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The Logistics Chain of Emergency Supplies in Disasters

CHALIAMALIAS Timoleon

Nurse



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Abstract

The number of disasters has increased over recent years and hundreds of millions of people are affected each year. The impact of disasters and the massive scale of recent global relief efforts have brought growing attention to the need for effective and efficient disaster response operations. After a literature review, we could conclude that quick response to the urgent relief needs right after disasters through efficient emergency logistics distribution is vital to the alleviation of disaster impact in the affected areas.

Although logistics is, nowadays, the largest and most complex element of relief operations, the most relief workers normally see it only as a series of local, disconnected activities. Improvement of emergency logistics is essential and could result in optimization of the humanitarian relief by better preparedness. All the information compiled and the activities carried out at the planning and preparation stage should serve as the basis for the development of the logistics plan, which must spell out procedures, responsibilities and timetables for implementation of a supply chain of emergency supplies.

The logistic chain of humanitarian supplies is necessary in order to achieve a balance between speed, security, storage and transport costs, before, during and after a disaster, natural or man-made.

Key words: disaster, human relief, emergency logistics, supply chain, emergency supplies, preparedness

Περίληψη

Ο αριθμός των καταστροφών που συμβαίνουν στις μέρες παρουσιάζει αύξηση, επηρεάζοντας κάθε χρόνο εκατοντάδες εκατομμύρια ανθρώπων. Ο καταστροφικός αντίκτυπος των καταστροφών αυτών, τόσο σε προσωπικό, κοινωνικό όσο και οικονομικό επίπεδο και συνάμα η μαζική προσπάθεια ανακούφισης από καταστροφές, που πλήττουν αναπτυγμένες και αναπτυσσόμενες χώρες, εγείρουν το παγκόσμιο ενδιαφέρον για αποτελεσματική κι αποδοτική λειτουργία των επιχειρήσεων αντιμετώπισης καταστροφών. Οι εμπειρίες των τελευταίων ετών καταδεικνύουν πως η ταχεία ανταπόκριση στην επείγουσα ανάγκη ανακούφισης αμέσως μετά από κάποια καταστροφή, μέσω της αποτελεσματικής λειτουργίας της ‘εφοδιαστικής αλυσίδας έκτακτης ανάγκης’ (emergency logistic chain), είναι ζωτικής σημασίας για την ανακούφιση από τις οδυνηρές επιπτώσεις των καταστροφών στις πληγείσες περιοχές.

Εάν και τα ‘logistics’ είναι στις μέρες μας το μεγαλύτερο και πιο σύνθετο στοιχείο των επιχειρήσεων αρωγής, συνήθως θεωρείται από τους περισσότερους εργαζόμενους των επιχειρήσεων αυτών ως μια σειρά τοπικών, έκτακτων, μη συνδεδεμένων και σχεδιασμένων δραστηριοτήτων. Βελτίωση, όμως, του τομέα αυτού κρίνεται επιτακτική, ώστε να οδεύσουμε προς τη βελτιστοποίηση της παροχής ανθρωπιστικής βοήθειας μέσω καλύτερης προετοιμασίας και έγκαιρου σχεδιασμού.

Όλες οι πληροφορίες που συγκεντρώνονται και οι δραστηριότητες που διεξάγονται στο στάδιο προγραμματισμού και σχεδιασμού θα πρέπει να αποτελέσουν τη βάση για την ανάπτυξη του σχεδίου διοικητικής μέριμνας, η οποία πρέπει να διευκρινίζει τις διαδικασίες, τις αρμοδιότητες και χρονοδιαγράμματα για την εφαρμογή της παροχής των προμηθειών έκτακτης ανάγκης με το βέλτιστο τρόπο, ακολουθώντας μια ‘εφοδιαστική αλυσίδα προμηθειών έκτακτης ανάγκης’.

Η ‘εφοδιαστική αλυσίδα’ παροχής ανθρωπιστικής βοήθειας (the logistic chain of humanitarian supplies) είναι αναγκαία προκειμένου να επιτευχθεί μια ισορροπία μεταξύ της ταχύτητας, της ασφάλειας, της αποθήκευσης και των μεταφορικών εξόδων πριν, κατά τη διάρκεια και μετά από μια καταστροφή, φυσική ή ανθρωπογενή.

Λέξεις κλειδιά: καταστροφή, ανθρωπιστική βοήθεια, σχεδιασμός και προγραμματισμός, εφοδιαστική αλυσίδα, προμήθειες έκτακτης ανάγκης, βελτιστοποίηση

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Abbreviations

AIDS: Acquired Immunodeficiency Syndrome
CRED: Centre for Research on the Epidemiology of Disasters
FB: Fire Brigade
FEMA: US Federal Emergency Management Agency
GIS: Global Information System
GSCP: General Secretariat for Civil Protection
HIV: Human Immunodeficiency Virus
ICT: Information and Communication Technology
IEHK: Interagency Emergency Health Kit
ISDR: International Strategy for Disaster Reduction
NGO: Non-Governmental Organization
PAHO: Pan American Health Organization
SCM: Supply Chain Management
SUMA: Supply Management Project
UHF: Ultra high frequency
TOR: Telex-Over-Radio
VHF: Very high frequency
VO: Voluntary Organizations
WHO: World Health Organization

Introduction

Every year, more than 500 disasters are estimated to strike our planet, killing around 75,000 people and impacting more than 200 million others. In 2012 thirty nine 'disasters' have already happened (January to April), killing almost 702 people and affecting thousands of people all over the world[1]. The economic and human impact of the disasters in the last 12 years (2000-2011) is: 1.1 million people have been killed, 2.7 people have been affected and there was 1.3 trillion (USD) damage in the economic area. The numbers show the effects of natural disasters such as earthquakes, floods, and hurricanes, as well as manmade disasters such as chemical accidents[2].

According to the Centre for Research on the Epidemiology of Disasters (CRED), 406 natural disasters and 234 technological disasters were reported worldwide in 2010. The number of natural disasters is close to the annual average for the decade but shows an increase of 11% compared to the decade's lowest value, reported for both 2008 and 2009. The number of technological disasters is the decade's second lowest, after 2009, far below the numbers reported during the first five years of the decade. The number of deaths caused by natural disasters (297,752) is by far the highest of the decade, exceeding 2004 and 2008. This is attributable to the January 2010 earthquake in Haiti (222,570 deaths), which was the second deadliest natural disaster of the decade (after the 2004 Indian Ocean tsunami), and to the summer heatwave in Russia (55,736 deaths), the second deadliest heatwave of the decade, after that in Western Europe in 2003. Also in 2010, the total number of people reported killed by mass movements of hydrological origin (3,402) is the highest of the decade and the number of deaths caused by floods (8,408), the second highest. The technological disaster that resulted in the highest number of deaths (346) was a stampede of people during a festival, in November, in Cambodia. Among industrial accidents, lead poisoning caused by illegal gold mining resulted in 200 deaths in Nigeria. The accident and explosion of a fuel truck led to the deaths of 192 people in the Democratic Republic of the Congo. The number of people reported affected by natural disasters (304 million) is the second highest of the decade, but far below the peak of 2002 (709 million). In 2010, more than 60% of people reported affected were victims of floods.

By comparison, technological disasters affect, proportionally, very few people and no damages were reported for technological disasters in 2010.

Natural disaster costs, US\$ 123.3 billion, were the fourth highest of the decade, after 2005, 2008 and 2004.[3]

As we can see, hundreds of millions of people are affected by disasters each year and even natural or manmade, all disasters have wide scale human suffering in common and without mobilization of aid missions from countries around the globe, the cumulative damage would be much worse. Global policies on disaster risk reduction have highlighted individual and community responsibilities and roles in reducing risk and promoting coping capacity. Most fatalities, injuries, and damage caused by disasters are preventable. Indeed, many studies indicate that adequate household emergency preparedness could significantly reduce the negative consequences from disasters and ensure that people can care for themselves and their families during the first 72h following a disaster[4]. Unfortunately, this requires that countries and organizations must organize how the required resources for a quickly recovery after a disaster could be obtained. This organizational structure is provided only by logistics, the art or strategy of achieving practical objectives as promptly and methodically as possible while making the most effective use of available resources.

Depending on the country emergency preparedness and emergency response of health care operations is carried out by a combination of governmental and non-governmental

organizations (NGOs)[5]. Regardless of this, the objective of disaster response in the humanitarian relief chain is to rapidly provide relief (emergency food, water, medicine, shelter, and supplies) to areas affected by large-scale emergencies, so as to minimize human suffering and death[6]. Therefore, the design and operation of the relief chain play significant roles in achieving an effective and efficient response.

But although logistics is key-factor to disaster response activities, for years, the aid sector's regard for logistics has been viewed as a necessary expense rather than an important strategic component of their work. Only recently have humanitarian relief organizations begun to understand the criticality and importance of relief chain management on the success of disaster relief operations. They realize that they must be more results-oriented as they become ever more accountable and therefore their operations must be more transparent. Since disaster relief is about 80%, logistics it is understandable that the only way to achieve this is through slick, efficient and effective logistics operations and more precisely, supply chain management[7],[8].

Unfortunately, no standard model exists for using supply chain management (SCM) techniques to provide relief to populations affected by disasters. Also, the management of emergencies or disasters is often characterized as adjunct to "more routine" bureaucratic functions such as planning, financial management, human resources management, and economic development[9].

For managers within the humanitarian sector, coordinating logistics during a relief effort is often a daunting task that can result in the loss of life and resources if not done quickly and effectively[10].

The *purpose* of this paper is to review the existing literature on emergency preparedness, recording the most popular tools in emergency logistics. The *method*, which used is the following. This review was conducted by searching at least four online literature databases (PubMed, SpringerLink, Elsevier and SCOPUS) using the following key words: disasters, emergencies, preparedness, emergency supplies, logistic chain, supply chain, humanitarian relief, disaster management and by looking at the reports and guidelines of the World Health Organization (WHO) and the Pan American Health Organization (PAHO). Google and Google Scholar search engines were used to obtain referenced articles not available in the above-mentioned databases. A manual search of all referenced articles followed the original searches.

Disasters-Definitions and effects

The definition of disaster is variable and usually reflects the nature and focus of the organization or individuals defining it. According to the more complete definition, ‘Disaster’ is defined as a crisis situation causing wide spread damage which far exceeds our ability to recover. A more focused definition generally accepted by the specialty of emergency medicine is: when the number of patients presenting within a given time period are such that the emergency department cannot provide care for them without assistance. With this definition, events that result in mass death toll are excluded[11].

But regardless of the given definition we conclude that there cannot be a perfect ideal system that prevents damage, because then it would not be a disaster. It has to suffocate our ability to recover. Only then it can be called as ‘disaster’. The Pan American Health Organization (PAHO) refers that the term “disaster” is usually applied to a breakdown in the normal functioning of a community that has a significant adverse impact on people, their works, and their environment, overwhelming local response capacity. This situation may be the result of a natural event—say, a hurricane or earthquake—or it may be the result of human activity[12].

Types of Disaster

Disasters are mainly of 2 types,

- ✓ Natural disasters. Example – earthquakes, floods, landslides, etc.
- ✓ Man- made disasters. Example – war, bomb blasts, chemical leaks, etc.

The phases of all disasters, either natural or man-made, are the same. The disasters often differ in quantity of damage caused or in quality of the type of medical consequences. For example earthquakes cause a lot of physical injury and fractures, floods cause drowning deaths and infections, chemical leaks cause toxic manifestations, etc

‘Crises’ and ‘disasters’ are defined as abnormal and unique events that occur with some degree of surprise to demand unusual, extensive and taxing response effort. These events are, in fact, ‘turning points’ in the life of individuals, family units, organizations, businesses, communities (e.g., municipalities), and nations with a potential for affecting them in both the short and the long term. They are events, which, by their definition, overwhelm any one-response organization and demand a multi-organizational and multi-jurisdictional response.

	Natural	Man-made
Sudden-onset	Earthquake Hurricane Tornadoes	Terrorist attack Coup d'état Chemical leak
Slow-onset	Famine Drought Poverty	Political Crisis Refugee Crisis

Figure 1: Explaining disasters[8]

Each disaster is unique—its effects not only have to do with the type of natural or man-made phenomenon, but also with the economic, health, and social conditions of the area. However, an important characteristic of all disasters is their centrality. Catastrophes are disasters of a great centrality. A total breakdown of everyday functioning takes place in them, with the disappearance of normal social functioning, loss of immediate leaderships, and the insufficiency of the health and emergency systems, in such a way that the survivors do not know where to go to receive help[13, 14]. So, there are common features, and identifying

them can help improve the management of humanitarian assistance and the use of resources. The following aspects should be taken into account when considering the nature of a disaster:

1. There is a correlation between the *type* of disaster and its impact on health, particularly the occurrence of injuries. For instance, earthquakes cause many traumas that demand medical attention, while floods tend to produce relatively few injuries;
2. Some of a disaster's effects do not have an immediate impact on public health, but pose a potential threat. Population displacements and environmental changes may increase the risk of a spread in communicable diseases. In general, though, epidemics are not *caused* by natural disasters;
3. Immediate and potential health hazards in the aftermath of a disaster seldom materialize simultaneously; they tend to strike at different times, and with variable intensity within the affected area. Thus, injuries tend to happen at the time and place of the impact, demanding immediate medical attention, while the risk of an increase in communicable diseases evolves more slowly and reaches maximum intensity with overcrowding and breakdowns in hygiene;
4. After a disaster, the need for food, clothing, shelter, and primary health care is rarely absolute; even the displaced often have the resources to satisfy some of their own basic needs. Moreover, it is common for the victims of a disaster to recover quickly from the initial shock and participate spontaneously in search and rescue efforts and other relief initiatives, such as the storage and distribution of emergency supplies;
5. Wars and civil conflicts generate a particular set of health problems and operational obstacles. Overcoming them requires dealing with many political, social, ethnic and geographical issues.

Effective humanitarian relief management is based on anticipating problems and identifying them as they arise, and providing specific supplies at the right time where they are most needed. (6)

The various effects of disasters on the population and its surroundings generate different kinds of needs and require different approaches to meet those needs. It is therefore important to have a general sense of what these effects are, and which systems are most commonly affected. However, experience shows that the effects in question cannot be taken as absolutes, since the impact and form a disaster takes depends on the specifics of the affected region.

We have the short-term effects of major disasters, as *death* or *severe injuries*, requiring extensive treatment and some effects, which change the way of life of the disaster victims for a long time. We could briefly mention the main, following effects of disasters:

- *Social reactions*

The behavior of disaster victims explodes into general panic or sinks into stunned apathy. After the initial shock, people tend to start acting positively to meet well-defined personal goals, leading to an increase in individual activities that, in spite of being spontaneous, quickly self-organize into collective endeavors. In some cases, actively antisocial behavior, such as looting takes place, whereas, individuals' spontaneous reaction may be detrimental for the whole community. Also, after a disaster rumors abound and can cause panic, or resistance to the proposed measures of public health.

- *Communicable diseases*

Natural disasters do not cause massive outbreaks of infectious diseases, although in some circumstances they may increase the odds of their spreading. In the short term, the increase in morbidity is frequently the result of fecal contamination of drinking water and food, causing gastrointestinal diseases. In the immediate aftermath of a disaster, the risk of contamination grows—as in the case of refugee camps—as existing sanitation services such as water supply and sewerage systems break down and it becomes impossible to maintain or restore public health programs.

- *Population displacements*

- *Exposure to the elements*

Health hazards associated with exposure to the elements are not common in temperate zones, even after a disaster, as long as the displaced are kept in dry places where they can remain sheltered from the wind and cold. However, in other climates with significant extremes in

temperature, whether too hot or too cold, proper shelter can be vital. Hence, the need to provide emergency shelter should not be seen as a given, but depends instead, to a large extent, on local circumstances.

- *Food and nutrition*

Food shortages in the aftermath of a disaster are generally due to two causes. The first is the destruction of food stocks in the affected area, which combines with personal losses to reduce the immediate availability or affordability of food. The second is disorganized distribution systems, which may contribute to shortages even if there is no absolute scarcity of food. Efficient food distribution may be a key need in the short term, but large-scale imports or donations of food are seldom needed. One crucial exception must be mentioned: the case of mass displacements of people.

- *Water supply and sewerage*

The interruption of such services leads to severe health risks.

- *Mental health*

In the immediate aftermath of a disaster, anxiety, neurosis and depression are not a major public health issue, and can generally be handled temporarily by other members of rural or traditional communities without external support. Confounding expectations, it is relief workers who may comprise a high-risk group. Whenever possible, all efforts must be made to preserve the social structure of families and communities. Likewise, the indiscriminate use of sedatives or tranquilizers during the relief stage of the disaster must be vigorously discouraged. In the industrialized or urbanized areas of developing countries, a significant increase in mental health problems often accompanies the long-term rehabilitation and reconstruction phase. Treatment must be provided. Special reference must be made to the traumas that are the result of contact with the horrors of armed confrontation and other forms of extreme violence. The violent death, disappearance, or injury of relatives and friends aggravates the trauma, which generally calls for protracted therapy.

- *Damage to infrastructure*

Natural disasters frequently cause severe damage to key facilities, affecting the health of those sectors of the community that depend on the services provided. In the case of hospitals and health centers whose structure is unsafe, natural disasters put its occupants at risk and limit institutional capacity to provide services to the victims. These destructive effects also have an impact on infrastructure, equipment, and other useful resources for managing the arrival, storage, and distribution of emergency supplies.

Logistics and emergencies

There are three phases of research on emergency logistics abroad: before the mid-1990s, from mid-1990s to the start of the 21st century, and since the start of the 21st century[15]. But the definition of emergency logistics remains ambiguous. Unlike business logistics which has been clearly defined as: ‘*Logistics is the process of planning, implementing, and controlling the efficient, effective flow and storage of goods, services and related information from the point of origin to the point of consumption for the purpose of conforming to customers requirements at the lowest total cost*’[16],[17], the definition of **emergency logistics** has not yet been well clarified. Intuitively, the above definition may not fully apply to emergency logistics as the nature of problem, operational purposes, and demand features, e.g., the people served and the urgency of relief needs in emergency logistics is distinctively different from that of business logistics. Accordingly, adapted from the above definition, we tend to clarify emergency logistics as ‘*A process of planning, managing and controlling the efficient flows of relief, information, and services from the points of origin to the points of destination to meet the urgent needs of the affected people under emergency conditions*’[18].

Whatever the definition, one thing that logistics has in common is the fact that includes the planning and preparedness, design, procurement, transportation, inventory, warehousing, distribution and recipient satisfaction. In short, all logistics operations have to be designed in such a way that they get the right goods from the right place and distribute them to the right people at the right time. The critical components of logistics include medical supply, communications, facilities, and security (figure 2).

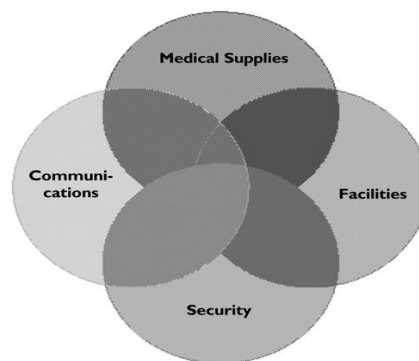


Figure 2: Logistic components [19]

The key challenges to emergency logistics planning as compared to the business logistics case are highlighted [6, 18] as:

- i. Additional uncertainties (unusable routes, safety issues, changing facility capacities, demand uncertainties),
- ii. Complex communication and coordination (damage to communication lines, involvement of many third parties, government, and civilians, inaccessibility to accurate real-time demand information),
- iii. Harder-to-achieve efficient and timely delivery and
- iv. Limited resources often overwhelmed by the scale of the situation (supply, people, transportation capacity, fuel).

However, humanitarian logistics play an integral role in response and recovery following a disaster. In emergency relief operations, logistics are required to support the organization and implementation of response operations in order to ensure their timeliness and efficiency. Mobilizing the staff, equipment and goods of humanitarian assistance organizations, the evacuation of the injured or the resettlement of those directly affected by the disaster, requires a logistics system to maximize effectiveness[20].

Characteristic	Commercial logistics	Humanitarian logistics
Objective pursued	Minimization of total logistic costs	Minimization of human suffering
Origination of the commodity flows	Self-contained	Impacted by material convergence
Knowledge of demand	Known with some certainty	Unknown and dynamic due to lack of information and access to the site
Decision making structure	Structured interactions under control of a handful of decision makers	Non-structured interactions, <u>thousands</u> of decision makers
Periodicity / volume of logistic activities	Repetitive, relative steady flows, "large" volumes	One in a lifetime events, large pulse of flow, relatively "small" volumes
Supporting systems (e.g., transportation)	Stable and functional	Impacted and dynamically changing

Table 1: Differences between commercial and humanitarian logistics[21]

Being better prepared (Preparedness)

Preparedness may be defined as the knowledge, capabilities and actions of governments, organizations, community groups, and individuals “to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions”[22] Humanitarians have begun to heed to the lessons learnt from previous disasters and realize that they have to work hard not only during disasters but also between disasters. They are beginning to think more in terms of optimizing their performance by being better prepared.

Logistical activities have to be planned, since adequate preparations are essential to a smooth operation. It is indispensable to renounce the commonly held notion that transport and other arrangements can be improvised, depending on circumstances “in the field” when disaster strikes. Planning is both necessary and practical, since it is generally possible to foresee the types of disasters that may affect a given location and the needs that such disasters will be likely to engender. In fact, logistics should be an active component of any national emergency response plan, as well as of the individual plans of disaster response organizations and key institutions such as schools and health establishments. Logistics must be closely linked to all other operational activities in the context of responding to a given emergency[8].

There is no question that being better prepared leads to a better response and the key to being better prepared, and perhaps the greatest stumbling block in humanitarian sector, is that logistics has to be recognized and understood as an intrinsic element of any relief operation. This has to happen before the functions can be designed and preparedness improved through effective disaster management.

The plan must be based, first of all, on a good working knowledge of the geographical, social, political and physical characteristics of the area where the operations are to take place. Such a plan must not only be well thought out in advance, so that it can run smoothly—it must, above all, be clearly understood and accepted by all stakeholders in any future relief operation.

The plan must provide clear answers to the following questions:

- Which tasks must be carried out? How do they relate to all the other activities, and what are the correct sequences for carrying them out?
- Who will be responsible for performing such tasks? (Rather than individuals, what must be identified here are organizations or departments.)
- Who will be in charge of the overall coordination of the logistical system?
- What resources are needed? How, when, and where can they be procured?
- What alternative actions can be implemented if the system is somehow disrupted?

Preparedness must be based on the vulnerability and resource assessments normally carried out to develop a national or regional emergency response plan. We must never forget that logistics has to be a key component of any such plan.

So, it is essential to draw up a list of preparatory activities, which must include the following:

➤ Assessing the vulnerability of key infrastructure.

The goal is to identify the strengths and weaknesses of public works and strategic structures of the country or region—highways, water supply systems schools, hospitals—as well as alternative actions that may be required should the infrastructure collapse. The approach will vary according to local conditions, but is likely to include the following:

- Map and systematically review key elements of the national transport infrastructure (port, road and rail, and air), such as capacities and constraints on strategic routes, key bottlenecks such as bridges and ferries, availability of communications, and risks of blockage due to hazard impact. A major concern will be port and airport vulnerability to natural hazards. This can include, for example, cyclone damage to hangars, warehouses, refueling and cargo handling equipment, and the impact of earthquakes on key systems.
- Review the potential secondary effects of disaster, such as road blockages by population movement from affected areas.
- Analyze annual weather records to see how climate can constrain transport system capacity at different times of the year.
- Regularly monitor major modifications and new construction, which may introduce temporary limits and diversions; for example, bridge weight, height or width restrictions due to repairs.

➤ Determining the availability of strategic resources for logistical support.

These resources are constantly changing, so they must be reviewed frequently to keep the information as up-to-date as possible. The review must also involve the private sector, the public sector, and national and international nongovernmental organizations.

- Build an inventory of in-country sources of the types of supplies, which might be needed at short notice in an emergency, including medical equipment, food, shelter items and fuel and rescue equipment. The analysis should consider lead times for the supply of critical items.
- Analyzing the capacity of the transport system for moving people and supplies—assessing in detail the country’s transport capacity, such as the size of fleets, their type and capacity, location, costs, and availability.
- Examine sites for operational logistics bases, buffer storage, and fuel supply. These can include existing transport facilities, both commercial and government-managed, large storage complexes and factories or other facilities, which can be adapted.
- Assessing the availability of spare parts and repair services— including private and public repair shops.
- Review port and airport capacity to handle relief commodities under different scenarios and determining other transport options, as coastal and river crossing, etc.

➤ Reviewing government policies, plans, and preparations.

It is very important for international agencies and nongovernmental organizations to know the government’s emergency response policies and plans. Since government disaster response agencies are the ones entrusted with coordinating relief efforts, it is crucial for the organizations that take part in these efforts to establish solid links with the local or national agencies. The contacts can also be used to negotiate mutual cooperation agreements for emergency situations, such as providing tax-exempt status to humanitarian supplies, priority treatment at customs, and so on [12], [23].

All the information compiled and the activities carried out at the planning and preparation stage should serve as the basis for the development of the logistics plan, which must spell out procedures, responsibilities and timetables for implementation. And we have to remember that the first step toward emergency preparedness is the identification of who needs to know how to do what[24].

The chain of emergency supplies[25]

The supply chain is the “flow” or transport of commodities from the source to the distribution point, with storage and holding points where needed. The goal is to achieve a balance between speed, security, storage and transport costs. The concepts are the same in all relief programs, whatever the quantities moved, the mode of transport, and the area involved.

The links in this logistics chain are not necessarily sequential or linear; indeed, they are often carried out in parallel. However, they must not be considered as separate activities but integrally, due to their complex interrelationships.

It could be referred that a supply chain is essentially a network consisting of suppliers, manufacturers, distributors, retailers, and customer. The network supports three types of flows that require careful design and close coordination:

- *Material flows*, which represent physical product flows from suppliers to customers as well as reverse flows for product returns, servicing, and recycling
- *Information flows*, which represent order transmission and order tracking, and which coordinate the physical flows and
- *Financial flows*, which represent credit terms, payment schedules, and consignment arrangements. [26]

The ultimate effective humanitarian supply chain management has to be able to respond to multiple interventions, often on a global scale, as quickly as possible and within a short time frame. Therefore, supply chains need to be ‘multiple, global, dynamic and temporary’. They also need to have some specific characteristics, concerning the procurement, the transport, the distribution and the storage of supplies. More precisely, the purpose of the procurement process is to make sure that the organizations involved in relief management have the resources needed to meet identified needs. This in turn requires identifying the sources of those goods and services and the way in which they will be acquired. After this, it's necessary to see the means whereby supplies reach the places they are needed. Of course, a transport strategy must not only take into account the means of transport but also the actual possibilities of getting supplies from one point to another, as well as alternatives for the timely, safe delivery of relief assistance. The emergency supplies must be protected in an organized, systematic fashion until they can be delivered to their ultimate recipients. The main goal of logistics chain is to deliver aid to the people affected by a disaster in a fair way and properly controlled in order to prevent abuses or waste. It is important to underscore the fact that all of the above components are closely linked. The failure or ineffective functioning of any of the links in the chain will affect overall performance. One missing link is all that is needed for the chain to break.



Figure 3: A typical Humanitarian supply chain[27]

The characteristics that make the supply chain management (SCM) a particular field of research are the following. Firstly, the diverse nature of the humanitarian aid community is not totally understood in the field of logistics. Second, crisis response is relatively short-term and the establishment of effective supply chains takes place under high-stress conditions. After, there is not the right coordination and the exchange of knowledge between the different agencies, which deliver aid successfully and there is not willingness to consider approaches

used by the wider business community which may have best practice concepts which could be usefully employed in the context of emergency response. Finally, unfortunately, there is a little finance available to fund research into SCM for human relief operations and the research that does take place is therefore intermittent and uncoordinated [28-30].

In order for successful supply chains to be effective there is a requirement for a clear understanding of the problems and issues involved. Improving supply chain efficiency requires uncertainty to be reduced, minimized, or even eliminated but in many business cases this may not be completely achievable due to the product involved[31]. Especially, in humanitarian aid, where the products are relief goods destined for communities of affected people, the problem worsen[32].

To overcome the problems raised, it is essential to take into consideration some factors such as the strategic planning (which discussed above), the transport and capacity planning[33], the supplier reaction, the continuous improvement, etc.

Emergency supplies

Humanitarian or emergency supplies are those goods, materials, and equipment used by organizations to provide relief in a disaster, particularly those required to meet the essential needs of the affected population. Such supplies cover an enormous spectrum, from food, drugs, and clothing to rescue equipment, electric generators, construction materials, and tools. Especially, following a disaster, the most critical health supplies are those needed for treating casualties and preventing the spread of communicable diseases[34].

The following basic principles regarding humanitarian relief supplies, which are referred in the book of PAHO[34], should be kept in mind:

- Sources for emergency supplies should be identified as part of the disaster preparedness process. Ideally, there should be a national inventory of resources that can be used in the event of a disaster.
- Stockpiling supplies exclusively for disaster situations is not recommended, because of the high costs entailed for developing countries. Such stockpiles require very efficient supply rotation systems that are costly to implement.
- When a disaster occurs, rapid damage assessment must be carried out in order to identify needs and resources.
- If external assistance is necessary, requests should be strictly limited to resources not available in the affected zone.
- Disaster managers must be prepared to receive large quantities of unsolicited donations from other areas of their own country, neighboring nations, and the international community. The quality and usefulness of such donations is often questionable.
- When requesting supplies, the time required for shipment and distribution must be considered, and there must be planning for needs that will remain unmet after supplies arrive.
- No supplies or other forms of relief should be sent without first verifying the need for such assistance. It is essential to assign priorities for each container shipped.

Categories

The World Health Organization (WHO), in consultation with other international organizations, has adopted a standard classification that places humanitarian supplies in 10 different categories. This form of identification is particularly useful for the sorting and recording of supplies.

The categories are the following:

1. Medicines,
2. Water and environmental health,
3. Health supplies/Kits,
4. Food,
5. Shelter/Electrical/Construction,
6. Logistics/Administration,
7. Personal needs/Education,
8. Human resources,
9. Agriculture/Cattle
10. Unsorted.

Every category is subdivided into subcategories, and the subcategories into items.

The “Unsorted” or “Unclassified” option is used to classify shipments with expired or useless items, or items that are too varied to classify on the spot. On the other hand, “Human Resources” is a category to classify the expertise of volunteers or support personnel, particularly those from abroad, who offer assistance during an emergency. Obviously, this classification is essential because their participation in humanitarian operations entails a series of needs and services, from their transport and mobilization to their feeding, lodging and health care, which must be taken into account in logistics planning. The Medicine category only includes pharmaceutical products, while the Health category refers to non-

pharmaceutical products used in health activities, such as surgery instruments, lab materials, X rays, etc.[25, 35]. It is very important to be mentioned that all the supplies have to be labeled and sorted to different priority levels, depending on the needs of the victims. So, there would be three levels of priority. Urgently needed, or priority 1 items, which need an urgent distribution, priority 2 supplies, that are useful but not urgently needed and Priority 3 items, which are of no use or require major time and effort to separate and classify. The above rating has been established by the SUMA team and has been adopted by most of the disasters' managers[36].

The labels are also very important for the classification of the *hazardous materials*, which are those whose chemical composition poses risks for people and their surroundings, although useful for the affected people. For example dangerous materials are: fuel, chloride products, domestic gas, oxygen, lab reactives, etc. that are routinely used and also required during an emergency. These 'supplies' must be handled carefully to avoid explosions, poisoning, contamination, and serious injuries onto people[25].

In this sector, we have to discuss about medicines and health supplies, or in other words, the *medical supplies*, which are a major priority in an emergency. By the term 'medical supplies' we mean drugs and medical, dental and laboratory products as well as equipment. It is necessary to ensure that these are readily available, but also that they are used rationally. When a disaster strikes, the supply procurement must remain effective in more challenging circumstances, since it must adapt to both the urgency of the situation and the scarcity that often accompanies an emergency. A serious problem that needs to be discussed is the right selection of medical supplies, including the appointed committee selection, which has to be a multidisciplinary team—doctors, nurses, pharmacists and the selection criteria of the supplies. Specifically, the selection of medical supplies must take into account the health care needs of the affected population, the characteristics of the patients required treatment, the availability of supplies, and the capacity of the health system to meet these requirements.

The World Health Organization (WHO) has prepared a list of basic drugs and medical products, which all the countries have to follow, when it is needed. As the practical impact of many donations and support sent in emergencies has often diminished, because either the supplies did not reflect real needs or requirements were not adequately assessed, the WHO published '*The Interagency Emergency Health Kit*' (IEHK) (last edition 2006)[37] in order to describe the first primary health care needs of a displaced population without medical facilities. As this text refers, its content is a compromise and there will always be some items which do not completely meet requirements. An ideal kit can only be designed with an exact knowledge of the population characteristics, disease prevalence, morbidity patterns and level of training of those using the kit. The standard kit consists of two parts: a basic unit and a supplementary unit (Annex 1). The estimation of medicine requirements in the kit has been based on:

- The average morbidity patterns among displaced population,
- The use of standard treatment guidelines,
- Figures provided by agencies with field experience.

The basic unit includes indispensable drugs and medical supplies and equipment for primary health care, and can be used by primary health care workers with limited training. It contains oral and topical medicines, none of which are injectable.

The supplementary unit contains medicines and medical devices for a population of 10,000 and is to be used only by professional health workers or physicians. It does not contain any medicines or devices from the basic unit and can therefore only be used when these are available as well.

In contrast of the guidelines of the last edition of WHO in 1998, the IEHK 2006 includes no equipment for resuscitation or major surgery, as the kit has been designed to meet the first primary health care needs of a displaced population without facilities. In situations of war, earthquakes or epidemics, specialized teams with medicines and medical devices will be required. Whilst IEHK 2006 will always be supplied with malaria modules unless there is a specific request not to include these items at the time of ordering, but does not include any

medicines against communicable diseases such as HIV, AIDS, tuberculosis or leprosy. Supplies for prevention and/or treatment of these communicable diseases will have to be ordered separately after an assessment of needs.

Finally, we have to repeat that after the acute phase of an emergency is over and the basic and supplementary units needs have covered basic health, specific needs for further supplies and equipment should be assessed as soon as possible.

Humanitarian relief supplies that arrive following a major disaster, whether natural or complex in origin, cause serious logistical and administration problems for national and international authorities. This is particularly true when the supplies have not been requested and their value in terms of meeting real needs is questionable. Emergency logistics and a supply management system should be oriented to resolve the issues arise.

A brief description of the essential steps for the construction of a logistic chain of supplies follows.

Emergency kits for the caregivers of infants

Reports from past emergencies have demonstrated the difficulties faced by those who care for formula fed infants in large-scale emergencies. So, a specific mention in this vulnerable population is necessary. There is a need to improve emergency preparedness and the delivery of aid to the caregivers of infants in emergencies[38].

Breastfed infants

Exclusive breastfeeding could be considered an emergency preparedness activity. Thus, the only items necessary to store in preparation for an emergency if an infant is exclusively breastfed are nappies and nappy wipes. Mothers who are exclusively breastfeeding during an emergency can continue to feed their infant as they did before the emergency occurred; no special actions are necessary.

Formula fed infants

Emergency preparedness for exclusively formula fed infants involves storage of items necessary for feeding the infant. Different requirements exist dependent upon whether liquid ready-to-use infant formula or powdered infant formula is available or chosen for use in emergency preparedness.

In Annex 2 there is a sample of the necessary emergency supplies for this category of affected population.

In a large scale emergency, providing aid to the caregivers of infants, particularly infants who are formula fed should be a priority. Infants, particularly the very young, who do not have access to appropriate food can become very sick and even die within days. We have to note that in the stage of distribution, which discusses later in following chapter, here, we need suitably experienced health workers (not food distribution workers) who are able to provide an assessment of the needs of the infant and provide education on how to prepare formula feeds using the available resources[39].

Implementation of the logistic chain

❖ Accessing the logistical and supplies needs

The assessment of Logistic and supply needs serves to ascertain, as accurately as possible, the population's needs as a consequence of a disaster, as well as the available local capacity and complementary requirements to meet those needs. This assessment should be an integral part of the overall assessment process carried out at the disaster site to determine the type and extent of the damages and the areas that most urgently need intervention.

With this procedure, the logistic chain starts counting the needs of the affected population, as well as, the needs of the actors (or organizations) that perform the relief tasks. More precisely the kind, the quantity, the urgency or not and the place of the transportation of supplies must be counted. The mainly effects of the particular disaster (see chapter1) must be taken into consideration and after evaluation of the socioeconomic characteristics and other specific aspects of the affected region or country, onsite response activities have to start while assessments continue and reveal more specific aspects requiring attention. Moreover, a disaster scenario is usually a dynamic and changing situation, thus this assessment must help not only to identify the current situation, but also to anticipate future needs.[12]

❖ Procurement

The supplies required responding to an emergency come from different sources, whether disaster relief organizations acquire them directly, receive them as donations from the national and international community, or get them as loans. Normally, all these procurement methods will come into play in an emergency, and each has its advantages and disadvantages. Not only that, but we are seldom in a position to choose the most appropriate one in the circumstances. However, whenever possible, the selection of a particular modality should be made based on technical criteria and an unbiased assessment of the needs of the affected population.[25]

Form of acquisition	Advantages	Disadvantages
Local purchase	<ul style="list-style-type: none"> • Prompt delivery • Lower transport costs • Support for local economy 	<ul style="list-style-type: none"> • Not always available in the quantity and quality needed • Can generate competition between organizations for the purchase of a product • Can cause shortages in the local market
Imports	<ul style="list-style-type: none"> • Possible to obtain better quality, larger quantities. • Can order according to specifications 	<ul style="list-style-type: none"> • Longer delivery time • Higher transportation costs • Do not support the local economy
Donations	<ul style="list-style-type: none"> • Free or low-cost (bear in mind: every donation has a cost) • Promotes national and international solidarity 	<ul style="list-style-type: none"> • Frequently, items have not been asked for • Supplies sent may not meet local needs • If unusable, their handling leads to a waste of time and resources

		<ul style="list-style-type: none"> • It is hard to reject them if they are useless
Loans	<ul style="list-style-type: none"> • Sometimes, it is equipment or material that is hard to purchase • Lowers operation costs 	<ul style="list-style-type: none"> • Depends on how long the items can be on loan • The loaned items must be cared for and must be replaced if damaged • It is hard to demand responsibility, quality, or the meeting of deadlines and other commitments

Table 2: Form of acquisition (+/-)[12]

It is important to become a reference about Requisitions and the way in which the supplies must be ordered, in order not misunderstandings to be arisen, especially in technical supplies. One clearly identified person has to form standardized documents to request emergency supplies. The forms should be numbered, dated, and include carbon copies to help follow up on the response to each request. Every requisition should clearly indicate the priority of supplies. Different kinds of items should never send in the same package. Every package must have a label, which indicates its content. Usually, the labels are green for medicines and medical equipment, red for food items, blue for clothing and household items and yellow for equipment and tools, etc, and have the complete data of sender and recipients.

❖ **Arrival of emergency supplies**

The supplies arrive in the affected area from different points and by different means: land, sea, air. In other words, consignment can vary greatly, and so can reception points. In general, donations or supplies, either from abroad or from other regions within the country, will arrive in sea or river ports, airports, or the terrestrial borders. These are transit places for supplies, where usually national authorities are in charge of handling them. Ideally, the arriving supplies should be registered according some acceptable instructions, as it is referred above, but, unfortunately, this does not always happen. Moreover, upon a massive arrival of shipments, the operation capacity of these entrance points soon reaches its limit and managing them may become chaotic. So a good plan and new receiving points are essential.

Another serious problem is the supplies unloading, as there is no hydraulic equipment at the operation site to handle the cargo, so strength and ingenuity have to be used to do so. It is important to know the type of vehicle and the characteristics of the cargo to be received in order to plan its reception adequately.[25, 40]

❖ **Control and monitoring of supplies**

Emergency supplies will have to follow a route and a series of stages from the point of entry or reception until they are handed over to the end users, the affected population. To prevent losses or diversions, and ensure a more efficient use of resources, an instrument is required to certify the progress of the supplies through the various stages and identify the next stage in the process. These controls should indicate what types of supplies have been mobilized, in what quantity, and in what condition. Briefly, three steps must be taken: sorting, classifying and taking inventory[12].

❖ **Transport**

Transportation is the element in the logistics chain that makes it possible for assistance to arrive at the site where it is required (the arrival of goods from abroad, as the movement of them within the country). When defining the transportation strategy, it is important to take into consideration not only the necessary means and resources to move the supplies, but also to determine what the actual possibilities and alternatives are to deliver assistance. Alternative means, methods, and routes should be considered as a matter of course. Supplies should not

just be moved in any way and at any time, but that the challenge is to do so *safely* and in a *timely* manner[23]. This requires maybe the use of all the available means. When deciding which means of transport to use, we have to think about two tasks: the needs on the ground (urgency, type of supplies, distance of the destination, other conditions, as routes, weather, etc.) and feasible forms of transport (available means, cost, transmission capacities, etc.)[41]. Table 2 shows a simple procedure for estimating the number of vehicles needed, whether they are trucks, boats, or planes, to transport a load with a known weight and deadline for delivery.

<p>Calculation procedure:</p> <ul style="list-style-type: none"> ✓ How many tons of supplies have to be moved? What has to be moved? For how long? ✓ How long does a round trip to the receiving site take? (Do not overestimate speed, and include time for loading and unloading) ✓ What is the vehicle's cargo capacity? <p>No. of possible trips per vehicle = period/Round trip time</p> <p>No. of loads = total tonnage/Vehicle capacity</p> <p>No. of vehicles = No. of loads/No. of possible trips / vehicles Add 25% time for contingencies.</p>
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Table 3: Calculating the number of vehicle[42]

When a consignment is on the road, it must be protected against damage, the weather, theft, and other eventualities, while when hazardous materials are transported, basic, standardized security measures must taken into consideration. Generally, it is preferable to avoid convoys (group of vehicles traveling together towards the same destination), because individual vehicles can move faster and organizing a caravan takes time and a great deal of planning, they make sense when long distances or dangerous conditions—desert routes, inclement weather, hazardous mountain passes, the presence of armed bandits or rebels—make it necessary for vehicles to travel in a group[43].

As concerned as the route, the selection must be taken depending on the kind of transport available, the urgency of the delivery, and the delivery schedule. Some basic principles are the following:

- The safest route must be chosen even if it is not the fastest or shortest one.
- It is important to identify key services along the way, such as places where one may obtain fuel, food, mechanical repairs or medical care
- It is also important to identify potentially insecure segments of the route.
- Any change or deviation from the agreed-upon route, as well as any other special situation that may arise during the trip, must be communicated immediately to the nearest base, whether it is the point of departure, the delivery point, or a base in between.

Similar principles have defined for the air operation, including landing site, kind of aircrafts, etc.

❖ Storage

Supplies have to must be stored until they can be distributed or used, but it is not a matter of just finding a place to keep items. An organized system should be utilized which allows one to know the type, amount and location of the existing supplies in this place as well as reserves for later needs. We will call this process *Warehousing* and it has crucial importance for the

protection of supplies. The organization of a warehouse should take into account the necessary guidelines for quality maintenance and safeguarding items.

Some warehouses have been specially designed to facilitate storage in most emergencies one has to settle for whichever spaces are available—and these are often schools, community centers, gyms, and the like, that were not designed for storage.

A special effort must be made to find an appropriate place for storing emergency supplies, even though choices are often few in an emergency zone. When selecting the site, however, certain basic issues must be borne in mind.

First of all, we have to think the place, according to the *type of supplies*, which are to be stored. Are they medicines or clothes, equipment, or food? Secondly, it's very important to look the *size* and the *accessibility* of the storage site. Also, we have to see some *internal site conditions* (good lighting, ventilation, no many damages, doors, windows, etc.) Finally, some *external site conditions*, such as its vulnerability to natural hazards, presence of stagnant water, security social environment, etc. must be taken into consideration[9].

The size of the warehouse needed depends on the quantity of supplies expected. However, in emergency operations it is generally hard to foresee how many packages or bundles will come in, since most of the items sent are unsolicited. It is therefore best to choose the largest possible space, even if at first the quantity of supplies does not seem to justify such a course of action.

There will be times when it is impossible to find an adequate structure to warehouse the goods, and it becomes necessary to explore alternatives for temporary storage. One option is to build a temporary structure out of timber and corrugated iron, or using reinforced plastic. Other alternatives include prefabricated structures for building hangars, which come with curved metal sheets that can be quickly assembled[12].

The rule of thumb in a warehouse is to never mixing products of a different kind on the same dock, pallet or lot, and that hazardous materials must not be stored in the same place as food and other products for human consumption.

❖ **Distribution**[25]

The main objective of humanitarian logistics is to provide assistance to the people affected by a disaster or to organizations managing the disaster response. Delivery of assistance must be proportionate to needs, equitable and controlled to avoid abuse and waste. Certain criteria has defined, in order to protect from the individuality of each organization and have to be applied at all times to produce a more fair and efficient allocation of the supplies.

- I. Political or religious beliefs, ethnicity, nationality, or any other form of negative discrimination cannot be criteria for determining the eligibility of the potential beneficiaries of humanitarian assistance.
- II. During the most active phase of the emergency, it is imperative to distribute those goods and items that are strictly necessary to cover immediate survival needs or to improve the living conditions of the affected population.
- III. Assistance should be delivered only to those who truly need it, in direct proportion to their needs.
- IV. Humanitarian assistance aims to support people in a situation in which their ability to satisfy their own needs has been suddenly curtailed, so it must cover the most critical needs immediately.
- V. Humanitarian assistance cannot resolve a population's entire problems.
- VI. However, it can support them in finding solutions to their most pressing difficulties, complementing the efforts made by the disaster victims themselves.
- VII. Humanitarian assistance must be relevant, appropriate, and adapted to local customs and environmental conditions.
- VIII. Humanitarian aid must be temporary. Long-term assistance generates dependency on outside aid and fails to stimulate the economic recovery of the affected area. Even in the case of displaced populations, who will need support for a longer period, the type of aid provided must promote self-sufficiency and a prompt return to normalcy.

Technology and communications

Maybe communications are one of the most important links of a supply chain. However, sometimes they are not considered as a link in the chain. If communications issues are not also addressed, however, today's manual non-integrated style of dealing with logistics will continue – and the logistics chain will remain incomplete and inefficient. We must not forget that information plays a crucial role in disaster management. It is clear that the speed with which the critical information is collected, analyzed and distributed by participating agencies will facilitate an effective response and hence more lives can be saved[44, 45].

The transmission of data, the exchange of information, the confirmation of supply movements, the request for new deliveries, and the safety of the teams on the ground—these are only a few of the needs that telecommunications can serve during logistical supply operations.

Information technology and telecommunications should be a strategic partner in the development of national disaster management plans. There is a need for structured, shared, and well-maintained ICT) Information and Communication Technology systems (including global information system (GIS) spatial data) that are pre configured to respond to needs assessments and information coordination between stakeholders. Such activities should be coordinated by a distinct entity tasked to fulfill this function.

More specifically, in the affected area, it is highly likely that the local telephone network in (if there is telephone service, which is not always the case) will be down depending on the type and intensity of the disaster, and restoring full service may be a matter of hours—or months. Similarly, the various types of communication systems cater to different needs and have different capabilities ranging from voice transmission to the exchange of text and graphics. For this reason, various options must be taken into account to maintain active communications. In brief we would say that the most flexible, dynamic, economic and widely used solution in the field is the radio, the various types of it, such as VHF radio or UHF radio, VHF Relay stations, TOR, PACTOR, etc.[12]

Regardless of the communications systems used in the area of logistics, rapid response needs are required to be aligned with the ability of agencies to coordinate the needs assessments with the responses. Integration of the international responses with national response also must be improved. Cooperative, strategic logistics planning should be attempted. Information sharing about logistic situations must be improved and prioritized. The lack of information is due to the lack of trained, local staff and appropriate connectivity, factors that must be taken into consideration during the phase of the preparedness[46].

Discussion- emergency logistics in Greece

In the previous chapters a brief reference to the principles governing the emergency logistics and to the basic links of a supply chain has become, in order to realize the improvements could be made to provide effective human relief when it is needed. This is very important for the Greek people, as in Greece many disasters happened in the past.

According to the General Secretariat for Civil Protection (GSCP) data, in 2010, in Greece 349 natural and 130 technological disasters happened, from which 56 were earthquakes over 4R and 307 were forest fires[47] (see Figure 4). In the recent past many people have killed because of disasters. In 2007, 84 people lost their lives because of the fires, including several fire fighters and in 1999 the earthquake of Parnitha, (5.9R) caused 143 dead, 700 injured, 40,000 homeless families and many damaged buildings. We have to think about the disaster relief operations in these situations and see what went wrong. And what has changed nowadays?

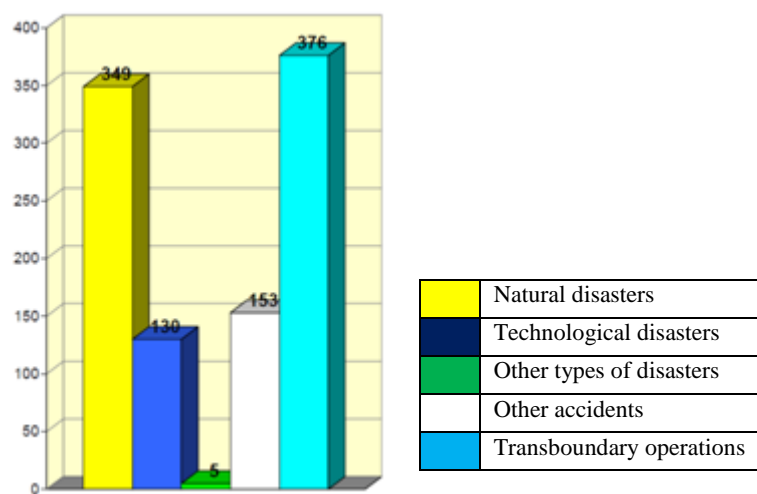


Figure 4: Number of incidents by category in Greece, in 2011

Greece and more specifically the System Reliability and Industrial Safety Laboratory of the National Center for Scientific Research 'DEMOKRITOS' is one of the partners in "The European Pre-Emergencies project", which aims specifically at the creation of a tool that facilitates the coordination of intervention groups, including state forces and voluntary organizations (VO), that operate in local or transboundary emergencies[48]. The result of this project, concerning the Greece, indicates some interesting information.

At the beginning, it is useful to see who is responsible for the disaster management in Greece. So, the mobilization of the competent authorities in the case of an emergency is adequately prescribed in the 1299/2003 Greek Law under the code name Xenocrates in combination with all of its directives and amendments. Competent authorities, such as the Greek Fire Brigade Body (FB), police, Coast Guard and Army are officially notified about an emergency through the GSCP or by their own emergency centers[49]. The operations are ruled by either the GSCP command centre (local, or central) or by the FB command center, where the participation of various personnel belonging to other ministries may also be claimed. VO are normally invited (if necessary) by the local branches of the GSCP through the local prefectures' services and they usually cooperate with competent authorities. The information follows a top-down approach from the president to the members, when lag in information is often noticed. During the operation, the use of protocols or international conventions or memoranda of cross-border cooperation is necessary to maximize output and to resolve conflicts. If such protocols are lacking, the protocols of the state bodies must be followed namely that of the FB.

Following, we have to refer the main factors that influence emergency management in Greece, according this particular study. The published results indicate that timely information passage is considered of high importance by all of the state-owned emergency groups, especially in cases of wild firefighting and rescuing, which are a race against time. The quality of the information, e.g. vegetation of the area set on fire, wind speed and direction, accessibility to the area and potential blocked areas, is also given considerable weight. Equally important is the early reaction time once the declaration of the emergency has been made official, i.e. the time needed by the organization officials to move their forces and undertake action. Some other parameters stem from the type of organization itself, as follows: role framing, i.e. the undertaking of operations that relate closely to the profile of the organizations and the skills of their members. It is a significant parameter for state-owned emergency response groups, which attribute to it more than 90% of the successful outcome of the intervention. A complementary factor is the intervention type. It is denoting the automatic intervention of the state-owned organizations or the under request intervention of some of the voluntary organizations. The number of people who take part in an intervention together with their competence and availability are also considered very significant for all emergency groups. Deeper contextual knowledge is an important parameter for the totality of state emergency group officials and is related to the lack of knowledge in all aspects of the emergency. It is noted that particular groups try to care for the preparedness of their members on specific actions only, which additionally to the low coordination degree among the groups create problems in the effectiveness of their intervention. Finally, the role clearness is another decisive factor effective emergency response effort.

As a conclusion, we could say that this literature review indicates that a higher number of governmental resources or donations should be devoted to the prevention rather than the mitigation of hazards. Efforts for this have started, but as the facts show, they are not sufficient[50]. Lacking of prevention can evolve in a disaster. Lacking of a plan for facing up an emergency can create 'chaos', when a disaster natural or manmade happens. Existing guidelines in combination with the experience may contribute to effective emergency response efforts. A logistic chain, consisting of basic links is essential in response to a disaster. These links are not necessarily sequential or linear; indeed, they are often carried out in parallel. However, they must not be considered as separate activities but integrally, due to their complex interrelationships.

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Annexes

Annex 1: Content of 2006 IEHK (sample)

Basic unit (for 1,000 persons for 3 months)[37]

Table 4: Medicines

<i>Items</i>	<i>Unit</i>	<i>Quantity</i>
albendazole, chewable tab 400mg	Tab	200
aluminium hydroxide + magnesium hydroxide, tab 400 mg + 400 mg	Tab	1,000
amoxicillin, tab 250 mg	Tab	3,000
Benzyl benzoate, lotion 25%,	Bottle, 1 litre	1
chlorhexidine gluconate, solution 5%	Bottle, 1 litre	1
Ferrous sulfate + folic acid, tab 200 mg + 0.4 mg	Tab	2,000
Gentian violet, powder	25 g	4
Ibuprofen, scored tab 400 mg	Tab	2,000
ORS (oral rehydration salts)	Sachet for 1 litre	200
paracetamol, tab 100 mg	Tab	1,000
paracetamol, tab 500 mg	Tab	2,000
Tetracycline, eye ointment 1%	Tube, 5 g	50
Zinc sulfate, dispersible tab 20 mg	Tab	1,000

Table 5: Medical devices, renewable

<i>Items</i>	<i>Unit</i>	<i>Quantity</i>
Bandage, elastic, 7.5 cm x 5 m, roll	Unit	20
bandage, gauze, 8 cm x 4 m, roll	Unit	200
compress, gauze, 10 cm x 10 cm, non-sterile	Unit	500
Cotton wool, 500 g, roll, non-sterile	Unit	2
Gloves, examination, latex, medium, disposable	Unit	100
Soap, toilet, bar, approximately 110 g, wrapped	Unit	10
Tape, adhesive, zinc oxide, 2.5 cm x 5 m	Unit	30

<i>Items</i>	<i>Unit</i>	<i>Quantity</i>
Basin, kidney, stainless steel, 825 ml	Unit	1
Bottle, plastic, 1L, with screw cap	Unit	3
Bottle, plastic, 250 ml, wash bottle	Unit	1
Bowl, stainless steel, 180 ml	Unit	1
Brush, hand, scrubbing, plastic	Unit	2
Drum, sterilizing, approximately 150 mm x 150 mm	Unit	2
Forceps, artery, Kocher, 140 mm, straight	Unit	2
Pail, with bail, handle, polyethylene, 10L or 15L	Unit	2
Scissors, Deaver, 140 mm, straight, sharp/blunt	Unit	2
Surgical instruments, dressing set	Unit	2
Thermometer, clinical, digital, 32-43 Celsius	Unit	5
Tray, dressing, stainless steel, 300 mm x 200 mm x 30 mm	Unit	1
Water container, PVC/PE, collapsible, 10L or 15L	Unit	1

Table 6: Medical devices, equipment

Annex 2: Emergency additional supplies for infants

Exclusively breastfed infant	Exclusively formula fed infant with ready-to-use infant formula	Exclusively formula fed infant with powdered infant formula
100 nappies	56 single serves of ready-to-use infant formula	2 tins of infant formula
200 nappy wipes	84 L of water	170 L of water
	Large storage container	Large storage container
	Metal knife	Large cooking pot with a lid
	Small bowl	Kettle
	56 feeding bottles or cups	Gas stove
	56 zip-lock plastic bags	Box of matches or lighter
	220 sheets of paper towel	14 kg of liquid petroleum gas
	Detergent	Measuring container
	120 antiseptic wipes	Metal knife
	100 nappies	Metal tongs
	200 nappy wipes	Feeding cup
		300 sheets of paper towel
		Detergent
		100 nappies
		200 nappy wipes

Table 7: Emergency supplies required for breastfed infants or for feeding infants using ready-to-use infant formula or powdered infant formula[39]