LOGISTICAL NEEDS OF THE ESTIMATED POPULATION IN CRISIS SITUATIONS

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Abstract

Crisis situations are mass events, independent of the specific threats that cause them. The term "estimated population" is used for groups of more than 100 people, simplifying and unifying calculations and forecasts. Determining the needs of the population in crisis situations depends on several factors: the number of affected people, the size of the area, and the logistical capacity of the responsible authority or institution. Planning for material needs in crisis situations is based on norms and standards related to the requirements of affected people. This article presents the principles of material requirement planning in crisis situations, including the development, implementation, and improvement of standards and norms. The research involved interviews, observations, and analysis of documents provided by local government units in Rzeszów County, Poland, to understand the logistic capabilities and planning processes in place for emergency situations. Additionally, it describes how these standards are applied to determine the optimal size and structure of stocks.

Keywords: Crisis situations, estimated population, material needs, material requirement planning

1. INTRODUCTION

In the context of statistics, a population refers to the set of all possible observations for a given variable, while an estimated population attempts to infer or determine the total number of observations or the central tendency of all observations from a sample. In this context, the estimated population does not refer to a specific number of people in a geographical area but rather to a statistical concept used in sampling and inference statistics. This concept refers to the total number of possible observations or data points that can be collected on a particular variable of interest [1].

When applied to crisis situations, the term "estimated population" typically refers to the approximation of the number of people affected by specific emergencies, such as natural disasters, conflicts, pandemics, or other emergency scenarios. Accurate estimates are crucial to guide humanitarian interventions, determine resource allocation, and ensure that relief efforts are appropriately scaled. Estimating the population in crisis provides a roadmap for effective, efficient and empathetic humanitarian interventions, ensuring that aid reaches those who need it most [2].

A crisis is a major, unpredictable event with potentially negative outcomes, occurring rapidly and uncontrollably. Crises can arise from various sources, including warfare, natural disasters, technological failures, human error, and deliberate acts. These events pose significant threats to the safety, health, and well-being of communities or large groups of people and can have long-term negative consequences if not managed properly [3].

Any organisation that professionally manages during a time of crisis should have a well-developed anti- crisis structure, consisting of a set of organisational elements and principles that directly shape the response policy in this type of difficult situations. Anticrisis personnel should be composed of people specialised in crisis management, who should also have the skills to act under high pressure and whose objective is to prevent

negative developments and take corrective action with the guarantee of high quality of decisions [4]. The competences of the anti- crisis team must be broad because the right selection of members of the anti-crisis staff ensures an appropriate response, which is why people with other important knowledge and skills, for example in the field of law, human resources management, or psychology, who can build an atmosphere of mutual support and reduce the threat of conflicts and divisions should also be recruited for anti-crisis activities [5]. Understanding the definition and nuances of crisis situations is essential for effective crisis management and preparedness. This not only helps organisations and governments respond effectively, but also helps build resilience for future threats. From a societal perspective, crises are often seen as threats to the safety, health or well-being of communities or large groups of people, even if the crisis originates from an organisational or technological problem [6]. They can emerge from the following:

- natural events such as earthquakes, floods, tsunamis, or pandemics [7],
- technological and accidental hazards such as industrial accidents, transport accidents, or biohazards [8],
- human conflicts such as terrorist attacks, wars, or other forms of violent conflicts [9],
- economic problems such as situations that lead to economic decline and financial crises [10].

The purpose of this article is to present the principles of material requirements planning in emergency situations, along with the norms, standards, and methods for their development, implementation, and improvement. Research for this article involved interviews, observations, and an analysis of documents provided by local government units of Rzeszów County, Poland. By understanding the logistical capabilities and planning processes in place for emergency situations, this article aims to improve the effectiveness of humanitarian interventions and ensure that aid reaches those who need it most.

2. METODOLOGY

The research for this article involved a combination of qualitative and quantitative methods to gain comprehensive insights into the logistical needs and planning processes in crisis situations. The following methods were used:

- Interviews: Conducted with key personnel from local government units in Rzeszów County, Poland, to gather detailed information on their experiences, challenges, and strategies in crisis management.
- Observations: On-site observations were carried out to understand the practical implementation of crisis management plans and the logistical capabilities of the local government units.
- Document Analysis: Reviewed documents provided by the local government units, including crisis management plans, logistical reports, and internal communications, to analyze the existing procedures and identify areas for improvement.

This multi-faceted approach allowed for a thorough understanding of the current state of crisis management logistics and informed the recommendations presented in this article.

3. PLANNING OF MATERIAL REQUIREMENTS IN CRISIS SITUATIONS

Based on the analysis carried out in the local government units of Rzeszów County, it appears that the municipalities included among the potential threats that can cause emergency situations are mass threats to the life and health of the population or degradation of the natural environment. These threats include:

- floods,
- spatial fires of forest complexes and compact buildings in towns,
- fire-explosive and chemical hazards,

- radioactive contamination,
- road, rail and air disasters,
- human and animal biological infections of epidemic character, mass poisonings,
- breaches of public order and acts of terror (bioterrorism),
- other hazards.

The research found that the surveyed local government units made several assumptions:

- the area of the municipality/county is covered by a communication and alarm system for the population considered to be at risk [11],
- there is sufficient time to warn and alert the population and implement management procedures,
- the population of the municipality/county has the necessary knowledge on how to behave in the event of various threats,
- the directors and managers of the municipal/county combined inspection services and guards are able to undertake the statutorily assigned tasks in accordance with their own operational plan.
- in the event of activation of the evacuation process (reception of the population), the continuity of cooperation between all participants of the response will be maintained in case of need, the assistance of the army will be possible according to established procedures [12],
- In the event of an increase in state defence at the local government levels, civil defence plans are developed whose procedures can be used in an extensive peacetime crisis on the territory of the municipality/county.

Providing security to society is one of the most important functions of a modern state. The obligation to provide basic conditions for protection against potential and real dangers related to the occurrence of natural disasters or other events that exhaust the hallmarks of a crisis. The highest state of crisis here includes war, which is the time when multiple crises occur at the same time and in the same area [13].

In this context, it is important that the municipality, district, province and the country have an effective crisis management plan that, in the event of an emergency, identifies specific tasks to be performed by the relevant entities and units. A safety net, i.e. an indication of the most likely threats to an area, should also be conscientiously created by the entire crisis management team.

A well-prepared plan is designed to:

- ensure the possibility of a systemic, effective and coordinated response of the mayor/starosty to large or very large-scale crisis events, in the case of which it is necessary to mobilise forces and resources at the disposal of organisational units of the administration, local government, nongovernmental organisations and individuals,
- identify potential types of hazards that may occur in the administered area,
- designate the functional persons who, within the framework of their statutory tasks or by agreement, will ensure the proper coordination of activities in emergency situations,
- establish principles and procedures for the provision of assistance by county authorities when municipal forces and resources are insufficient to cope with the situation.

In some of the local government units, no proper attention was paid to the proper organisation of logistic security organisation, indicating the need for a detailed analysis (**Table 1**) of internal capabilities [14], and in the absence of these, the use of external service providers through the conclusion of contracts and the imposition of personal and inkind services [15].

Table 1 Example of logistic capacity analysis

Type	Current status	Implementation
Nutrition and provision of daily necessities	Lack of own facilities	Concluding the contract and launching full-day catering for employees
Medical care	Clinics and health centres	Staging of a Medical Post with a sanitary car in the area
Transport and operation of vehicles and technical equipment	Lack of own facilities	Assignment of personal and material services to passenger-terrain vehicles with drivers
Supply of fuels and consumables	Petrol stations	Assignment of services to provide refuelling and vehicle maintenance assistance
Counter-intelligence protection	Running protection	Establishing cooperation with the relevant authorities to develop a special cover
Special intervention points	Chemical teams and civil defence in companies	Activation of civil defence formations and their use in the realisation of the operation
Organisation of an aerial threat and contamination and infection notification and alert system	System organised and tested during trainings	Starting the system

Proper planning of material requirements in crisis situations is critical for a rapid and effective intervention and can ensure that resources are deployed where they are most needed, efficiently and effectively, saving lives and helping communities recover more quickly. A thorough and rapid assessment of the needs should be the first step that helps to understand the scale, nature, and urgency of the material requirements [2]. Furthermore, the following aspects are also very important:

- prepare prepositioned stocks of essential supplies such as food, water, medicine, and shelter materials to ensure their immediate deployment in a crisis situation [16],
- prepare logistics systems in a way that they can be quickly scaled up in response to increased demand in times of crisis [17],
- prepare a list of suppliers who can quickly supply the necessary materials in an emergency [18],
- development of effective mechanisms for collecting, storing and sharing data necessary for real-time decision making [19],
- ensure that transportation means (such as trucks, helicopters, etc.) are available and routes are mapped out in advance [20],
- taking into account local knowledge and resources, which can speed up response time and ensure culturally appropriate assistance [21],
- ensure that feedback mechanisms have been established to continuously monitor material distributions and adjust strategies accordingly [22],
- provide training for staff and local partners to ensure that material needs are identified, planned and distributed efficiently [23],
- ensure seamless coordination between different stakeholders, such as NGOs, government agencies, and the private sector to avoid duplication and gaps [24].

In crisis situations, the size of the supply and service capacities that can be used to ensure logistic security of the affected population is known as logistic capacity. This potential is made up of human resources, supply resources and service resources, that relate to specialised and economic logistics services and medical services. This potential is established prognostically for emergencies at all levels of local and central government, and its size is determined with reference to the balance of logistical needs [25]. According to the

principle of crisis management, each higher level of government serves its own potential for the lower levels (**Table 2**). Therefore, a capability is not prepared that meets all the needs that arise. This is mainly due to the enormous costs associated with such preparation and maintenance. The logistics capacity prepared for an emergency is estimated to be around 75% of the needs contained in the forecasts, and the other part is provided by higher-level resources as support [26].

Table 2 Structure of the crisis management system in Poland [27]

Crisis Management System in Poland			
Level	**Crisis management authority**	**Opinion-giving and advisory body**	**Crisis Management Centre**
National	Council of Ministers, Prime Minister	Government Crisis Management Team	Government Security Centre
Resort	Minister heading a department of government administration, head of a central authority	Crisis Management Team (ministry, central office)	Crisis Management Centre (ministry, central office)
Voivodeship	Voivode	Voivodship Crisis Management Team	Voivodeship Crisis Management Centre
District	District governor	District Crisis Management Team	District Crisis Management Centre
Commune	Mayor	Communal Crisis Management Team	Community (urban) crisis management centres (not required to be established)

Human resources used to secure the affected population in emergency situations are mainly logistics support groups supported by a welfare group and a health care group. As crises are of different types and each has a different scope, the tasks provided to the affected are different and require a different human potential they may represent:

- military units,
- public and non-public health services,
- police,
- municipal and community guard,
- border guard,
- fire protection units,
- NGOs,
- civil defence formations.

The logistic supply potential refers to the sources from which materials are obtained during a crisis situation. From the point of view of the affected population, the most important thing is the supply of basic items necessary for surviving the situation and, for this reason, in particular drinking water intakes, food storage facilities, household items, power supplies, fuels, fire and flood prevention equipment as well as medical supplies and materials need to be prepared. The proper securing of the sources of supply requires their availability as close as possible to the emergency area. Therefore, it is important to perform a reconnaissance to determine the availability of local material resources and to create agreements with nearby suppliers who can help in case of need. Furthermore, it is possible to obtain the necessary supplies from the targeted state reserves, as well as to request support from higher levels of government or national and international humanitarian organisations [28].

The potential for service includes field infrastructure, real estate, and movable property that can be used to provide specialised, economic and medical logistics services. Field infrastructure should be understood primarily as critical infrastructure facilities, which are key to ensuring the security of the state and its citizens, but also as transport infrastructure facilities, meaning all transport routes with equipment. Real estate facilities are warehouses, where essential supplies are stored, accommodation facilities, such as dormitories, schools, and hotels; repair facilities, such as maintenance factories and workshops, and catering facilities such as restaurants, bars, and canteens. Medical services are provided by hospitals, clinics, sanatoriums, pharmacies, etc. Movable assets include land, water and air transport, as well as handling and specialised equipment such as truck cranes, refrigerated trucks, bathing cars or equipment adapted for water extraction and purification, equipment allowing transportation of fuel storage and distribution [29].

The tasks of the logistics system in a crisis situation depending on the subsystem are summarised in **Table 3**.

Table 3 The tasks of the logistics system in a crisis situation [26]

Subsystem	**Tasks of Logistics**
Transport and evacuation	ensuring priority supplies of drinking water and food; ensuring the priority supply of medical goods, such as pharmaceuticals and bandaging equipment; transfer of rescue teams to the danger area; securing the delivery of supplies; assisting and supporting the evacuation of the affected people; carrying out evacuation of pets and livestock; ensuring the supply of materials needed to rebuild damaged infrastructure facilities; arranging road diversions; removal of traffic obstructions; maintain constant communication with the Crisis Management Centre; keeping transport equipment on standby.
Materials and supplies	holding specific levels of stock and material reserves and protecting them, together with quality control; distribution of medical and other materials according to accepted volumes; seeking additional sources for supply; keeping the necessary records and reporting; alerting when critical stock sizes occur; following all standards for foodstuffs; continuous communication with the Crisis Management Centre.
Economic and social services	providing the affected with hygiene and hygiene supplies; preparation of specialised equipment; preparation of food points for the affected; preparation of mobile or fixed facilities for bathing and washing clothes; organising temporary accommodation; providing basic accommodation equipment; providing heating materials as needed; ensuring fire safety; looking for specialists and service engineers in case of failures and damages; maintaining public order; providing psychological or religious services; continuous communication with the Crisis Management Centre.
Technical security	maintaining and protecting critical infrastructure facilities as well as communication facilities; carrying out the necessary engineering and repair work on the accommodation facilities; searching for heavy equipment if necessary; environmental protection; repair of technical equipment; continuous communication with the Crisis Management Centre.

According to the principle of standardisation, limitation, and rationing normative volumes of supply are introduced for some logistics services. This is due to the shortage of the mix of products to supply in crisis situations. However, the limit level should not exceed a certain critical level, which is based on health and food indications, as well as on transport, social, health, or hygiene regulations. Especially precise limits are established for the supply of drinking water for one victim, as well as food and various hygiene and sanitary items. Logistical needs in crisis situations must first be identified and then planned quantitatively and qualitatively. It is important to consider that due to limited resources, it is impossible to meet all needs and for this reason it is essential that existing requirements should be effectively balanced with the real potential. The choice of optimal solutions in logistics support during a crisis is related to the following elements [30]:

- minimising the time needed to reach the affected population with logistical services,
- maximising the number of victims who can be helped,
- maximising the delivery of all supplies and logistic services to the affected population,
- optimisation of the deployment of equipment and materials,
- minimising the length of escape routes,
- minimising the time required to evacuate from the danger area,
- reducing the time required for the flow of information between the actors involved in logistics tasks,
- minimising the costs of operations with the achievement of the planned level of effectiveness.

When logistic support is performed, some priorities must be applied in action. This is mainly a result of the extreme diversity of needs and also their scale. For this reason, rules and a sequence of actions were created, which are implemented in the three distribution channels concerning medical, material, and technical support. Determining the needs of the population in crisis situations depends on how many people are affected and the size of the area in which they are located, as well as the capacities (supplies, medical, etc.) available to the unit responsible for helping. When the scale of the damage is greater than the available capacity or there are other problems in reaching the victims, the assistance provided may be limited to the minimum necessary to guarantee survival. Due to the risk of the situation described above, three standards have been developed to meet the food needs of affected people:

- standard norm – meets physiological needs,
- reduced norm – 50% of the standard,
- critical norm – provides the minimum necessary for survival.

The standards for health and logistics services are primarily related to health and safety regulations, as well as sanitary, hygienic, and antiepidemic conditions. As with meeting food needs, medical services can be reduced to a minimum to ensure survival. This happens when the potential for medical assistance is lower than the needs [31].

4. CONCLUSION

Crisis management encompasses numerous critical issues that are essential to the field of security. Effective functioning during an emergency ensures the continuity of institutions and organisations and aids in the swift return to normalcy. The prepared plans and procedures must be up-to-date, with documented changes and clearly applied corrections, to enhance the overall crisis management system. A well-functioning system to counteract and respond to danger is vital to proper security. Therefore, correlating and coordinating the activities of all actors in this field, along with educating the public, is paramount.

The construction and continuous practice of crisis management plans are crucial. Regular drills and the introduction of improvements ensure that these plans remain effective. Standards in logistics, including those for crisis situations, aim to ensure that products arrive at the right place, in the right quantity, quality, and time,

and at the right costs. Successful mitigation of all crisis threats and their negative impacts relies on a well-established and organised crisis management system, with logistic support as one of its most important components.

During a crisis, the efficient organisation of the supply of basic materials and resources, as well as logistical and medical services, is of central importance. The affected population relies on these operations for survival. Human life and health are the most valuable assets, necessitating efforts to help as many affected individuals as possible in the shortest time. These activities, known as logistic support in crisis situations, are a crucial aspect of crisis management.

The concept of an "estimated population" plays a pivotal role in crisis management planning. It simplifies and unifies all calculations and forecasts by providing an approximation of the number of people affected by a crisis. Accurate estimation is essential for guiding humanitarian interventions, determining resource allocation, and ensuring that relief efforts are appropriately scaled. Using the estimated population, crisis managers can plan for material requirements and deploy resources where they are needed most.

In crisis situations, the importance of logistic support increases significantly. By adhering to established standards and taking advantage of the concept of the estimated population, objectives can be achieved efficiently and effectively. The effective functioning of all crisis management activities is only possible with adequate logistic support, utilising the estimated population to simplify and unify all calculations and forecasts.

In general, this article highlights the importance of planning and preparation in managing the logistical needs of populations during crises. Through interviews, observations, and document analysis conducted in Rzeszów County, Poland, it becomes clear that thorough planning, proper coordination, and the implementation of standards are essential for effective crisis management. These efforts ensure that aid reaches those in need, resources are used efficiently, and the impact of crises is mitigated as much as possible.

It should be emphasised that this article is only a starting point for further research. The findings presented here underline the need for ongoing studies to further develop and refine crisis management strategies, to ensure that they remain effective and adaptable to evolving challenges.

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