

HUMANITARIAN SUPPLY CHAIN DURING NATURAL DISASTERS ILLUSTRATED THROUGH AN ASEAN REGIONAL COMMUNITY EXAMPLE

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ABSTRACT

As a result of the growing significance of globalization and regionalization in the development of particular countries, it is crucial to comprehend the importance and the nature of relationships between particular entities participating in logistics carried out in the time of natural disasters. The modern trend associated with ensuring a sustainable development in many areas determines the creation of institutional solutions. Amongst them humanitarian logistics should be distinguished especially that begins to play an increasingly important role worldwide. It refers directly to the issues related to natural disasters. First of all, higher cost intensiveness of natural disasters is noticeable in the entire economy. Therefore, in case of occurrence of natural disasters, the growing number of disaster victims and the availability of resources used to reduce disaster effects result in problems related to the provision of goods and information.

Providing aid proceeds within material, financial, human as well as informational flows both in international and domestic range. The growing importance of logistics in international manner, including macroeconomic scale, determines extraction of humanitarian supply chain. The time-orientated, rather than operating costs-orientated, highlights sustainable and prosocial approach. Nevertheless, the orientation depends on the existing institutional, economical, demographical, social, informational and infrastructural determinants. In the world literature, the problems of humanitarian logistics are analysed from the perspective of the State and humanitarian organizations. There is a deficit of scientific publications including the regional community approach. The increasing role of international cooperation constitutes a gap in the humanitarian supply chain.

In this context, the intensity of natural disasters, safety, or particular logistics operations are of crucial importance. The attempts to define humanitarian supply chains and to develop models or systematized activities have been observed; however, neither of these attempts are characterized by a holistic approach. Primarily, attention should be paid to a fairly narrow approach to the problem of humanitarian logistics amongst aid providers. In case of humanitarian organizations, this issue remains frequently limited to the activities undertaken during the response

phase to a natural disaster occurrence only, whereas the prevention and reconstruction are simply noticed, but not sufficiently developed. In case of the government sector, the strategy is limited to crisis management, which consists in the development of activities and processes to be performed in the course of particular humanitarian logistics phases in the situation of natural disasters.

Therefore, a fragmented approach to the presented issues results in inconsistencies in the aid activities and reduced level of humanitarian supply chain effectiveness. Although particular nongovernmental entities recognize the need for integration and internationalization of mutual logistics operations, so far no attempts have been made to prepare effective strategy. The existing studies have a strictly local character. It does not give any perspectives for strategy's adaptation in a regional or even global manner.

A regional attempt requires to include a regional community in the processes of aid provision within humanitarian supply chain. The ASEAN Community highlighted by the author consists of ten South-East Asia States: Brunei, Philippines, Indonesia, Cambodia, Lao PDR, Malaysia, Myanmar, Singapore, Thailand and Vietnam. These regions have been affected by natural disasters periodically. Due to being located in a so-called Pacific Ring of Fire as well as having equatorial and tropical climate these regions suffer from disasters which take an intense form, resulting in measurable human and material losses. The regional community discussed in this dissertation undertake a wide scope of activities to prevent the negative impact of natural disasters therefore becoming a benchmark among other associations.

The primary objective of this dissertation is to indicate the role and importance of regional community in the logistics operations carried out by humanitarian supply chain in the occurrence of natural disasters.

The main objective will be completed through following a sequence of sub-goals, which author divides into scientific, cognitive and practical goals. Among the scientific and cognitive objectives the following were listed:

1. Critical analysis of the subject literature in the area of natural disasters, theory of safety and security, humanitarian logistics, humanitarian supply chain and convergence theory.
2. Identification of the determinants of humanitarian logistics development at the State level.
3. Definition and characterization of the concept of logistics convergence in a humanitarian supply chain.
4. Diagnosis of logistics convergence factors in humanitarian supply chain.

5. Identification of the role of synergic effect among the ASEAN Community States.
6. Presentation of the determinants and challenges justifying the need of humanitarian supply chain internationalization.
7. Identification of the role of humanitarian supply chain in the situation of natural disasters as well as relations with the theory of international safety and international logistics.

Among the practical objectives the following were listed:

1. Development of a composite indicator of humanitarian logistics useful in the situation of natural disasters.
2. A comparative analysis of ASEAN Community States in terms of the determinants of humanitarian logistics development.
3. Diagnosis of the level of logistics convergence in humanitarian supply chain in the institutional, informational and infrastructural form.
4. Diagnosis of logistics operations of regional association in the situation of natural disasters.
5. Assessment of humanitarian supply chain impact on the effectiveness of the undertaken logistics operations.
6. Development of a referential model of a humanitarian supply chain.
7. Development of procedure for the implementation of a model in regional association such as European Union, African Union, Organization of American States, etc.

Thus, the main research question was put forward: will the application of a referential model of humanitarian supply chain increase the effectiveness of humanitarian aid implementation in the situation of natural disaster?

In addition to the main research problem, this study explores research questions such as:

1. What are the dimensions of logistics in humanitarian supply chain?
2. What is the role of a State in the logistics operations of humanitarian supply chain when in the situation of natural disasters?
3. What is the extent of integration and coordination of logistics operations in humanitarian supply chain in the situation of natural disasters in ASEAN Community?
4. What is the impact of an external determinants of humanitarian supply chain on the scope of undertaken activities within humanitarian logistics?
5. What is the essence of logistics operations effectiveness and how to measure it in humanitarian supply chain?

Based on the presented research questions and objectives, the main hypothesis has been formed as follows: the application of the referential model of humanitarian supply chain will increase the effective implementation of humanitarian aid in the situation of natural disaster.

Confirmation of the main hypothesis has been verified through the detailed research hypotheses:

1. The effectiveness of humanitarian supply chains can be achieved through the coordination, integration, institutionalization and internationalization of goods and services supply processes within the framework of humanitarian aid in the conditions in which human life and health are of utmost importance.
2. The decentralized activities within humanitarian logistics at the State level require centralised coordination within humanitarian supply chain constituted at the regional association level.
3. On a regional association level, the humanitarian logistics activities during natural disasters are characterized by concurrence, which is an evidence of logistics convergence in humanitarian supply chain.

The spatial range of the research refers to the States that are members of the ASEAN Community. The time range covers the years 2007-2016. This is conditioned by the statistical data availability and the genesis of integration within regional association. In the construction of composite indicator of humanitarian logistics, the time range coincides with the years 2007-2016. However, the analysis of the particular logistics operations was carried out in the period of 2012-2016. This is due to the implemented institutional solutions introducing regional, coordinated, integrated and internationalized activities.

The dissertation is divided into an introduction, four chapters and conclusion. In the first two chapters, the theoretical and conceptual trend is described. The following chapters focus on the application dimension. The author does not propose to improve the current approach to the presented issues but looks for a new way of explaining that phenomena. This research is the first study of this type, offering an extensive and holistic approach to the logistics operations of humanitarian supply chain from the regional association perspective. The dissertation focuses on the conceptualization of the humanitarian supply chain as well as the role and importance of the regional association in implementing the sustainable development of humanitarian logistics.

In the first chapter the relations among the theory of natural disasters, safety and security as well as humanitarian aid has been presented. Particular attention was paid for the distinction of seemingly identical concepts of disasters, hazard, risk and crises. Common and divergent elements were distinguished as well. For the purpose of the dissertation the concepts of natural

disaster, natural hazard and cataclysm are interchangeable. The author has compiled several approaches to classifying these phenomena including his own classification proposal. The stages of natural disasters that are essential for logistic operations have been indicated. The frequency and intensity of natural disasters have a significant impact on socio-economic reality, therefore statistical data have been presented as well.

The issue of natural disasters approach determines the consideration of national and international security issues. These are syndromatic phenomena that require institutionalization. Therefore, the author of the dissertation draws attention to the essential role of international institutions. The first chapter highlights the importance and role of globalization and regionalization that determines the internationalization of States. For the purpose of the dissertation the concepts of region, regional organization, regional association and regional community are interchangeable. The first chapter also notes the economic dimension of security. Because security affects regional stability, the importance of its comprehensive form that combines the national stability with the international one was underlined. The author's intention was to expose the importance of complementarity. From the point of view of further considerations the paths of security institutionalization that have their practical application in the ASEAN Community have been presented.

Issues related to humanitarian aid show its short-term nature. Therefore, the objectives and importance of this aid in a view of the so-called humanitarian interventions have been included. Due to the social character of this aid, its connections with developmental goals were also distinguished. The specificity of humanitarian aid requires indication of its stages and principles that are commonly used among humanitarian organizations. The forms of this aid as well as the principles of effectiveness were presented. The final stage of this chapter consists of the characteristics of entities involved in providing assistance including the definition of key channel partners.

The second chapter refers to humanitarian logistics and humanitarian supply chain. Concepts, objectives, functions, phases, types, evolution, flows as well as their place in socio-economic reality have been presented here. The key logistic determinants and the importance of international logistics were indicated. It has been emphasized that logistics is a source of competition especially in the case of a humanitarian supply chain. The intention of the author was also to show the differences between the concept of humanitarian logistics and crisis management as well as between the business and humanitarian supply chain. Consideration of these issues requires determining the significance, nature and sources of natural disasters in the context of humanitarian aid. This chapter highlights the determinants of effective aid delivery as

well as the nature of logistics modernization in international terms. Due to the interdisciplinary nature of logistics, the requirements of rationalization and internationalization of logistics operations were outlined. Development strategies and challenges posed to humanitarian logistics in the physical, informational and organizational areas were discussed in great detail as well.

The second chapter of the dissertation presents also the characteristics of the humanitarian supply chain and the logistics chain. This requires consideration of the types of humanitarian supply chain and indication the appropriateness of management at the international level. The author defined the moment of chain activation in the situation of a natural disaster, the determinants of the effectiveness of humanitarian aid and the necessity to coordinate and integrate of logistics operations. Therefore, the risk classification that determines the economic integration of chain channel partners was noted. The author has compiled the factors of efficiency of the international logistics chain that have a direct impact on the humanitarian supply chain. The second chapter also includes a summary of basic approaches to humanitarian aid modelling based on logistical issues. Thus, the process of logistic support systems modelling was illustrated which divides the determinants of the chain's development into external and internal ones.

The second chapter also indicates the scope of partial tasks during the prevention phase as well as the impact of security on the uncertainty of demand and supply. Key humanitarian supply chain processes have been defined. The essence of the international logistics management process has also been defined. This is of fundamental importance for chain configuration within a regional association. Therefore, the types of flows related to physical, financial, human and informational streams were presented. Attention is drawn to the relations between international logistics and the impact on competitive advantage. Separate theoretical characteristics require the principle of financial flows, which are closely related to the principle of special diligence in calculating tasks. The author emphasized the importance of informational flows, which in his opinion are the key element to minimizing the suffering of the affected communities. The importance of two-way communication through the use of modern technology and integrated ICT systems was pointed out. It was emphasized that public administration, including a regional association, should perform coordination and integration functions. It was distinguished that the humanitarian supply chain consists mainly of warehouses and transport connections. The factors of creating a network of connections have also been characterized, among which important factors are imposed on the macroeconomic environment.

The second chapter also includes the theory of logistics convergence in the humanitarian supply chain which is based on an economic approach. Characteristics of the basic concepts relating to convergence were made: internal, external, real, nominal, absolute, conditional, beta

and sigma. The relation between economic development and the occurrence of convergence was indicated. The author also compared the determinants of international exchange that are of fundamental importance to the logistics issue in the supranational dimension. An original definition of logistics convergence in the humanitarian supply chain was introduced and the key cause and effect determinants were identified. The concept based on the macroeconomic dimension has been correlated with the logistics absorbcency which constitutes the measure of regional development. Therefore, three forms of this convergence are presented: institutional, informational and infrastructural. It was emphasized that it may be considered in two dimensions. The first one is related to the optimization of processes within the chain, while the other one is strictly macroeconomic. The author drew attention to the legitimacy of logistics operations institutionalization within the humanitarian supply chain which promotes their homogenization as well as sustainable development. It was also emphasized that the macroeconomic dimension requires a comprehensive analysis using statistical methods. A theorem were presented that claims that internationalization affects the level of chain efficiency.

The third chapter of the dissertation consists of issues related to the logistics of humanitarian supply chain in the ASEAN Community. Therefore, the main attention was focused on the external determinants of the chain configuration. First of all, the research methodology and the method of constructing the composite indicator of humanitarian logistics in the situation natural disasters were presented. The idea of the original indicator was to indicate the possibility of measuring the development of humanitarian logistics which in consequence may lead to the achievement of a sustainable level. Furthermore, the characteristics of the ASEAN Community were carried out in the context of undertaken activities in the situation of natural disasters. This requires discussing the genesis of integration processes as well as describing the mechanisms and institutions that determine the coordination, institutionalization and internationalization of logistics operations. The author also presented the impact of natural disasters on this regional association in the form of a comprehensive characteristics of frequency and intensity of cataclysms in individual countries of the Community.

The third chapter of the dissertation also justifies the selection of variables that constitute the composite indicator of humanitarian logistics. Determinants were grouped into five basic components: natural disasters, demographics, institutional and economic determinants, informational and social determinants, and infrastructural determinants. The significance of the variables selection was determined using the correlation coefficients. In addition, the author prepared a multi-dimensional scaling that presents countries similar in terms of groups of determinants of humanitarian logistics development. The importance of this indicator, that allows to

rank ASEAN member countries, is highlighted. The final part of the third chapter consists of the analysis of logistics convergence in the humanitarian supply chain. The author indicates that all of its three forms exist in the ASEAN Community through adapting the methodical approach of calculation using the so-called sigma convergence.

The fourth chapter deals with the modelling of the humanitarian supply chain. The chapter consists of two parts. The first one refers to the internal determinants of the humanitarian supply chain, while the second one is devoted to presenting the referential model.

Therefore, the analysis of internal determinants was started with the characteristics of the regional warehouse in Subang in Malaysia which serves as the hub and logistics centre of the ASEAN group in the situation of natural disasters. A comparative analysis of fifteen logistics operations undertaken by AHA Centre in 2012-2016 was also carried out through comparison of material, financial, human and informational flows. The author of the dissertation presented the scope of logistics operations and characterized the activities carried out in the various phases of humanitarian logistics. The moment of activation of logistics operations was presented as well as the form of cooperation between national contact centres and institutions of a regional Community. The fourth chapter highlights the importance of coordination, integration and internationalization of the activities that are the foundation of cooperation in the ASEAN group. Partial tasks carried out during Typhoon Haiyan were characterized which was the most intense natural disaster in the analysed period. Its complexity made it possible to indicate the dependence among the entities involved in the supply chain.

In the second part of the fourth chapter the configuration of the humanitarian supply chain is presented. The analysis was prepared in the three dimensions, which directly correspond to three forms of logistics convergence in the humanitarian supply chain: institutional, informational and infrastructural. The elementary entities responsible for the activities were also defined in the perspective of each dimension. The author of the dissertation characterised the levels of internationalization of flows which main objective is to increase the level of effectiveness of the humanitarian supply chain. The presented thoughts are also focused on the need to integrate and coordinate logistics operations which together with the sustainable development of humanitarian logistics and the internationalization of these operations speak for the efficiency of the supply chain. Main entities within the supply chain were distinguished at the regional association level as well as the advantages and disadvantages of the proposed model were characterized. Since the configuration of the reference model of the humanitarian supply chain in the situation of natural disasters is supported by a high degree of theorizing, the final part of the chapter focuses on the proposals for its implementation in the regional Community.

Following research methods have been applied in this dissertation:

1. Critical analysis of the subject literature based on the presented scientific and cognitive objectives.
2. Complex analysis of statistical data. The use of a spreadsheet to prepare a composite indicator of humanitarian logistics in the occurrence of natural disasters (correlation coefficients and the construction of the indicator) and analyses of logistics convergence in the humanitarian supply chain. In addition, the R programming language has been used in order to prepare multidimensional scaling.
3. Case studies of coordinated logistics activities in the occurrence of natural disasters undertaken on the ASEAN Community level by the AHA Center institution. Comparative analysis based on the determinants of the humanitarian logistics development.
4. Development of a reference model of the humanitarian supply chain in the occurrence of natural disasters at the regional association level and the procedures and tools for its implementation.

The extended scope of this research allows a unique and original presentation of humanitarian logistics theory in accordance with international logistics, safety and security, disasters and convergence theories. The world and national literature related to the presented theories were used, including the review of the ASEAN Community documents and other entities participating in logistic operations in the situation of natural disasters. The scientific and cognitive objectives of this dissertation were to provide extensive insight into the issues which had not been sufficiently discussed in the related studies so far. Moreover, the achievement of the practical objectives allows the implementation of a reference model of a humanitarian supply chain in an regional association. The main difficulty was to obtain relevant and sensitive information about the ASEAN Community.

The holistic approach to humanitarian logistics and humanitarian supply chain is important from the regional associations' point of view. It is justified to prepare procedures, methods and techniques for matching logistic operations with available material, human and financial resources based on available information. Presently, the configuration of the international supply chain that integrates individual countries of the region in the occurrence of natural disasters is essential.

Globalization and regionalization play a crucial role in the integration processes. It is necessary to conduct community projects in the situations during which individual communities in particular countries are not able to coordinate them by themselves. Humanitarian logistics is

not a chance only, it is also the requirement which should be fundamental for including a regional association in logistics operations. Internationalization determines the synergic cooperation indispensable when natural disasters occur. In the perspective of the growing role of comprehensive security, cooperation and regional integration based on the activities' institutionalization seems to be the most efficient way for countries' development.

The humanitarian supply chain is not limited to humanitarian organizations. The potential and possibilities that the public sector has, as well as regional association, should be actively used to counteract, minimize and eliminate the effects of natural disasters. First of all, logistics is the foundation for the dismantling of partial tasks undertaken by entities involved in humanitarian aid. The extent and intensity of cataclysms determine the scope of the provided assistance. The necessity of international material, financial, human and informational flows justifies the need to integrate mutual undertakings. Therefore, regional association creates conditions that determine the effectiveness of the humanitarian supply chain. In addition, logistics is an important factor for economic development. Transport, storage and distribution processes must include external conditions defining the limits in which logistics can function effectively.

Secondly, logistics operations within the humanitarian supply chain are impeded due to the absence of transparency and efficiency of government institutions of particular countries. The role of a regional association or humanitarian organization is not to replace the State's competence. The entities which operate in permanent symbiosis offer a humanitarian aid service through cooperation, and are characterized by complementarity. It is a causative factor that influences the socio-economic reality.

Additionally, the importance of humanitarian logistics in international terms is noticeable. ICT or transport systems substantially affect the effectiveness of logistics operations. The deepening infrastructural and institutional integration is an evidence of the humanitarian supply chain growing strength within ASEAN Community. The internationalized logistics activities and investment projects tend to standardize the procedures and scope of the supply chain's operations. Co-ordination competences are transferred from the national contact centres to the regional level, which contributes to the diversification of risk and increases the level of logistic operations' effectiveness. The optimization of these activities is a causative factor influencing the communities' security.

What is more, the humanitarian supply chain is strongly correlated with external determinants. The frequency and intensity of natural disasters, demographic, institutional, economic, informational, social and infrastructural determinants are an immanent feature of humanitarian logistics. They affect the configuration of the supply chain and the effectiveness of logistic

operations. They play a fundamental role in balancing the development of humanitarian logistics which determines the State's predispositions in this aspect. Therefore, it provides information that is crucial for increasing effectiveness. The analysis of logistics convergence in the humanitarian supply chain allows to determine the range of countries' concurrence in the development and optimization tasks. This study emphasizes that the greatest dynamism is characterized by institutional convergence, which is caused by significant economic and institutional discrepancies in the States. Therefore, humanitarian logistics is a unique concept which enables integration within various economies at all possible stages of economic development. On the other hand, informational convergence is essential for raising the level of public awareness as well as the ability to cope independently with the effects of natural disasters. Infrastructural convergence is characterized by the lowest level of change. This is due to the long investment time and the intense nature of natural disasters. Nevertheless, it should be emphasized that humanitarian logistics is an integrative and coordinative factor for the economy that it creates and an added value for the affected inhabitants and the State itself.

Moreover, logistics is the causative factor in the effectiveness of humanitarian aid. The prioritization of time over costs is an evidence of the unique nature of the humanitarian supply chain. Thus, the effective prevention, reaction and reconstruction reduce the impact of natural disasters.

The absence of a uniform approach in terms of a theoretical justification determines the background for the standardization of logistics operations in a humanitarian supply chain. This dissertation contributes to a more extensive and deeper knowledge in the area of primary research in the discipline of economic sciences, mainly with reference to the logistics operations within humanitarian supply chain. The research results have impact on supplementing knowledge related to the usage of methods focused on the effectiveness of activities performed in that supply chain. This dissertation's findings may have a direct impact on the improved awareness and the extent of knowledge on the presented topics for regional associations, government sector, humanitarian organizations, and the entire society.

The increasing number of disasters and calamities, as well as their range and impact in the form of measurable human and material losses impose actions characterized by both complexity and a holistic approach. This dissertation suggests that the humanitarian supply chain should contribute to the optimization of individual logistics operations as well as to enter the path of sustainable development of humanitarian logistics. This would enable effective preparation for the natural disasters' effects as well as efficient pursuit of infrastructure and economic development. Humanitarian logistics and a humanitarian supply chain contribute to minimizing the

community suffering and to eliminating the gap of non-adjustment to the problem of natural disasters. In order for these goals to be met, the State and a regional association must ensure comprehensive security and joint liability.