

## MANAGING VEHICLES USED IN TRANSPORT IN EMERGENCY SITUATIONS

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**Abstract.** *When considering emergency situations, the question arises on how to manage the vehicles used then. Dealing with emergency situations usually involve quick reaction which would influence a lot of people being faced with such matters, as floods, earthquakes, hurricanes or terrorist attacks. Typically, both evacuation and response to the problem involve massive movements and a wide range of issues that need to be addressed. One of the notions of great concern is how to use available tools and how to make evacuation as flawless as possible. The tools involve available means of transport, such as planes, drones and airships, trains, road vehicles such as cars, coaches, buses, but also trams and trolleybuses, and boats of various kind. Those may prove both extremely comfortable and useful means of evacuation and unfortunately, equally effective and threatening means of terrorists' massive attack tool. When considering the former case, one needs to address such issues, as managing the fleet in use, problems with infrastructure or with people skilled to operate them, as well as panic issues. When considering the latter one, one needs to consider distraction impact, the panic that would rise, the need to block the attack and to need to evacuate people. In order to be able to face the challenges, one ought to be able to use the tools to manage all the fleet that is used in emergency situations. The tools that may help deal with such situations are the ones that would cover gathering the information about each of the vehicle. They should also offer the possibility to update such knowledge, as well as pass selected information to other bodies and receive feedback from them. Moreover, there is the approach towards managing the vehicles and towards to priorities set in an emergency situation. The hereby article presents the overview of the available tools and approaches towards dealing with the emergency. The Authors try to describe possible ways and methods in use when facing the emergency, together with the suggestion which option appears to be the most suitable in case of particular means of transport and the situation involved. The Authors are aware there is no one perfect pattern of conduct to be used in every case, however, they hope their work would be of some assistance to those who are responsible for taking decisions in the situations that are both extremely stressful and dangerous.*

**Keywords:** *managing vehicles; transport; emergency situation.*

## Introduction

When considering the issue of emergency situations, the question arises on how to manage one of the means used when such a situation takes place, that is, the vehicles. Dealing with emergency situations usually involve quick reaction which would influence a lot of people being faced with such matters, as floods, earthquakes, hurricanes or terrorist attacks. Moreover, it concerns the cooperation of many parties; as it is highlighted, "Emergency response usually calls for the cooperative efforts of a broad range of community agencies. Typically, police, fire, search and rescue teams, ambulance corps, and backup health facilities work together, but other support services may be called upon to assist as required by circumstances" (Granot, 1997, p.305). That creates the network of numerous people involved in the process who need to respond to the situation but also, to the expectations of the people involved; as it has been observed, "high expectations of public and stakeholders in emergency and disaster management require effective use of resources by collaborative networks" (Kapucu, Arslan & Demiroz, 2010, p.452).

Typically, from the perspective of a body or bodies which are to manage reaction in the given area, both evacuation and response to the problem involve massive movements and a wide range of issues that need to be addressed at the same, or almost at the same time. One of the notions of great concern is how to use available tools of fast evacuation and how to make it as flawless as possible, as was in case of the systems mapping for technology in CBRN response (Hancox et al., 2017, p.111), joining the response of various agents (police, firefighters, hospitals etc.) into one information platform. The tools involve available means of transport, such as planes, drones and airships, trains, road vehicles such as cars, coaches, buses, but also trams and trolleybuses, and boats of various kind. Those may prove both extremely comfortable and useful means of evacuation and unfortunately, equally effective and threatening means of terrorists' massive attack tool.

When considering the former case, one need to address such issues, as managing the fleet in use, overcoming the shortcomings of the emergency situation, such as lack of power, problems with infrastructure or with people skilled to operate them, as well as such challenges such as panic among the citizens or people who found themselves in the area where emergency has taken place. Therefore, what needs to be known from the start is the updated information on exact state, position, number of the vehicles, their location, mechanical requirements, such as power in use (petrol, electric energy etc.) as well as the list of people able to drive, or operate them; such list would offer the possibility to contact such people as quickly as possible, although the challenge arises whether everybody would agree to be enlisted for such reasons (as this is not military force, some would be afraid, others might expect extra funds for being on standby; also, as such vigilance would require updating one's location whenever it has changed – for example, due to holidays, business trips or training – some could be discouraged to participate). Also, the individual's drive for self- managing the problem ought to be taken into consideration: not everybody will listen to and follow the procedure, some people, despite previous plans, would like to take the action into their own hands; although that might prove useful, in some situations such as evacuation, such an approach might prove harmful and disturbing; it sometimes is in case of reaction to the danger of fire – the attempt to distinguish it oneself may win over calling the appropriate services (Whales & Thompson, 2013, p.94). One might ask, whether such behavior pattern would not

override planned activities.

When considering the latter one, that is the case of terrorists' attack, apart from the problems indicated above, such as the location of the vehicles, fuel, people to operate, infrastructure etc., one needs to consider the issues such as distraction impact, panic that would rise, the need to block the attack and to need to evacuate people from the endangered area as fast as possible. Panic is a greatly important issue that may not be forgotten, as it influences not only the individuals exposed to the emergency, but being highly contagious, it spreads among the crowd easily, causing chaotic, sometimes dangerous behavior that is impossible to be fully predicted and therefore, almost impossible to be steered.

Taking all the above into consideration it is to be appreciated how collecting and operating data that may prove useful when managing the emergency is crucial for the situation to be dealt with efficiently. It is especially appreciated in case of using the tools enabling the evacuation, the vehicles, and at the same time, using the skills of the people involved in the situation. What is more, it is not to be forgotten how important the planning and forecasting is, especially in the situations that involve numerous people and may happen suddenly.

Summing up, managing the fleet to be used in the emergency is the task requiring careful planning, involving many bodies, forces, agencies and citizens of the area the situation has taken place and therefore, it is quite a difficult task. However, some of the issues concerning it may be pre-planned, and thus it may appear to be somewhat easier to deal with the case.

The research methodology followed in the article is based on analyzing the contents of the documents and scientific materials (reports, articles) understood as "the analysis of the content as reasonable, systematic and analytic reading/ perception of the content" (Szczański, 2012, p.83). There are two types of documents content analysis; there is "internal analysis focusing on learning the document content, profound understanding and explaining as well as distinguishing major elements, leading thoughts and their mutual relations from the context" (Łobocki, 2005, pp.222-223). There is also external analysis, "focusing on time, conditions of creating the document, and its identification of the author and the reader for whom it has been created or its potential influence on particular situations and happenings" (Łobocki, 2005, pp.222-223). The hereby text was created on basing mostly on internal analysis of relatively short content; following Apanowicz's belief that "the goal is to receive specific data on effects of the activity, process or organization-economic system elements. Document content analysis may be limited to setting an actual state, they may also help to collect data needed to forecast the future state" (Apanowicz, 2000, p.131). Hopefully, such an approach will help to build a greater picture of contemporary solutions, challenges, and chances of managing vehicles used in emergency transport.

### **Managing vehicles in an emergency**

In the times of crisis, various types of vehicles would require different means and methods, appropriate to their conditions of use and the requirements needed. However, there will also be some of the issues common for each type of transport, such as the following:

- some of the means to collect necessary data
- some of the means providing required operating staff
- some of the methods to provide the evacuated with the appropriate information

As far as the means to collect necessary data is concerned, it seems the approach launched in case of smart cities may be of great assistance. It concerns collecting the data of the ordinary traffic in the city using cameras, sensors, and detectors, and passing the information to the traffic participants via radio, internet, mobiles, variable message signs etc. Obviously, it cannot be used in case of all the transport means, air transport would be able to use it means, but road transport may profit from such solutions in total, and rail and inland transport may use at least some of the abovementioned means of communication.

Also, it is important to highlight the obvious, that is that the message ought not to be long and sophisticated: short, clear information about the nature of the problem (it is another concern whether in all circumstances the information should be completely true in that part), the provided means and location of evacuation, preferably method (e.g. how many people on board, the reassuring information that all requiring will be taken and evacuated etc.) of leaving the endangered place.

As far as the means providing required operating staff are concerned, it appears to be a good idea to stretch the military approach over the people owning the required skills. It seems obvious to take their opinion into account, as not everybody would feel they need and should be always ready to take part in the evacuation or else, endanger themselves when they could be far from the problem. However, there are many people willing to participate in official or semi-official military groups such as National Defense forces and perhaps their members would be interested in volunteering into the expert's list: the list of professionals whose skills could be the answer to the evacuation issues in case of the emergency. Such list, available to the coordinators of emergency offices or emergency teams, could provide the solution to the situation, where there are people to be moved, there are transport means available, such as a train, but there is nobody declaring the knowledge on how to operate the vehicle. The idea is not new, it was used before and is currently used, however, in somewhat different form. PMG, Economy Mobilization Program, is designed for the enterprises, not individuals, and prepared on the basis of the Act of 23<sup>rd</sup> August 2001 on organizing tasks for the state defense, realized by entrepreneurs (Journal of Law no 122, item 1320 with amendments) and on the basis of the Decision of Ministry of Defense on preparing the plan of realizing the duties resulting from PMG (Journal of Laws of MON, Decision no 331 MON from 7<sup>th</sup> December 2016). The document is prepared every four years for the next decade, it is classified and its goal is to maintain safety and providing the means for appropriate forces, such as Police, Army, etc. It is to enlist entrepreneurs considered important for the economy and they are to create the chain of resources provided to the Army. Such work is paid and reported annually (<http://www.milwomen.pl/aktualnosci/program-mobilizacji-gospodarki>). Such program could also enlist the name list of professionals willing to help in the emergency and be paid for being on standby, which could potentially compensate for the inconveniences of having to report every move in and outside the country.

As far as the methods to provide the evacuated with the appropriate information are concerned, the means all branches of transport could use are of course radio, Internet platforms, text messages sent to everybody in the vicinity, all the applications the mobile

users could download to be updated about the emergency (it is suggested it should be offered for free, but such option is to be discussed in the future). Direct contact with all the exposure to the emergency could provide their fast and relatively calm reaction, however, it would not exclude the role of the coordinators. Their common contact, as well as their contact with the evacuated, is extremely important, however, the tools used on such communication channel would not differ much from the abovementioned ones; perhaps it would be more standardized, as mobiles and emails would constitute the basis of their communication.

Other issues, such as the role particular means of transport could serve in the evacuation, the requirements of its use in such situation and the danger it could create when used by the terrorists should be discussed separately for each means of transport taken into consideration.

When considering air transport means to be used in emergency situations, one may consider planes, but also drones and airships. What all those means have in common is the possibility to see the whole picture, offering the data to analyze the whole issue of evacuation at once. As for planes, they offer the possibility to evacuate quite a lot of people at once, they also offer the chance to travel to and back the quickest. Air transport has also one more advantage to consider from the perspective of evacuation planning, sometimes forgotten. This is firefighting equipment available on the airports. As it is stated: "Airport administration spend millions of dollars providing and operating firefighting equipment, hoping that they will never have to use it." (RFFS) (Kazda & Caves, 2010, p.427). Rescue and Fire Fighting Service is the team that could support other parties in organizing the crowd, monitoring people flow or immediately responding to spreading the fire of water.

As for perceiving airplanes as a potential terrorist's tools, one need to take into consideration the scenarios, when the plane is used to attack the crowd (hitting the building as on 7/11, massacring the crowd on the land etc.) or else, when the plane is hijacked and people traveling with it do not reach safe destination but start their run for life.

When analyzing air transport means, one cannot forget the airships. Slower than planes, yet offering the amazing capacities to start and land from literary everywhere, not requiring so numerous infrastructure solutions as planes, airships may be used as great means to facilitate evacuation. They offer the possibility to evacuate many people at the same time, however, they are more dependent on external conditions than planes. Moreover, one cannot forget their slowness. What is more, as the vehicles using explosive fuel, they may be easily turned into terrorists' weapon and as such prove a real danger to everybody being close to them. Nonetheless, it is highlighted that despite their advantages, "the success of airship transport or any form of airship operation depends to a very large extent upon the efficiency of the ground organization and equipment. In the past, the lack of appreciation of this fundamental fact has been the cause of many of the troubles encountered and to a large extent the reason for the comparatively slow development of the airship." (Scott, 1930, p.235). In case of evacuation, the transport infrastructure is of somewhat less importance than during its development, however, one needs to remember that airship could offer the possibility to supplement the solutions offered by planes.

Other tools supplementing the evacuation procedure are drones. Those smart machines, operating with quite noticeable speed, offering rather small load and size, may constitute great tool for gathering the data concerning the situation, following evacuation process step by step round the clock, giving information on the current state of operation, upcoming dangers, difficulties, ways of coordinating parties taking part in particular operation stage or stages, transporting documents if needed, making films, photos etc. One of the machines used in emergency situations was described by Hasam, Newa and Ahsan (2018), who highlighted its speed, compactness, and equipment: "an aircraft type autonomous portable drone suitable for surveillance and disaster management. The drone is capable of flying at a maximum speed of 76 km/hour. This portable drone comprises five distinct parts those are easily installable within several minutes and can be fit in a small portable kit. The drone consists of a ballistic recovery system, allowing the drone landing vertically. The integrated high definition camera sends a real-time video stream of the desired area to the ground control station. In addition, the drone is capable of carrying ~ 1.8 kg of payload" (Hasan, Newaz & Ahsan, 2018, p.147). On the other hand, gathering information means may be used by both good and bad hands, offering similar intel to the terrorists and warning them against any undertaken action or activity. Drone, is a great supporting tool, may as well be considered as great, dangerous weapon.

As far as road transport means used in evacuation process are concerned, they are usually the ones to be taken into consideration first when responding to evacuation planning. Road vehicles, whether we consider buses, coaches or cars, are the easiest to get due to their number, also the biggest number of people have, even if only rudimentary, knowledge how to operate them, and the infrastructure needed to use them may also fragmentary, even partly destroyed. The greatest concern is fuel, but it is also among the easiest to obtain due to numerous stations (at least, at the level of evacuation). Sadly, those advantages may also prove them being chosen as a quick method of massive harm, such as in some cases when a truck was used to kill, being driven into the crowd – this aspect cannot be forgotten. However, there is one option that first of all solves the problem of people needed for operating the machines and second, eradicates road vehicles from the range of terrorist: those are unmanned vehicles. The trend is quite visible: "The unmanned robotic vehicle industry is largely driven by government requirements, both military and civilian. Unmanned service robots are also found in commercial applications such as pipeline surveillance, crop monitoring and fish school location at sea" (Bloss, 2009, p.13). Road vehicles without the drier would provide easier to access means of evacuation and if protected properly, would not be possible to be used and a terrorists' weapon. The thing to remember when creating and using them, though, is appropriate IT safety measures.

In case of railroad transport means, their popularity offers great evacuation possibilities, however, limited with the already described issues with operating staff willing to participate in the evacuation process and the case of fuel. One of the fuels needed is electric power and this is usually cut off first in case of the emergency, leaving the means immobile or worse, blocking the railroad. That is why it is not easy to consider railroad vehicles as the first means of evacuation, however, in the situation when the power is not cut off yet and the need to leave the area is urgent, perhaps even just for the first mile of evacuation road such means of transport would prove useful, although then they need to be changed into other types of vehicles.

As far as inland means of transport are concerned, they are usually not mentioned, if not forgotten, in the majority of evacuation plans. Perhaps it is due to the case this is not the most popular means of transport, as well as not situated everywhere; however, in the areas boats are available they ought to be considered as an evacuation means, even if only supplementary, as they may help solve the panic problem of people left behind, because there was no place for them in the buses.

Summing up, all means of transport available in the area ought to be considered to be used in evacuation path planning and executing, obviously taking into consideration their strong and weak points so as to avoid the risk of creating the plan impossible to implement and to limit, if not eradicate, potential panic of the people involved.

## Conclusions

The issue of evacuation is the complex task that requires careful and detailed planning as well as multiple plan variations so that majority (if not all) scenarios are predicted and well prepared for. In the process of creating appropriate evacuation path, it seems a good idea to consider all the potential ways of rescue and all possible means of transport that could be used in the given location. What need to be considered, though, are the possibilities offered by every kind of available machines, as well as the shortcomings one may face when deciding to use them.

What seems potentially best solution is to divide the planning process into at least two stages and first consider the challenges to answer that are common for all possible solutions, such as lack of operating staff, number of vehicles, means to collect and spread the information necessary for smooth evacuation process. Secondly, it appears to be prudent to consider the possibilities offered by particular means of transport available in the area, as well as dangers they would create when used as the terrorists' means. When such data are cross-referenced with the information about the population of the area, the number of people currently in the vicinity, the nature of the danger they need to face, those may result in appropriate evacuation plan that may work best in the given conditions and help to save lives and wellbeing of numerous people faced with the emergency.

What needs to be highlighted, though, is the general idea of planning, preparing for the situation every one hopes would never happen. As it has already been observed: "Look at the way in which public transport is used for evacuation of personnel in the event of emergencies or disasters. Although the work of the emergency services is well documented, it seems that the important task of evacuation, and particularly the planning, operation, and documentation is often overlooked. (...) This is due to the sometimes unpredictable nature of the transport system due to roadworks, road closures, accidents, etc. Special events, such as football matches, are a regular occurrence, which includes the need to move large crowds to and from the venue. This strategy and planning can be used in the evacuation of people in the event of a disaster" (Scanlon, 2003, p.428).

Planning and trying to prepare for the unexpected seems to be the most important part of any successful evacuation case. It is visible in already analyzed evacuation cases, as it was in case of analyzing floods issue; it was observed, that the flood victims who were given evacuation notices were five times more likely to evacuate (Soon,

Kamaruddin & Anuar, 2018, p.134). It seems impossible to be prepared for anything and everything, but as those are the lives that are at stake the authorities need to do all they can to protect people in need and mostly, to prevent the emergency, and if that is not possible, to protect people against as many of unwanted emergency consequences as possible. Evacuation is but the first step, yet it seems crucial for people to believe the problem might be solved; carefully prepared plan, including the scenario to use particular means of transport and people willing to help evacuate other, is the most important stage of the operation. Therefore, appropriate managing of the vehicles used in an emergency situation would appear the key element for successful evacuation process and that in turn cannot be performed without proper analysis of each and every potential solution involving all means of transport available in the area.

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