



## **THE ROLE OF LOGISTICS IN DISASTER MANAGEMENT AND DISASTER LOGISTICS ISSUES**

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Disasters disrupt the normal life of the society and overcome community's adaptability capacity. Disasters cause high amount of fatalities, loss of property and injuries. Disaster management covers the periods before, during and after disaster. Disaster management targets the prevention and reduction of physical and economic losses in a country. Another aim is the decrease of people's suffering and to speed up the reconstruction process. The foundation of a successful aid operation depends on the timely, balanced and fastest delivery of aid materials and equipment. Disaster logistics provide the bridge between aid materials and the areas of disasters. Disaster logistics ensure the efficient flow of aid to disaster areas. Logistics activities constitute the most important part of the humanitarian aid operations and disaster management. In this study, the role of disaster logistics in disaster management and the disaster logistics issues have been examined.

**Keywords:** Disaster logistics, Disaster logistics issues, Disaster management.

### **1. Introduction**

Every year disasters caused thousands of injuries, deaths and devastating economic damages. Despite the technologic improvements, mankind is still desperate against disasters. Disasters continue to cause physical and psychological damages. Disaster preparedness, disaster management and disaster response are important actions for minimizing the damage of the disasters. National and international humanitarian aid operations aim decreasing the sufferings of disaster victims and reducing losses. Another goal is provide human and respectable life standards to every disaster victim.

Earthquakes as common events in Turkey do not always create disaster situation. To count an earthquake as a disaster, it must have caused destruction, life and property loss. Today, natural disasters are unforeseeable events. But with necessary preparedness and conscious community, it is possible to prevent natural disasters' destruction to some extent. Improvements in early warning systems for disasters take place with developing technology. There have been changes in the perspectives on disasters. It is possible to overcome disasters with minimum losses through accurate precautions and planning.

## 2. Literature Review

### 2.1 Disaster and Disaster Types

“Disasters suspend normal life and social activities for humans and other beings. They cause physical, social, economic and cultural losses. Affected community can not cope with the results of natural or man made disasters”<sup>1,2</sup>

“Disasters overcome the response and adaptation capacity of the affected communities. Disasters cause high number of life and property loss”<sup>3</sup>. “In developing and undeveloped countries %95 of life loss take place by natural or man-made disasters.”<sup>4</sup>

Every earthquake, fire, flood or tsunami is not a disaster. If affected community can not overcome natural or man-made incidents by using their own resources, those incidents are evaluated as a disaster. For instance, tsunami occurred at Gölcük on 1999 Marmara Earthquake did not evaluated as a disaster, but 2004 Indian Ocean Tsunami, which killed over 230 thousands people, evaluated as a disaster.<sup>5</sup> For an incident to evaluate as a disaster, at least one the following needs to be occurred according to the CRED (Centre for Research on the Epidemiology of Disasters);<sup>6</sup>

- 10 or more life loss,
- 100 or more injuries/ displacements,
- The state of emergency declaration by affected country’s government,
- The call of international aid by affected country’s government.

Disasters have different types. Different kinds of disasters require different approaches in humanitarian aid operations. Disaster types are;<sup>7</sup>

- Rapid onset natural disasters such as earthquakes, tornados, storms,
- Rapid onset man-made disasters such as terror attacks, industrial accidents,
- Slow onset natural disasters such as starvation, famine, epidemics,
- Slow onset man-made disasters such as economic crises, refugee crises.

Most dangerous types of disasters are rapid onset natural disasters. Rapid onset disasters need the fastest and the most flexible response. Because they create devastating results in short time periods. Slow onset disasters need long termed aid and development projects. For example, earthquakes are not predictable. Earthquakes cause many life loss and infrastructure damage. On the other hand, starvation and famine affects wide areas and cause deaths in the long run, but they do not damage the infrastructure.<sup>8</sup> Because of these differences, every aid operation needs to be planned and executed according to the disaster at hand.

<sup>1</sup> Ö. Işık, H.M. Aydınlioğlu, S. Koç, O. Gündoğdu, G. Korkmaz ve A. Ay, (2012). Afet Yönetimi ve Afet Odaklı Hizmetleri. *Okmeydanı Tıp Dergisi* 28(2), p.83-84.

<sup>2</sup> World Health Organization Web Site.

<sup>3</sup> S. Gögen, (2004). Afetler Ve Afetlere Müdahalede Asgari Sağlık Standartları. *TSK Koruyucu Hekimlik Bülteni* 3(12), p.297.

<sup>4</sup> A.g.e.

<sup>5</sup> Ö. Işık, H.M. Aydınlioğlu, S. Koç, O. Gündoğdu, G. Korkmaz ve A. Ay, (2012), p.84.

<sup>6</sup> D. Strömberg, (2007). Natural disasters, economic development and humanitarian aid. *Journal of Economic Perspectives* 21(3), 201.

<sup>7</sup> A. Cozzolino, (2012). Cross-Sector Cooperation in Disaster Relief Management. *Humanitarian logistics and supply chain management*, p. 6-7.

<sup>8</sup> S. Schulz, (2008). *Disaster Relief Logistics: Benefits of and Impediments to Horizontal Cooperation Between Humanitarian Organizations*. Berlin Technical University, p.21.

## 2.2 Disaster Management

Turkey and the surrounding region had many disasters throughout history. At recent history, destruction caused by 1999 Marmara Earthquake showed that Turkey needs better disaster management operations. Only efficient disaster management operations overcome the shortcomings of disaster response. “Disaster management aims reducing the damage of disasters. Disaster management includes planning and coordination of all practices in damage reduction, preparedness, response and first aid, restoration-restructuring processes. Shortly, disaster management means planning, coordination and management of all phases of disasters”<sup>9</sup>.

“Disaster management includes planning for disasters, assessment of resources at hand; evaluation of requirements, work planning and creation of possible scenarios”<sup>10</sup>. The goal of disaster management includes; reducing or preventing the humane, physical, economic losses in affected country, decreasing the suffering of affected community and accelerating the reconstruction process.<sup>11</sup>

The possible effects of disasters must be evaluated before disasters take place. During the preparedness phase, by using these evaluations, scenarios and plans must be prepared. After response phase, restructuring phase begin to reduce the long term negative effects of the disaster. Logistic practices form the greatest and the most important parts of the disaster management. Logistic operations are system implementation. The success of this system is related with the working personnel and environment. Logistic systems first designed by humans, then these systems direct people. To manage the logistic system effectively, accurate estimations and minimum fault planning required.<sup>12</sup>

“In disaster management studies, security, communication, psychological support, sheltering, water-sanitation, transportation, food and health modules are the foundations of the emergency action plans. For effective disaster management, the communication between these modules required. The priorities of these modules change due to occurring disasters. Every module has its own standards”<sup>13</sup>.

“In disaster management, disaster information systems have an important role. Advanced disaster management systems used in every disaster management processes (damage reduction, preparedness, response, restoration) and every phase of the disasters. These systems provide benefits to both field personnel and administrative personnel”<sup>14</sup>.

After the disaster, emergency health services must be provided to the disaster victims quickly. Emergency health services are an important part of the disaster management. Evacuation of the disaster victims to the safe zones, emergency response to the injured people and providing psychological support to the people are very important after the disaster hits. The right distribution of the medical personnel to the disaster area are also important to reduce the deaths and disabilities. Despite the hardest road and weather conditions, military forces could reach distant areas and be able to provide health services and also logistic support.<sup>15</sup> After the disaster, in the collection centres epidemics are the greatest dangers because of the crowded people. Medical personnel in these centres have to be watchful about the symptoms of infectious diseases.<sup>16</sup>

<sup>9</sup> Ö. Işık, H.M. Aydınlioğlu, S. Koç, O. Gündoğdu, G. Korkmaz ve A. Ay, (2012), 87-88.

<sup>10</sup> S. Gögen, (2004), p.298.

<sup>11</sup> S. Schulz, (2008), p.25.

<sup>12</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.1.

<sup>13</sup> Ö. Işık, H.M. Aydınlioğlu, S. Koç, O. Gündoğdu, G. Korkmaz ve A. Ay, (2012), p.83.

<sup>14</sup> Ö. Albayrak, (2005). Etkin afet yönetim bilgi sistemleri: Gereklere ve kullanımı. Deprem Sempozyumu Kocaeli 2005, p.1510.

<sup>15</sup> L. Zhang, X. Liu, Y. Li, Y. Liu, Z. Liu, J. Lin, J. Shen, X. Tang, Y. Zhang ve W. Liang, (2012). Emergency medical rescue efforts after a major earthquake: Lessons from the 2008 Wenchuan earthquake. *The Lancet* Vol. 379, p.856.

<sup>16</sup> H.H. Cranmer, (2005). Volunteer Work: Logistics First. *The New England Journal of Medicine* 353(15), p.1543.

## 2.3 Disaster Logistics

Humanitarian aid and disaster logistics are complementary and interconnected concepts. Every humanitarian aid operation largely consists of logistic practices. In this context, initially definition of humanitarian aid will be discussed, and then logistic practices in humanitarian aid operations will be defined.

### 2.3.1 Humanitarian Aid

Humanitarian aid aims for saving lives after natural or man-made disasters. Humanitarian aid includes giving support to disaster victims, determining long term restoration goals and solving problems that caused by migration.<sup>17</sup>

Humanitarian aid highly depends on voluntariness both in financial and manpower aspects. The recipient of the humanitarian aid is not a part of any commercial transaction. Final delivery points generally have damaged infrastructure, inefficient transportation network and could have some political barriers.<sup>18</sup>

Efficiency of the humanitarian aid depends on the political and military conditions of the donors and host countries. The priorities of the donors, the urgency for the aid in host countries and the coordination plan affect the humanitarian aid operations. Non-governmental organizations put an effort to collect donations. But donors usually make their donations for short term emergencies. Long term donations and investments on logistics systems do not receive much attention. This causes serious changes on donation amounts.<sup>19</sup>

### 2.3.2 Disaster Logistics

Efficient humanitarian aid operations depend on the speed of transportation of humanitarian aid materials and services at accurate amounts, on right time and in right conditions to the places in need.<sup>20</sup> Disaster logistics is planning, implementation and management of storage and flow of aid materials and necessary information. Efficiency and cost are also need to be considered in this process. Preparedness, procurement, transportation, tracing, storing, inventory management and customs clearance are among disaster logistics functions.<sup>21</sup> First response in an emergency situation includes transportation of medical supplies, communication equipment, repair equipment, food, shelters and personnel to the place in need.<sup>22</sup>

Disaster logistics require cooperation between governments and non-governmental organizations. Disaster logistics require the use of different transportation modes. Humanitarian operations could suffer from infrastructural incapacity, logistics bottlenecks and political barriers. The presence of many actors in the field, lack of cooperation between and within organizations and lack of communication could be experienced in these operations.<sup>23</sup>

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<sup>17</sup> Ministry of Foreign Affairs of the Republic of Poland Web Site.

<sup>18</sup> D.K. Lu, S. Pettit ve A. Beresford, (2006). Critical Success Factors for Emergency Relief Logistics. Whampoa: An Interdisciplinary Journal 51, 178.

<sup>19</sup> R. Oloruntoba ve R. Gray, (2006). Humanitarian aid: an agile supply chain. Supply Chain Management: An International Journal 11 (2), 115.

<sup>20</sup> United Nations Disaster Response and Coordination Team, (2006). Disaster Logistics, p.1.

<sup>21</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.2.

<sup>22</sup> United Nations Disaster Response and Coordination Team, (2006). Disaster Logistics, p.1.

<sup>23</sup> R. Oloruntoba ve R. Gray, (2006), 116.

## 2.4 The Stages of Disaster Logistics

Disaster logistics activities in humanitarian aid operations performed in three phases. These phases are; preparedness, response and reconstruction-restoration.

### 2.4.1 Preparedness Phase

Preparedness phase is the most important part of the disaster logistics activities. Preparedness stage includes assessment of the vulnerabilities, making of emergency situation planning, construction of coordination structure, the mobilization of response mechanisms, education and drills. Also procurement and storage of the aid materials, the setup of the early warning systems are part of the preparedness stage.<sup>24</sup>

“In preparedness stage, the installation of the logistics centers where aid materials stored, have an important role”<sup>25</sup>.

Pre-positioning of the aid materials has an important place in preparedness stage. Pre-positioned goods are basic humanitarian aid supplies such as food, water, medical supplies, house kits and shelters. Free from the disaster type and socio-economic conditions, basic aid supplies are useful in any disaster situation. This situation makes standardization of aid supplies easier. In the lack of pre-positioning, during disaster time, the aid materials need to be procured from the international markets. Because disaster hit local suppliers also have hard time during disaster time. Doctors without Borders and Red Cross have pre-positioned warehouses. Also these foundations have contracts with suppliers to make use of during disaster time.<sup>26</sup> The procurement processes from the international markets could disrupt aid operations because it is more costly and take more time.

World Vision have 44 thousand employees and have presence over 100 hundred countries around the world. World Vision ensures the arrival of aid to children and communities in need.<sup>27</sup> World Vision have pre-position basic aid materials at warehouses in Denver (USA), Hannover (Germany), Dubai (UAE) and Brindisi (Italy). In case of disaster, World Vision has quick Access to the materials in these warehouses. Also they use the pre-made contracts with suppliers about aid materials. With the chosen transporters in Kenya, Canada, India, Pakistan, Thailand and Australia aid material easily could be transported to the disaster areas. The use of pre-positioned goods save time and provide quick access to the disaster areas.<sup>28</sup>

### 2.4.2 Response Phase

Response phase, which comes after the preparedness stage, begin with occurrence of the disasters. Logistics activities are mostly used in response stage. The quick response after big disasters such as earthquakes, floods, typhoons is important for saving lives and damage reduction. In this stage, effectiveness of the rescue efforts depends on the right distribution of aid materials and sufficient aid personnel. The success in these efforts limits the casualties.<sup>29</sup>

Response stage represents humanitarian aid efforts and emergency services after the disaster hit. Rapidity is very important in this stage. After the response, the last stage, reconstruction and restoration

<sup>24</sup> UNDRO, (1992). Components of disaster preparedness. An Overview of Disaster Management 2nd Edition, p.63.

<sup>25</sup> O. Gözaydın ve T. Can, (2013). Deprem Yardım İstasyonları İçin Lojistik Merkezi, p.19.

Seçimi: Türkiye Örneği. Havacılık ve Uzay Teknolojileri Dergisi 6(2), p.19.

<sup>26</sup> M. Howden, (2011), p.5.

<sup>27</sup> World Vision Web Site.

<sup>28</sup> S. Matthews, (2005). Logistical Challenges. Forced Migration Review Special Issue July 2005, p.38.

<sup>29</sup> J. Sheu, Y. Chen ve L.W. Lan, (2005). A Novel Model For Quick Response To Disaster Relief Distribution. Proceedings of the Eastern Asia Society for Transportation Studies Vol. 5, p. 2454.

stage begin. Last stage includes normalization of lives and ensuring self sufficient living efforts for victims of the disaster.<sup>30</sup>

### **2.4.3 Reconstruction and Restoration Phase**

The last stage of the disaster management, the reconstruction and restoration phase which takes long time. Restoration process aims the normalization of lives in disaster hit communities. Accordingly, reconstruction of infrastructure and devastated buildings, provision of jobs and education efforts take place in this stage. These activities may take years to complete. For example, after 2004 Indian Ocean Tsunami, humanitarian aid organizations provide boats to local fisherman. With these boats, they helped the recovery of the local economy and made life easier for fishermen.<sup>31</sup>

One of the aims of the humanitarian aid efforts, ensuring self sufficiency for the victims of the disasters, is very important. In long term, not every refugee or disaster victims could adapt and provide sufficient conditions for themselves. For these reason, providing economic and psychological support for these people are necessary.<sup>32</sup>

After the response stage, the reconstruction and restoration phase immediately need to begin. With recontruction stage, the devastation caused by disasters may provide temporary support to the local people. For example, after 2004 Indian Ocean Tsunami, 11 thousand local people worked in the reconstruction efforts. These jobs provide psychological suuport to local people and supported local economy.<sup>33</sup>

## **2.5 The Use of Information Systems in Disaster Logistics**

In disaster logistics, the procurement, storage and distrubution of aid materials are required. Humanitarian logistics information systems; provide integration of logistic units into the humanitarian supply chain and improve logistics activities throughout the organization. At the same time, information systems provide constant support for disaster logistics management stages and create opportunity for cooperation between aid organizations.<sup>34</sup>

Humanitarian aid information systems provide mutual flow of information and increase the efficiency of humanitarian supply chain. Humanitarian aid information systems provide many benefits in the issues listed below;<sup>35</sup>

- They provide visibility for field teams about inventory in local warehouses or pre-positioned storages. They also allow finding availability of aid materials in local and international markets. They make the need assessment better.
- They provide better procurement planning by listing price and lead time info of aid materials in local and international markets.
- They provide support to understand logistics bottlenecks and notify the personel about procurement activities.
- They provide accurate financial information about procurement funds to the budget managers. Therefore they prevent over or under budget spending.
- They provide warehouse inventory reports to the staff. Therefore they provide best utilization from the inventory.

<sup>30</sup> O. Gözaydın ve T. Can, (2013), p.19.

<sup>31</sup> M. Howden, (2011), p.6.

<sup>32</sup> M. Kett, (2005). ABC of conflict and disaster: Displaced populations and long term humanitarian assistance. British Medical Journal Vol. 331, p.100.

<sup>33</sup> M. Couldrey ve T. Morris, (2005), p.8.

<sup>34</sup> M. Howden, (2011). How Humanitarian Logistics Information Systems Can Improve Humanitarian Supply Chains: A View from the Field. 6. International ISCRAM Conference, Götensburg, Sweden, p.1.

<sup>35</sup> M. Howden, (2011), p.4.

- They provide information about the distribution of the inventory. Therefore the staff follows and assesses logistics activities better.
- According to the budget, they provide efficient and accurate distribution of logistics expenses such as warehouse renting, transportation fees and personnel salaries.

The standardization in coordination and information sharing in humanitarian aid is a need for companies. This seems like an improvement in current information management systems. But standardization could be a key driver for supply chain management, especially in the areas like need assessment and information sharing.<sup>36</sup>

### 3. Method

This study is a case study with qualitative perspective. Research method is literature review. Real time disaster management informations, declarations, news, aid organizations' activity reports are used as references. The important cases about the recent disasters are also included to the paper. Problems in disaster logistics activities are identified by evaluating these cases of disasters,

### 4. Findings

There is a strong relationship between the disaster logistics activities and the disaster management. Because of this relationship the problems in disaster logistics are deeply affecting the success of disaster management. In this context, the relationship between disaster logistics and disaster management and the issues in disaster logistics are pointed out below.

#### 4.1 The Relationship between the Disaster Logistics and Disaster Management

Humanitarian aid operations could be both national and international. Both case they require certain type of cooperation between different countries, organizations and people. Medicine, water, food, shelter and similar aid materials need to be sending to the disaster area by the fastest way possible. For rescue and reconstruction efforts, provision of necessary equipment and materials to the field teams are very important. These materials and equipment could only be transferred to the disaster areas through logistics operations. Most part of the humanitarian aid operations and disaster management activities comprised of logistics activities (%80). Logistics activities are the most important and expensive part of disaster management. When we look the costs; %65 of this %80 are consist of materials and equipment procurement cost. Remaining %15 are transportation and storage expenses. For that reason, the role of logistics in humanitarian aid could be understand better today. So accurate planning and implementation of logistics activities are very important for the success of humanitarian aid operations.<sup>37,38,39</sup>

Disaster logistics include activities such as procurement, storage, fleet management, transportation of materials and personnel, assets management, facility management, security, information management and communication. Different from the commercial logistics, disaster logistics cover big areas and executed in unknown locations. Therefore disaster logistics are more complex.<sup>40</sup>

<sup>36</sup> P. Tatham ve K. Spens, (2011). Towards A Humanitarian Logistics Knowledge Management System. Disaster Prevention and Management January 2011, p.9.

<sup>37</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.2.

<sup>38</sup> L.N. Van Wassenhove, (2006). Humanitarian aid logistics: supply chain management in high gear. Journal of the Operational Research Society, 57(5), 475.

<sup>39</sup> S. Schulz, (2008), p.45.

<sup>40</sup> M. Howden, (2011), p.2.

Logistics is at the heart of the disaster operations. Because logistics functions are a bridge between; preparedness and response stages, procurement and distribution processes, the field and the headquarters. Also logistics operations allow benchmarking after each disaster operation for the future by the way of keeping the experienced useful information (such as procurement, transportation, distribution, costs etc.) in logistics departments.<sup>41</sup>

By planning the logistics activities in the preparedness stage logistics needs could be met better in case of disaster. Logistics activities are planned in four stages. These stages are; strategic planning phase, preparation phase, before the disaster phase and after the disaster phase.<sup>42</sup> Logistics planning must include many scenarios, alternatives and must be fully compatible with disaster management plans. Planning and forecasting are crucial for the successful disaster logistics. Logistics planning based on the geographical, technical, political and physical conditions. So when you consider the situation in disaster area logistics plans should have to be flexible and having alternatives.<sup>43</sup>

Different kind of aid stuff is necessary for humanitarian operations in different stages. Slight materials are adequate during the needs assessment stage initially. The type of disaster has an important impact on decision making at this stage. More stuff is required to satisfy the needs in the distribution stage of the operation. Excessive resources could be needed later on to sustain the aid operation. Funds used in the operations decrease and eventually stop in the reconstruction stage.<sup>44</sup>

The stuff and the services which will be required due to the type of disasters are determined in the preparedness stage. Aid organisations also work on donations and procurement of aid materials. Similarly plans are completed for the responsible person about acceptance and distribution of the aid materials. Specialized teams need to be assigned. Humanitarian organisations try to predict the needs in case of disaster and they evaluate how much of the donations will meet those needs. Humanitarian organisations provide coordination between the disaster victims and donors by activating humanitarian supply chain.<sup>45</sup>

Logistics activities must be integrated into the humanitarian supply chain operations. Humanitarian supply chain management includes the administration of the aid programs, donation running, budget management and coordination of all logistics in the field.<sup>46</sup> Humanitarian supply chains are performing in a continuously changing dynamic environment. Unstable donations and funds from donors and governments for different reasons cause instability in humanitarian supply chain.<sup>47</sup>

Most humanitarian organization split their operations into two parts; field operations and support activities. Field operations include transportation and distribution of aid materials such as water, food, medicine, shelter to the disaster areas. Support activities include headquarter efforts about technology, finance, communication and human resources. All these logistics activities have a very important role in disaster management.<sup>48</sup>

## 4.2 Current Problems in Disaster Logistics

The underdeveloped economies and inadequate infrastructure of the disaster areas cause problems for humanitarian aid operations and create huge bottlenecks for the logistics activities. Insufficient capacities of airports and ports, insecure storage areas, lack of loading equipment are some of these congestions. Bad conditions of railroads and highways, freightage and height limitations of tunnels and bridges, inadequate

<sup>41</sup> A. Thomas, (2003). Humanitarian Logistics: Enabling Disaster Response, Fritz Institute, p.3.

<sup>42</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.2.

<sup>43</sup> United Nations Disaster Response and Coordination Team, (2006). Disaster Logistics, p.2-3.

<sup>44</sup> S. Schulz, (2008), p.27.

<sup>45</sup> R.M. Tomasini ve L.N. Van Wassenhove, (2009). From preparedness to partnerships: case study research on humanitarian logistics. International Transactions In Operational Research 16(5), 554.

<sup>46</sup> M. Howden, (2011), p.3.

<sup>47</sup> R. Oloruntoba and R. Gray, (2006), p.115.

<sup>48</sup> A.S. Thomas and L.R. Kopezak, (2005), p.5.



signal systems of roads decrease the efficiency of logistics activities.<sup>49</sup> After the Philippines Typhoon in 2013, government owned rice silos ransacked by locals is an example of unsecure operation areas.<sup>50</sup>

Last minute air transportation could be made in disaster operations because of ineffective planning. Insufficient stocks are other disaster logistics problems. In addition, the lack of coordination between organizations and poor information flow cause inefficiency in logistics activities.<sup>51</sup>

Destruction and debris caused by disasters, floods and landslides, cause damages in communication systems and these limit to send the aids to the operation area. Low capacity of airports limits the transportation of aid materials by air and decreases the overall aid quantity. Damaged infrastructure, communication failures, unsecure environment, presence of many actors in the field, tough field conditions complicate the logistics activities in disaster areas.<sup>52,53</sup>

The disruption in communication systems complicated the evacuation the disaster victims during the East Japan Earthquake in 2011. Breaks destroyed the real time communication which needed for the procurement and transportation of the aid materials. Interruptions in communication systems caused the breakdown of the information flow between warehouses even weeks after the disaster.<sup>54</sup>

Damage caused by the disaster, especially at the highways makes land transportation difficult. Therefore, aid materials need to be transported by air. But it can be very difficult and costly to reach distant areas by air transportation in the countries which disaster hit. Because of the damage in the infrastructure some areas that need help could not be reached. For example, after Pakistan Earthquake in 2005, the International Federation of Red Cross and Red Crescent Societies announced that humanitarian aid could not be touched to 14 villages that have 15 thousand of population for nine days even after the earthquake. The main reason for this was the damage in transportation infrastructure.<sup>55</sup>

Today, the communication through social media can produce quite difference in emergency responses to the disaster areas. In 2013, World Health Organization used Twitter for announcing official information about the Avian Influenza pandemic in China. During the pandemic, staff at the Centers for Disease Control and Prevention followed the updates about the pandemic through big organizations' social media web sites.<sup>56</sup>

Disaster logistics activities include procurement, storage and transportation of aid materials that needed by disaster victims. Machines and equipment that needed for removing the debris and for the reconstruction efforts are also covered by disaster logistics activities. These activities also include rescue efforts for the disaster victims and transfer of aid personel to the disaster area. Despite the severe conditions of disaster area, all logictics operations must executed quickly. These aid operations take long time and costly due to the disaster effects. For this reason the coordination between all organizations during the preparedness stage, where logistics systems are developing, is very important. Success of the coordination determines the success of the logistics operations.<sup>57</sup> "The success of the disaster logistics requires synchronization between governments, local authorities, security forces, media, universities, non-governmental organizations, trade associations, unions, experts, international organizations and public"<sup>58</sup>.

<sup>49</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.2.

<sup>50</sup> Yeniçağ Newspaper Web Site.

<sup>51</sup> R. Oloruntoba ve R. Gray, (2006), p.116.

<sup>52</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.2.

<sup>53</sup> United Nations Disaster Response and Coordination Team, (2006). Disaster Logistics, p.1.

<sup>54</sup> M. Okumura,(2012). Logistics Chain Management for Emergency Supplies. Knowledge Note 3-3. Tohoku University, p.6.

<sup>55</sup> P. Tatham ve K. Spens, (2011), p.7.

<sup>56</sup> I.C. Fung ve K. Wong, (2013). Efficient use of social media during the avian influenza A(H7N9) emergency response. WPSAR 4(4), p.1-2.

<sup>57</sup> A.M. Köseoğlu, (2011). The Lifeblood of Disaster Management: Logistics. Uluslararası Lojistik ve Tedarik Zinciri Kongresi (İzmir), p.2.

<sup>58</sup> Ö. Işık, H.M. Aydınlioğlu, S. Koç, O. Gündoğdu, G. Korkmaz ve A. Ay, (2012), p.91.

“The procurement of the aid materials from local or international suppliers during and after the disaster time is costly and time consuming. For this reason, some aid organizations store necessary aid materials at strategically important areas. Also establishment of disaster aid stations are included in these efforts”<sup>59</sup>.

Personel shortcomings are generally experienced by the aid organizations almost after each disaster. Number of personel who will run the disaster logistics activities are not sufficient. Trained and qualified personel are very important for the success of the aid operations. Cause only the expert stuff could plan efficient disaster logistics activities (such as procurement, storage, transportation and facility location selection). After the East Japan Earthquake in 2011, there were some problems experienced in transportation and distrubution of the aid materials due to the lack of trained personel. A lot of trained personel lost their lives in the disasters. Local administrations had hard time to find trained personel. Staff who had no experience at logistics and supply chain management did not execute the distrubution and transportation activities properly.<sup>60</sup> Most of the aid organizations have voluntary staff. They can not find or keep trained and experienced personel easily. Also they have difficulties to find specialized staff at some areas.<sup>61</sup>

Coordination of international aid in the disaster area is also very important to decrease suffering. Especially donations from developed donor countries have great importance for the disaster hit underdeveloped countries. Acceptance, coordination and transportation of the international aid are an important part of the humanitarian aid operations. Only a small portion of donations could be used for the support activities of the aid organisations. But the investments of logistics systems will reduce the costs, improve the logistics activities and increase the efficiency of operations. Donations generally aim for short term straight aid materials. As a result, there are not enough funds for logistics systems and other support systems for strategic disaster preparations. Investments for the disaster operations infrastructure such as information technologies are not adequate.<sup>62</sup>

Another problem about the donations is bureaucratic difficulties. Host countries should ease the processes about the incoming humanitarian aid and the personel. This easiness increases the speed and success of the aid operations. But in many cases, entrances to the countries, which the disaster hit, have complex processes, especially for the support equipment such as computers, communication equipment and vehicles. These equipments considered as potetial security risks, therefore customs processes for this equipment take long time. Also many countries have limitations about the use of satellite systems.<sup>63, 64</sup> For example, after the 2004 Indian Ocean Tsunami, India closed its borders to the humanitarian aid organizations which have no office in India.<sup>65</sup>

After a disaster, the plenty amount of humanitarian aid and excessive media attention place quite pressure on aid organizations. Donors have important expectations from the aid organizations and operation. The accountability about the donations is also an important issue.<sup>66</sup> Especially, organizations which receive high amount of donations must be accountable to their donors about the usage of donations. Good communication with the donors and good reporting increase the transparency. Transparency provides serenity the donors and lead to higher amount of donations.

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<sup>59</sup> O. Gözaydın ve T. Can, (2013), p.19.

<sup>60</sup> M. Okumura,(2012), p.5-6.

<sup>61</sup> M. Couldrey ve T. Morris, (2005). UN assesses tsunami response. Forced Migration Review Special Issue July 2005, p.6.

<sup>62</sup> A.S. Thomas ve L.R. Kopczak, (2005). From Logistics to Supply Chain Management: The Path Forward in the Humanitarian Sector. Fritz Institute, p.5.

<sup>63</sup> M. Couldrey ve T. Morris, (2005), p.6.

<sup>64</sup> S. Matthews, (2005), p.38.

<sup>65</sup> A. Thomas ve V. Ramalingam, (2005). Response effectiveness: views of the affected population. Forced Migration Review Special Issue July 2005, p.46.

<sup>66</sup> M. Couldrey ve T. Morris, (2005), p.6.

## Conclusion

The efficient implementation of the disaster logistics is very important in disaster areas. Cause every aid material and service in the disaster areas could save or enhance lives. Logistics play an important role in disaster preparedness, response and reconstruction stages. Consequently, logistics have important part in every stage of the disaster management. For successful disaster management, successful disaster logistics required.

The preparedness stage is the most important part of the disaster logistics. Investments in preparedness stage could reduce the possible complication in the response phase. These investments also could provide savings on costs and time. The response stage, which disaster logistics heavily used, takes form according to the disaster type and current conditions. Disaster environments have many unknowns. Aid operations need to be planned, executed and continued according to the conditions at hand.

During the response stage, there are priorities and these should be fulfilled. The safety of the disaster victims and aid personel are the main priorities. After that, the quick delivery of the aid materials such as clean water, food, medicine and shelter, comes.

For a successful disaster management, successful planning and implementation of logistics operations are required. The transportation of the aid materials and personel, storage, and distribution of the aid materials have very important role in the logistics operations. Problems and shortcomings in logistics reduce the success of the aid operations. Therefore sufferings in the disaster are increasingly goes on.

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