¹⁰⁶ Naser, Kamrani, *Intelligent Transportation and Evacuation Planning. A Modeling Based Approach*, 39.

¹⁰⁷ Jean Bethke Elshtain, “A Call to Civil Society,” *Society*, no. 36(5) (1999): 11-19.

¹⁰⁸ Béatrice Pouligny, “Civil Society and Post-Conflict Peacebuilding: Ambiguities of International Programmes Aimed at Building New Societies,” *Security Dialogue*, no. 36(4) (2005): 495-510, doi: 10.1177/0967010605060448.

and channels¹⁰⁹. One of the strong traits of civil society is participation in the organizational life of the community¹¹⁰.

It should be emphasized that civil society is often treated as a voice of political objection that comes from outside state institutions. Citizen groups represent the multiplicity of interests and problems present in society in a better way. The key to understanding the term civil society is information indicating that this society exists as a conceptual sphere separate from the sphere of political society of politicians and state officials¹¹¹.

Civil society can be considered in its institutional and qualitative dimensions. Institutionally, civil society is made up of all associations to which people belong, and examples include: family, religious organizations and social movements¹¹². In addition, civil society can be defined as a space outside the family, state and market where different people come together to achieve common interests¹¹³.

Civil society can be viewed through the prism of two opposing concepts. The first is the vision of civil society in the process of globalization, and the second is the vision of civil society in the concept of balanced and sustainable development. In both of these concepts, civil society is considered through the prism of the following features: space; objective; community property; patterns of behaviour, connections and dependencies; time; communication; values; mobility; development; quality of life; efficiency; competitiveness; ties¹¹⁴.

In another approach, it is indicated that civil society should have the following characteristics:

- pluralism – there are many competing views on the political scene. Civil society does not always identify with everyone but does not refuse to proclaim the competing views,
- numerous civic associations – these include voluntary associations of like-minded people,

¹⁰⁹ Maria R. Markus, "Decent Society and/or Civil Society?" *Social Research*, no. 68(4) (2001): 1011-30.

¹¹⁰ Michael Bernhard, Ekrem Karakoç, "Civil Society and the Legacies of Dictatorship," *World Politics*, no. 4(59) (2007): 539-567, doi: 10.2307/40060172.

¹¹¹ Michael Strange, "Civil society" in *The Language of World Trade Politics – Unpacking the Terms of Trade*, ed. Dingwerth Klaus, Clara Weinhardt (London: Routledge, 2018): 97-114.

¹¹² Caroline H. Persell, Adam Green, Liena Gurevich, "Civil Society, Economic Distress and Social Tolerance," *Sociological Forum*, no. 16 (2001): 203–30, doi: <https://doi.org/10.1023/A:1011048600902>.

¹¹³ Christina Fink, Adam Simpson, "Civil Society," in *Routledge Handbook of Contemporary Myanmar*, ed. Adam Simpson, Nicholas Farrelly, Ian Holliday (London: Routledge, 2018), doi: <https://doi.org/10.4324/9781315743677>.

¹¹⁴ Klaudia Wójtowicz, „Społeczeństwo obywatelskie jako warunek urzeczywistniania rozwoju zrównoważonego i trwałego,” *Problemy Ekologii*, no. 1(11) (2007): 27-31.

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- political associations – associations of people with similar political views,
 - activism – members of the civil society are characterized by an active attitude in social life and political activity,
 - high voter turnout – citizens have the need to co-decide about the fate of their country; hence they take an active part, inter alia, in parliamentary and presidential elections,
 - criticism – citizens are critical of reality. In everyday life, they evaluate various types of activities, both those relating to the authorities and those relating to other organizations,
 - innovation – they present new ideas and opinions; this results, inter alia, from the free exchange of thoughts and effortless communication between individuals,
 - sense of shared responsibility for the state and local community,
 - low level of corruption¹¹⁵.

It is this criticism that makes people who are members of civil society evaluate the actions taken as part of the evacuation. Probably this feature is one of the reasons for the fact that if they have such a possibility, they decide to use an individual evacuation. Moreover, they do not immediately follow the announcements issued by the authorized bodies but withhold decisions until the last moment. However, such a situation may pose a threat, as it happened, for example, after a fire broke out in Australia. As a result of withholding the decision to evacuate, in part due to the desire to protect one's own property, 173 people died and 400 were injured¹¹⁶.

Thanks to the advent of new technologies and the growing trust of civil society leaders in poorer countries, new energy has emerged in civil society. This energy concentrates on the governing processes, not the essence of it. In addition, it shows signs of a shift in civic engagement as well as increasing state accountability to citizens¹¹⁷. New technologies offer many possibilities, e.g. quick access to a lot of information, but their use also entails threats such as mess and information overflow. Civil society takes full advantage of modern technological advances, which provide a lot of information in the field of security, including those related to possible threats and related possible evacuation. Much of this information is

¹¹⁵ Helena Tomaszewska, *Społeczeństwo obywatelskie*, accessed: October 17, 2020), <http://www.tomaszewska.com.pl/10.obywatelskie.pdf>

¹¹⁶ Mitch Ryan, „72 niebezpieczne miejsca. Ogień i lód,” Serial dokumentalny, Netflix, dostęp: 18.09.2020.

¹¹⁷ John Clark, “Civil Society in the Age of Crisis,” *Journal of Civil Society*, no. 7(3) (2011) 241-63, doi: 10.1080/17448689.2011.604986.

false, as a result of which the views formed are incorrect and the actions taken do not serve the safety of the general public.

4. Discussion – the consequences of selecting a specific type of evacuation for the safety of civil society and recommendations

Taking into account the considerations concerning the concept of evacuation and the characteristics of individual types of evacuation, it is recommended to conduct collective evacuation instead of individual one. The fact that it is planned and properly prepared influences its recommendation. In addition, it is very important that in the case of a collective evacuation, it is likely that communication routes will not be blocked by an excessive number of vehicles moving along the same route, and that the evacuation will be carried out in a timely manner. In the case of an individual evacuation, problems may arise with the decision to evacuate too late, as well as with too much load on communication routes as a result of too many vehicles on the road, as well as vehicles left on the road without fuel. This situation may prevent people from being able to get out of the danger zone into the safe zone.

However, taking into account the features of civil society, it can be said with high probability that a large proportion of people will choose, contrary to the recommendations, evacuation carried out individually using their own resources, e.g. their own means of transport. Therefore, one should keep this in mind and when planning the evacuation, consider the number of people evacuating in this way, the estimated time of evacuation, as well as the directions in which they will move. The inclusion of this information should help avoid traffic congestion.

It should be emphasized that the decision to evacuate is conditioned by three main dimensions: warning, people's perception of risk, and the advancement of evacuation research. These elements are important when combined with each other as the warnings do not in themselves motivate an evacuation. It turns out that people need to see the risks¹¹⁸ which often leads to a decision to evacuate too late.

During an individual evacuation, people have to find answers to the following queries: whether to evacuate, when, where, and how. Before the evacuation, there are preparatory

¹¹⁸ Nicole Dash, Hugh Gladwin, "Evacuation Decision Making and Behavioral Responses: Individual and Household," *Natural Hazards Review*, no. 8(3) (2007): 69, doi: [https://doi.org/10.1061/\(ASCE\)1527-6988](https://doi.org/10.1061/(ASCE)1527-6988).

activities that are estimated to last from several hours to even several days¹¹⁹. These activities contribute to the increase in traffic, most often to purchase fuel or food. There are two major problems with this element. First, congestion prior to evacuation can have a significant impact on evacuation routes and times. Secondly, possible shortages of supplies, e.g. fuel, should be considered¹²⁰.

Research has shown that knowledge on how people prepare for disasters is essential to developing an action strategy. Understanding the response of the population is crucial in preparing protection in the event of future disasters ahead. It is particularly important that many respondents do not intend to prepare in any way for the upcoming disasters, such as a hurricane¹²¹.

The literature provides the results of research on collective evacuation using public transport before a hurricane strike. The authors of the study assumed that the evacuation zones, places of refuge, and the time of impact of the hurricane were known prior to its occurrence. Evacuation operations begin when a warning is issued and end when a hurricane is expected to strike. The authors proposed a multi-stage approach to solve this situation. The first step is a planning structure where pick-up locations are identified and assigned to shelters, and then an initial set of routes is generated along these locations. In a second step, each route is assigned a trip number such that firstly routes that require more trips are generated and secondly it is assumed that two consecutive trips per route are evenly distributed. This allows one to evaluate the escape route design tool and propose positive route changes when needed¹²².

In addition, a tool was created that allows to check the reactions of survivors to emergency situations. This tool is a standardized psychological instrument: BeSeCu-S (Behaviour, Security, and Culture – Survivor). BeSeCu-S is a questionnaire for individuals who experienced an emergency, whose life and property were in danger, and the evacuation from the facility was the best option. The questionnaire is divided into four main stages related to

¹¹⁹ Brian Wolshon, Joseph Lefante, Hana Naghawi, Thomas Montz, Vinayak Dixit, John Renne, Patck Haughey, Wendel Dufour, *Application of TRANSIMS for the Multimodal Microscale Simulation of the New Orleans Emergency Evacuation Plan*, (Baton Rouge: Louisiana State University, 2009).

¹²⁰ Yin, Murray-Tuite, Ukkusuri, Gladwin, "An agent-based modeling system for travel demand simulation for hurricane evacuation," 44-59.

¹²¹ Joanna Burger, Michael Gochfeld, Clifton Lacy, „Concerns and future preparedness plans of a vulnerable population in New Jersey following Hurricane Sandy,” *Disasters*, no. 43(3) (2019): 658-85, doi: <https://doi.org/10.1111/disa.12350>.

¹²² Rahul Swamy, Jee Eun Kang, Rajan Batta, Younshik Chung, "Hurricane evacuation planning using public transportation," *Socio-Economic Planning Sciences*, no. 59 (2017): 43-55, doi: <https://doi.org/10.1016/j.seps.2016.10.009>.

the event: start, execution, evacuation and aftermath¹²³. It is recommended to use this tool and take into account the obtained results when planning an evacuation.

Some researchers believe that the development of a disaster response plan, such as a tsunami, should be based on a community-based approach to disaster preparedness. The authors postulate that a community-based approach to tsunami preparedness and mitigation is feasible, i.e. the local community is the focus in disaster reduction. This process uses traditional organizational structures and mechanisms and disaster response capacity building activities with the participation of local disaster committees and volunteers¹²⁴.

The literature also includes studies of the collective dynamics of humans in crisis situations based on experiments with non-human organisms. The need to understand better the similarities and differences between the (collective behaviour) of humans and animals is emphasized. This allows for the development of better experimental designs¹²⁵. Animal behaviour can be translated into human behaviour and conclusions can be drawn about how best to deal with an emergency.

In addition, the literature contains the results of research that performs a collective analysis of crowd behaviour¹²⁶ using visualization¹²⁷. M. Haghani and M. Sarvi in their research paper reviewed the research carried out in the field of crowd evacuation¹²⁸. It should be highlighted that crowd evacuation is different from collective evacuation.. Crowd evacuation usually takes place from one place and concerns a large group of people crowded together. In turn, collective evacuation takes place in relation to a large number of people in various places. However, these people are not crowded, but they can be at certain distances from each other.

¹²³ Daniela Knuth, Doris Kehl, Ed Galea, Lynn Hulse, Jordi Sans, Lola Vallès, Malin Roiha, Frank Seidler, Eberhard Diebe, Lena Kecklund, et al., "BeSeCu-S – a self-report instrument for emergency survivors," *Journal of Risk Research*, no. 17(5) (2014): 601-20, doi: 10.1080/13669877.2013.815649.

¹²⁴ Aini mat said, Ahmadun Fakhru'l-Razi, Ahmad Rodzi Mahmud, Abas Fuad, „Community preparedness for tsunami disaster: A case study," *Disaster Prevention and Management*, no. 20(3) (2011): 266-80, doi: [http://dx-doi-org-1000002xu0d57.han.wat.edu.pl/10.1108/09653561111141718](http://dx.doi.org/10.1080/09653561111141718)

¹²⁵ Nirajan Shiwakoti, Majid Sarvi, "Understanding pedestrian crowd panic: a review on model organisms approach," *Journal of Transport Geography*, no. 26 (2013): 12-17.

¹²⁶ Yasser M. Alginahi, Mohammed Mudassar, Muhammad Kabir, Omar Tyan, "Analyzing the Crowd Evacuation Pattern of a Large Densely Populated Building," *Arabian Journal for Science and Engineering*, no. 44, (2019): 3289–3304, doi: <https://doi.org/10.1007/s13369-018-3411-z>.

¹²⁷ M.Sami Zitouni, Harish Bhaskar, Jorge Dias, Mohammed E. Al-Mualla, „Advances and trends in visual crowd analysis: a systematic survey and evaluation of crowd modelling techniques," *Neurocomputing*, no. 186 (2016): 139-59; Balasubramanian Yogameena, C. Nagananthini, „Computer vision based crowd disaster avoidance system: a survey," *International Journal of Disaster Risk Reduction*, no. 22 (2017): 95-129.

¹²⁸ Milad Haghani, Majid Sarvi, "Crowd behaviour and motion: Empirical methods," *Transportation Research Part B: Methodological*, no. 107 (2018): 253-94, doi: <https://doi.org/10.1016/j.trb.2017.06.017>.

Crowd evacuation is usually carried out urgently, collective evacuation is usually conducted in a planned manner, e.g. after finding an unexploded ordnance.

In the field of evacuation planning, various evacuation models are available in the publications¹²⁹. Moreover, an integer-based evacuation programming model is available for the multi-site allocation problem. During natural disasters all over the world, there is a need for more efficient and effective allocation of response resources due to their jurisdictions. This is because in the event of a catastrophe, wasted time can draw the line between life and death¹³⁰.

The literature provides information on hurricane evacuation simulation systems. The system is able to generate comprehensive action plans in the event of an evacuation. It implements various models that represent displacement and decision behaviour throughout the evacuation process. Such a system takes into account six typical evacuation decisions: evacuation / stay in an emergency, choice of accommodation type, choice of evacuation place, choice of means of transport, choice of vehicle use, as well as choice of departure time¹³¹.

Consideration should also be given to the evacuation of a special needs population where possible. They can be people with physical disabilities¹³², the elderly, residents without their own means of transport, as well as tourists¹³³.

When designing evacuation plans, it is very important to consider the dynamic changes in the human population in the affected areas and to understand the social perception of residents. It is possible thanks to the use of innovative methods of data integration using, inter alia, social media, census survey, geographic information systems (GIS) data layers, volunteer suggestions and remote sensing data¹³⁴.

¹²⁹ Pamela Murray-Tuite, Brian Wolshon, „Evacuation transportation modeling: an overview of research, development, and practice,” *Transportation Research Part C Emerging Technologies*, no. 27 (2013): 25-45.

¹³⁰ Nezhil Altay, „Capability-based resource allocation for effective disaster response,” *IMA Journal of Management Mathematics*, no. 24(2) (2013): 253-66, doi: 10.1093/imaman/dps001.

¹³¹ Weihao Yin, Pamela Murray-Tuite, Satish V. Ukkusuri, Hugh Gladwin, „An agent-based modeling system for travel demand simulation for hurricane evacuation”, *Transportation Research Part C: Emerging Technologies*, no. 24 (2014): 44-59.

¹³² Aruna Apte, Susan K. Heath, Andres Pico, Yong H.R. Tan, “Evacuating People with Mobility-Challenges in a Short-Notice Disaster,” *Decision Sciences*, no. 46(4) (2015): 731-54, doi: <https://doi.org/10.1111/dec.12153>.

¹³³ Evangelos Kaisar, Linda Hess, Alicia Benazir Portal Palomo, „An Emergency Evacuation Planning Model for Special Needs Populations Using Public Transit Systems,” *Journal of Public Transportation*, no. 15(2) (2012): 45-69, doi: <http://doi-10.100007xu0d28.han.wat.edu.pl/10.5038/2375-0901.15.2.3>.

¹³⁴ Atsushi Nara, Xianfeng Yang, Sahar Ghanipoor Machiani, Ming-Hsiang Tsou, „An integrated evacuation decision support system framework with social perception analysis and dynamic population estimation,” *International Journal of Disaster Risk Reduction*, no. 25 (2017): 190-201.

The available literature is rich in proposals for mitigation, preparedness, response¹³⁵ recovery solutions¹³⁶. These elements should be taken into account when planning the evacuation of the population.

5. Conclusions

The hypothesis assumed for the main problem (What kind of evacuation (collective or individual) is recommended to ensure the safety of civil society?) has been positively verified. As a result of the study, it was confirmed that the recommended type of evacuation is collective evacuation, which will guarantee safety for all people, including persons identifying themselves as members of civil society. The type of evacuation should not be chosen based on the situation of the evacuees. Persons who have their own means of transport should benefit from a collective evacuation in the interests of everyone. This is due to several fundamental reasons. Firstly, the collective evacuation is well thought-out and planned, which would mean that it is also rational. It should not be conducted in a chaotic way. Secondly, in the case of a mass evacuation, there are large movements of people leaving the area. The reduction in the number of means of transport and the use of larger vehicles to transport people should not result in road congestion. Thirdly, in the case of an organised evacuation, the vehicles shall be in good working order and have operating fluids, including the fuel, necessary for displacement. The use of collective means of transportation will eliminate numerous passenger cars and leave vehicles not properly prepared for escape, e.g. with an empty fuel tank on the route. Fourthly, a person undergoing a collective evacuation shall not bear any costs related to him/her, neither the cost of fuel, nor the cost of accommodation, food, and medical hygiene measures.

Taking advantage of collective evacuation requires people to feel responsible for everyone and to take joint action to make everyone safer. However, many people's thinking is directed towards saving themselves and their loved ones. People also don't trust the power, that it is properly prepared, will take action on time and will be able to secure their needs, at least to the extent that they will have access to goods necessary for survival. Therefore, it is reasonable to assume that many people, despite the arguments put forward, will self-evacuate.

¹³⁵ Gina Galindo, Rajan Batta, „Review of recent developments in OR/MS research in disaster operations management,” *European Journal of Operational Research*, no. 230 (2013): 201-11.

¹³⁶ Nezhil Altay, Walter G. Green, „OR/MS research in disaster operations management,” *European Journal of Operational Research*, no. 175 (2006): 475-93.

When deciding on self-evacuation, one should consider whether they have information about:

- the area to be evacuated,
- the routes that will allow you to move away from the area of threat, as well as about their overload,
- access to fuel,
- the range of the evacuation and the nearest safe place to go,
- access to current messages from the relevant authorities, e.g. informing on situation changes (evacuation area),
- possibilities of access to and use of medical assistance, about accommodation and necessary supplies.

Streszczenie:

W artykule wskazano, jaki rodzaj ewakuacji jest zalecany, aby zapewnić bezpieczeństwo społeczeństwa obywatelskiego. Przedstawiono także przykłady sytuacji obrazujących zachowania członków społeczeństwa obywatelskiego w czasie kryzysu. Tekst podzielony jest na pięć głównych części. Pierwsza część zawiera wstęp, w którym przedstawiono problem badawczy, hipotezę i uzasadnienie podjęcia badań w tym zakresie. Kolejno przedstawiono sposób przeglądu literatury oraz opisano przyjętą metodologię badań. Następnie dokonano analizy pojęcia ewakuacji, wyróżniając w jej ramach ewakuację zbiorową i indywidualną. Przedstawiono także wybrane rodzaje ewakuacji. Następnie dokonano porównania ewakuacji zbiorowej i indywidualnej, ze wskazaniem zalet i wad z nimi związanych. W trzeciej części przedstawiono charakterystykę społeczeństwa obywatelskiego i jej wpływ na wybór rodzaju ewakuacji. Następnie przedstawiono wybrane skutki wyboru konkretnego rodzaju ewakuacji dla bezpieczeństwa społeczeństwa obywatelskiego. W wyniku tych analiz w części piątej przedstawiono wnioski i rekomendacje dotyczące rodzaju podjętej ewakuacji. Zweryfikowano przyjętą hipotezę roboczą i przedstawiono zestaw informacji, jakie powinny być udostępnione osobom decydującym się na samoewakuację.

Słowa kluczowe:

Bezpieczeństwo społeczeństwa obywatelskiego, ewakuacja, rodzaj ewakuacji.

Key words:

Safety of civil society, evacuation, type of evacuation.

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