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Disaster Management in Indonesia: Logistical Coordination and Cooperation to Create Effective Relief Operations

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Abstract: Indonesia has in the past often been struck by natural disasters. After these disasters, the disaster relief operations turned out to be ineffective in most cases. This study focuses on the main problems in disaster relief operations in Indonesia and tries to deliver a general model to deal with those. Literature studies showed that the main problem occurred in the field of organization, communication and logistical processes. Literature studies on relief operations in other countries showed that cooperation with private parties can be effective in these operations. The result of this study is a model which handles with the main problems and has the potential to create effective disaster relief operations.

Keywords: Disaster Management, organization, coordination, communication, logistic.

Introduction

South-East Asia and especially Indonesia has been struck by natural disasters in the past decades. In the last couple of years Indonesia has dealt with more than 400 natural disasters of which floods, fires, typhoons and soil eruptions are the most common. However, more destructive disasters like earthquakes, tsunamis and volcano eruptions also happen on a yearly basis. Disasters which had a big impact on the Indonesian community were the tsunami in 2004, the earthquake in Yogyakarta in 2006 and the earthquake in Padang in 2009 (Taubenböck *et al.* [11]).

In total more than 10 percent of the country's surface is subject to a relative high mortality risk from multiple hazards. However, the percentage of Indonesian people living in these areas is close to 60 percent (Dilley *et al.* [2]). This difference is mostly caused by the island of Java, which has by far the highest population density of the archipelago and bears a high natural disaster risk.

After natural disasters humanitarian relief operations have to deal with great challenges to get first aid, like water, food and medical attention to the victims. These great challenges are caused by different problems on organizational and physical level and of course a great time pressure to get the aid to the affected scene as soon as possible (Kovacs and Spence [4]). Different literature is published on the problems and (parts of the) solutions in disaster relief operations (Leeuw [5]; Tomasini and Wassenhove [12]), but no research can be found for the specific case of Indonesia. Mean-while the disaster relief operations in Indonesia suffer from inefficient organization, communication and logistical processes which were exposed most after the tsunami in 2004. In this case, donations in the form of money and products were abundance, but most victims did not receive the relief they needed (Cosgrave [1]).

This study focuses on the main problems in disaster relief operations in Indonesia. Looking at different cases of disaster relief operations in Indonesia will expose the main problems organizations are faced with during these operations. Because other countries have to deal with the same problems, foreign cases will be used as a benchmark and will lay down similar problems and winning strategies. Eventually this article attempts to use these problems and strategies to come up with a general model to cope with main problems and challenges in the first few days after a disaster. In this case, disaster management can lead to the effective distribution of disaster relief to the affected areas.

This article will start with different literature reviews to determine the main problems disaster relief operations are subject to in Indonesia. These reviews will focus on the supply of first aid (water, food and medical assistance) to the victims in the first few days after a disaster. Literature reviews will also be done to determine problems and winning strategies in other countries. The results will be used to create a general disaster management model for relief operations in Indonesia which describes the

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organization, communication and logistical processes before and after a natural disaster. The article will end with the main conclusions and recommenddations.

Problem Definition

The time after a natural disaster can be divided in four phases. The first phase consists of the first few hours after a disaster. During this phase the most important task is to rescue those people who can be saved. Because this is the priority directly after the disaster, it has to be done by those who are already there. The second phase starts after a few hours until a few days after the natural disaster. At this phase external organizations will play an important role in saving even more people by supplying medical attention, food, water, shelter and basic sanitation to the victims. The third and fourth phases deal with the recovery of the area and are therefore not interesting for this study (Leonard [7]).

Tsunami 2004

After the tsunami in 2004 the local community turned out to have a critical role in the first phase after a disaster. More than 90 percent of the rescued in Aceh state that they were saved by people from the local community. Normally, after a day the regional or national governments take over the response from the local people. In all the countries hit by the tsunami, this was the case. However, in Indonesia it took several days longer. This was caused by three reasons (Cosgrave [1]): First, many local officers were killed by the tsunami. The tsunami also hit the local military very hard; especially the navy unit in Sumatra. Secondly, the tsunami also destroyed government properties, like offices, and transport infrastructure. It destroyed main roads near the coast as well as bridges in both Aceh and Sri Lanka. The main airport of Sumatra could also not be used because of flooding from the tsunami and most harbors were destroyed. For some isolated groups this meant that they had to wait for the first aid for about ten days. The last, when the tsunami struck the main roads it also tore apart the main telephone and internet cables. It also led to the malfunctioning of the mobile phone network because of the destroying of towers and power supplies.

These reasons made it hard for the officials to determine the size of the disaster which has happened. Other reasons for ineffective governmenttal acting were the reforms in the local and national government. The responsibilities were therefore unclear and this caused confusion between local, regional and national governments. After the first phase the international organizations arrived. These included international militaries, International Non-Governmental Organizations (INGO's) and the foreign Red Cross. These organizations were followed by the United Nations. All the organizations together provided a lot of relief help, but also made it hard to coordinate. All the help from donor countries also led to the fact that the responsibility and accountability shifted from the local and national governments and people in the affected area to the media and public from donor countries. This led to competition, duplication and waste of help. The communication between military parties was good, because the tasks and responsibilities of both national and international armies are well known. Between the other organizations, the UN, the Red Cross and other (I)NGO's the communication was poor (Cosgrave [1]).

Establishing *command and control* is an important step to rapidly organize logistics after a natural disaster. Past disasters taught that this is a major challenge and showed how this can be possibly organized. One of the most effective ways is to organize sudden responses through an *Incident Management System*. There are some complicating factors though, that makes it hard to establish a sudden temporary organization. The tsunami affected suddenly and simultaneously a wide range of villages on a length of thousands of miles. This made it very hard to reach all these villages and regions. Thereby there was the problem of multiple and confusing jurisdictions, because the impact zone is characterized by multiple authorities of many different types. Decisions on who is in charge and who reports to who is a continuing challenge for some time. The third factor is the political instability in some of the affected countries. On the short run this was not a big issue, because everybody was just doing what they could to save people from the affected area. But on the long term the political instability did play a role on determining who is in charge, who has what responsibilities and whose priorities would get the biggest attention (Leonard [7]).

The quality of the help was not very good. There was no clear assessment made of the kind of help people needed. Therefore, a lot of unneeded aid was send to the affected area instead of the aid people really needed. There were also problems with inappropriate clothes, food and medicine and expired food. The victims later stated that they felt 'over-assessed, but not consulted' (Cosgrave [1]).

Other Indonesian Disasters

In 2009 Padang, a city on the West coast of Sumatra, was struck by an earthquake with the magnitude of

7.6 on Richter's Scale which caused severe damage to buildings and infrastructures. People left the city being afraid for a similar tsunami as they suffered in 2004 (Taubenböck *et al.* [11]). This led to the situation that the little transportation infrastructure that still could be used was jammed up by people moving inland. Communication was also nearly impossible, because power and telephone lines were cut off. These two implications caused the national army and (inter)national humanitarian relief organizations being unable to enter the affected scene in the first few days.

Yogyakarta and its neighborhood villages suffered from an earthquake in may 2006. In this case the local community played an important role. After the disaster in Yogyakarta, the local community together with *Yayasan Emong Lansia* (YEL) Jakarta and YEL Yogyakarta (voluntary NGO's, normally focused on elderly people) immediately began a survey to assess what was really needed in the affected area (Sabdono [9]). They also started setting up first aid posts, so-called 'posko's' which where centralized posts distributing water, food, and tents and counting and helping the injured and casualties. YEL and local communities made long hours helping the injured and distributing food and water and every evening had a meeting about the next day. People from all over the county came to help the people in Yogyakarta and the villages around the city. National volunteers were also at the affected area to help out the local community in the posko's. Just after the national Red Cross arrived, the Norwegian Red Cross also came to the affected scene to help the national volunteers. Ambulances were driving around to pick up wounded people and bring them to the hospitals. In this case, the coordination and cooperation between organizations and the local community turned out to be effective and the disaster relief operation was more efficient than after the tsunami in 2004. This had two main reasons, the first being that the scale of the disaster was smaller and the accessibility of the area much higher. The second reason is that the local government was able to react a lot quicker (Leitmann [6])

Disaster Relief in Other Countries

In the past decade several major natural disasters happened at other locations in the World. Most recent Chili and Haiti suffered from earthquakes with major effects on the country. Unfortunately there was no reliable information about the relief operations available during the writing of this article. Therefore is focused on two other natural disasters: The 2005 hurricane Katrina in New Orleans, USA and the 1995 Earthquake in Kobe, Japan.

On the August 29th in 2005 Katrina hit the Gulf Coast, leading to major infrastructure damage, flooding, civil disorder, fires, toxic chemical dispersion, disease risk and thousands of people isolated for days without water, food or medical care (Litman [8]). Looking at the relief operation in New Orleans several problems could be identified. On the day the hurricane actually hit New Orleans volunteer agencies were already prepared to enter the area. Federal Emergency Management Agency (FEMA) director Michael D. Brown though requested to not enter the area without being dispatched, letting the fire workers do their job first. FEMA stated that they had 500 trucks of ice, 500 trucks of water and 350 trucks of MREs (meals ready to eat) to distribute within the area. However, it took the trucks days to enter the affected area, leaving 54,000 people waiting for aid (Yildrim [14]). Another problem occurred in the warning system. In the days before the actual disaster there were several warnings, including many *tornado warnings*. The problem with this type of warning is that people seek at finding shelter in the lower levels of the house. But in fact therefore they were vulnerable to the floods when levees broke (Smith [10])). Problems occurred as well during the evacuation of victims from the area. Before the actual storm began evacuation had been executed well. But just after the disaster problems occurred during evacuation. Main reason was that about 200,000 to 300,000 did not have access to reliable personal transportation, about 100,000 did not want to leave the area and there was a lack of outbound infrastructure capacity (Wolshon [15]). Another big problem was that they had enough buses, but no drivers wanting to stay behind with a hurricane of this category. A lot of people (about 26,000) sheltered in the Superdome, which was hardly reachable to provide enough food, water and medical treatment to the people (Yildrim, [14]).

Besides the problems mentioned above, there were also some things working well after the Katrina disaster. For example private supplier Wal-Mart, which operates daily in a competitive supply market, had 45 trucks of goods ready to deliver before landfall (Yildirm [14]). And that was not the only effort of Wal-Mart. With more than $18 million donated to aid emergency relief efforts and 2,450 truckloads of supplies dispatched to communities throughout the Gulf States. Wal-Mart set up a 16,000 square foot tent store which included six registers, a Connection Center for cell phones, a digital photo kiosk and a Tire Lube Express Center for tire repairs.

In Kobe, Japan occurred similar problems after a earthquake with a moment magnitude of 7.3 on Richter's scale. Several problems could be identified

here as well. Next to the problems with telecommunication and electricity another big problem was the lack of coordination among relevant organizations. Thereby the different (governmental) organizations, infrastructures and buildings were not well prepared to such a disaster. Another important problem was Japan's reluctance to help from abroad. This stemmed from three important sources. At first there was a strong sense of national pride that was the reason to reject help from abroad, especially from countries that were less developed than Japan. Second, the multi-layered Japanese bureaucratic decision-making process made it difficult to respond quickly to the immediate offers of aid from many countries around the world. Third, risk-averse Japanese bureaucrats resisted allowing medicines, relief personnel, dogs to locate survivors, and so forth into the country without first subjecting them to time-consuming procedures, such as the testing of drugs to account for Japanese "uniqueness," animal quarantine measures, and government licenses. Some of these requirements were later eased, but too late to make a significant difference to the victims (Fukushima [3]).

Some good working structures could be identified as well. It had for example been very important that a huge amount of volunteers (1.4 million) tried to help with the supply of food, water and medical aid to the affected area. Next to this voluntary aid, there were also some private parties that tried to help victims. For example Yakuza, that could rely on their nationwide network and clear lines of authority. They were able to transport most food, water and medical help to the Kobe area and distributed them to local residents with great efficiency (Fukushima [3]).

Disaster Management Tools

From the previous part it became clear that three main problems could be identified looking at the different relief operations after natural disasters:

1. *Coordination* of the relief operations was poor. Especially after the tsunami in 2004, many different organizations went to Sumatra to help the victims, but it was unclear who was in charge and what the responsibilities were of all the actors.
2. *Information* supply was not sufficient. It took a long time before the outside world knew about the size of the disaster. Later on, it was unclear which area needed which kind of relief. People finally got helped, but not the help they needed.
3. *Logistical* processes were hard to execute, given the fact that most infrastructures were damaged. Roads, rails, bridges, harbors and airports were severely damaged and unusable.

A disaster management model ideally should avoid these problems in the future. The main purpose of this new structural model is to develop strategies that can be used during relief operations. A disaster management model should contain several parts: organizational structure, information flows, logistics, preparation and evaluation. The organizational structure can be seen as the fundament facilitating all other processes; therefore it is the most important part of the model. Looking at the three problems identified before, the structure should make it possible to coordinate the relief operation, have clear and up-to-date information and facilitate logistical processes throughout the relief operation. In other words, it facilitates the other parts of the model. Preparation is needed for an effective and quick response, which until now often failed. In the last place an evaluation program should make it possible to learn from the past and to improve the operation.

Organizational Structure

The organizational structure for a disaster management model in Indonesia should look like the chart in Figure 1. There should be one central organization that is responsible for all coordinative tasks before and during a relief operation. This *Coordination Unit* is a new governmental organization combining knowledge and support from different governmental departments and ministries. For the purpose of relief operations it is very useful to form the coordination unit (CU) with specialists from the department of Transport, the department of Defense, the department of Health and the department of Communication and Informatics. The combination of skills and knowledge of their specialists should make it possible to react to the different situations. The coordination unit will function right below ministerial level.

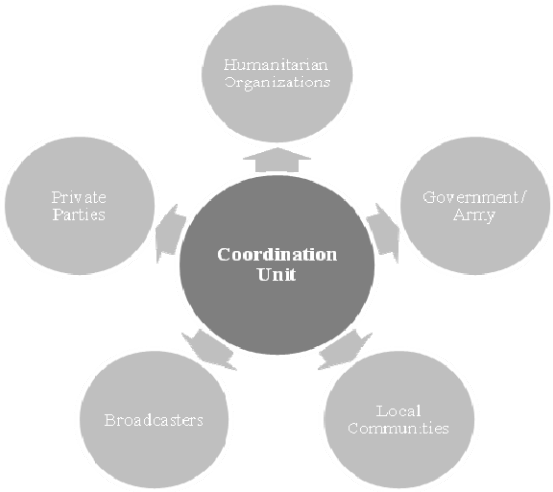

Figure 1. The organizational structure forms the fundament of all other operations

The CU coordinates different kinds of organizations. All these organizations should add value in their specialty to the relief operation as a whole. The main goal for the CU is to coordinate all these organizations in such a way that the operation's effectiveness and efficiency will be maximized. The relief operation during the first few days is essential for saving lives. It is impossible for them to do this job on their own. Therefore they should cooperate with several types of organizations.

The first group of actors is the local community. They are not only important to the CU for the first information about the impact, but are also essential for the first relief of their neighbors. Their exact role will be discussed later. For the actual relief operation humanitarian organizations like the Red Cross and United Nations are essential. They have the ability to mobilize qualified and well-trained people and get them quickly into the affected area. There they can cooperate with other organizations, volunteers and the local community for effective relief.

For the different logistical tasks it is very useful to use private parties. Their knowledge and experience with large logistical operations should be used to get logistical operations going quickly after the natural disaster. Because the public transport network in Indonesia is not of high quality, other organizations like travel agencies can be used for the evacuation of people. In different relief operations in other countries the logistical help of large supermarkets like *Wal-Mart* and *Yakuza* had been lifesavers (Yildrim [14]; Fukushima [3]).

Governmental organizations are partly represented in the coordination unit, but will also be external actors. They are used for their ability to mobilize money and the necessary people. Thereby the army will be part of this group of actors as well. Military force will be used for saving people from under collapsed buildings, to help humanitarian organizations with medical treatment and to assist in the evacuation of people.

Last group of actors in the organizational structure is formed by broadcasting organizations. Indonesian television and radio broadcasters are currently used to inform people about a natural disaster or to warn them when possible. In several case studies it appeared that broadcasters like BBC and CNN arrive most of the times as quickly as other organizations at the affected area (Tomasini and Wassenhove [12]). Therefore they can be very useful for the CU to gain information about the situation.

Humanitarian Supply Chain Management

Logistics for humanitarian relief is more than the transport of products from A to B. In the last decades it became more and more clear that a *supply chain management* (SCM) approach could add vital things to the logistical operations of humanitarian relief. SCM added global networks of design, procurement, manufacturing, distribution and sales to logistics management. An important input for logistics is for example information. Where the regular SCM uses the three B's: *Boxes, Bytes and Bucks*, the humanitarian SCM approach adds two B's: *Bodies and Brains*. The implication is that humanitarian logistical operations do not only need products (boxes), information (bytes) and money (bucks). More important are well trained and qualified people that can actually participate in the relief operation: Bodies and Brains (Tomasini and Wassenhove [12]).

To design a supply chain three design pillars should be used. These three pillars are included in Figure 2. Pillar 1 includes *process and product structures*. The conceptual design of processes and products has a large impact on supply chain performance potential. The second pillar contains the *organizational structure*. This is a very important pillar because the organization divides tasks and responsibilities. The organizational structure is not only important in preparation or during execution of the tasks, but can also be used to measure the performance of the different parties and organizations. The third pillar is technology. Especially information and communication technology (ICT) play an important role in humanitarian relief. Without correct and adequate information, efficient relief is not possible (Tomasini and Wassenhove [12]).

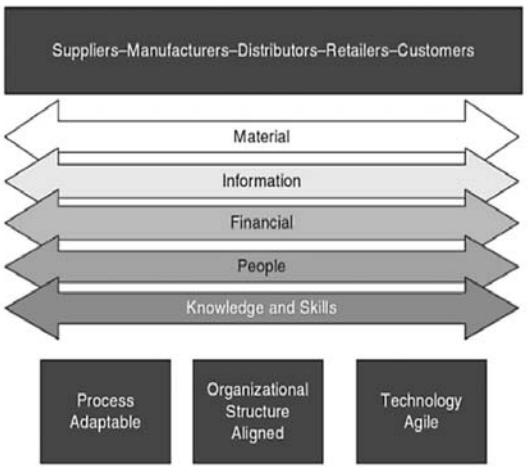

Figure 2. Humanitarian supply chain management (Tomasini and Wassenhove [12])

Information and Logistics

From previous disasters could be learned that having full information about the situation is a key factor for effective relief. Therefore the local community is an important organization in the structural design. Their ability to monitor the situation directly after a natural disaster is very helpful for a quick response. The local community in Indonesia can be split up in different levels. On the lowest level you have RT's, which consist of 80 to 100 families. Ten to twelve RT's together form a RW. A combination of five to ten RW's is called a Desa. Every RT, RW and Desa has a leader that will be the contact person for the coordination unit. In first instance information will go bottom up towards the coordination unit. This means that they will inform the CU about the situation and about what is needed for the first relief. Former problems were caused by damaged telephone and internet lines. These problems can be prevented by using satellite telephones. When the leaders of all RW's and Desa's have a satellite telephone, the can contact each other and the CU. Every RW should have a safe meeting point where the leaders (or substitute leaders) of RT's can come together and make an assessment of the situation. This information can then flow via Rw's and Desa's to the CU.

After a low impact disaster the CU will decide to give the full responsibility to the local community for the relief operation. Currently they do it on their own as well and the system works. When the impact of the natural disaster is higher, other organizations should be included as well, because in that case the local community will not be able to handle the situation on their own. Until the moment those organizations enter the area the local community can start with 'neighbor relief'.

The First 24 Hours; Quick Response

It should be a goal for the CU to enter the area by themselves within 12 hours after a natural disaster. Together with the first humanitarian relief organizations they can start to support the local community with helping people. Thereby they can monitor the situation by themselves. Therefore the CU should have different offices on different islands to make their quick presence possible.

In the mean time other organizations should be mobilized as well, depending on the impact of the disaster and needs of the specific area. Private parties for example can be used for their logistical network or possibility to help with evacuation operations. They will be needed within 24 hours after the natural disaster. The national army, police force, fire fighters and local practitioners will also be deployed to help in the affected region. The army is very important to help with the recovery of damaged infrastructure, like creating emergency bridges with pontoons. The decisions on the division of tasks and responsibilities will be made by the CU. They will make these decisions based on the information they gather and their own observations.

After 24 Hours; Actual Relief

After a quick response with a focus more or less on the most damaged areas and most harmed victims the second period of 24 hours should have a focus on the actual relief operation. All needed parties should be mobilized and well organized by now and able to enter the area with more people when needed. The actual relief can start and all victims can get supplied with water, food, medicines and, when needed, shelter. Qualified people will be available to provide medical care to harmed people. Travel agencies and the army cooperate on the evacuation of people when needed. The CU in the same time keeps monitoring the situation and adapts the relief plans according to their observations. They also keep in contact with the different organizations in the region and the broadcasters to gather as much information as possible. It is very important that they keep doing that to avoid problems with the supply of goods to the region, like happened in the past (Cosgrave [1]).

The Days After; Relief and Recovery

In the days after relief will not stop. The situation should be more stable by that time, which reduces the role of the CU. Most organizations can continue their work and at some place maybe already start with recovery operations. This is not part of the responsibilities of the CU. They do keep in touch with the active organizations in the region, which makes it possible to respond and support when needed.

Preparation

To make all these procedures and processes possible an accurate preparation is vital. Preparation is most efficient when five elements are well prepared: *Human Resources, Knowledge Management, Process Management, Resources and Community*, see Figure 3 (Wassen-hove [13]).

Human Resources, Process Management and Community are elaborated on in the previous part. People should be well trained and situations should be practiced a few times per year. Local community should be aware of their responsibilities and processes

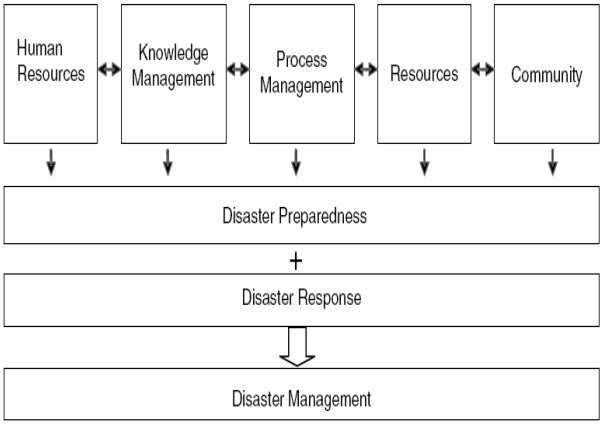

Figure 3. The five key elements for efficient disaster preparedness, which leads to effective disaster management (Wassenhove [13])

should be prepared (and practiced). Resources that should be prepared are not only food, water and medicines, but also money that is needed for a quick response. Often money is only collected *after* a natural disaster, but then it cannot be used anymore for the first relief, which is most vital in saving lives. Money should be available in advance to prepare for relief operations (Leeuw [5]). Knowledge management aims at learning from the past and to improve knowledge on logistical operations. After a relief operation or after practicing procedures with related organizations, evaluation should take place on what decisions were made and what exactly happened.

Evaluation

Where people work, mistakes will be made. The purpose of an evaluation program is *not* to see who is to blame when things went wrong, but to adapt strategies in such a way that similar problems can be avoided in the future. That is why this is a very important ingredient for having efficient and effective relief operations. Typical elements that should be evaluated are the communication between the different parties, the logistical operations, the quickness of response, the preparation of all parties for a natural disaster, and the use of people throughout the operation. Thereby there should also be looked at previous evaluations and whether or not changes that have been made after those evaluations had the aimed success. Practice sessions should also be input to take lessons for the actual relief operation.

Conclusion

This study aimed at disaster relief operations in Indonesia. From the problem definition it became clear that common problems in these operations are in the field of *organization, communication* and *logistical processes*. From the literature on other countries it became clear that cooperation with private parties can have a positive effect on relief operations, because of their knowledge, stocks and transportation facilities.

The model represented in this article deals with the main problems of disaster relief in Indonesia. In this model the Coordination Unit is the central actor which receives information from the other actors and based on this information sends them to the areas where they are needed most. The preparation of this organizational structure is vital for effective disaster relief operations. Quick establishment of a coordination unit is necessary for the implementation of this model as well as contracts with the other actors to agree on tasks and responsibilities.

This structure deals with the main problems on organizational, communicational and logistical level. However, one has to keep in mind that this is only a general model which has to be adjusted to the specific time, place and disaster. The evaluation of disaster relief operations is therefore of great importance. Based on that, the model can be adjusted to the dynamic environment.

Next research has to be done on the use of warning systems. Instead of fires, earthquakes and other unpredictable disasters, floods and tsunami's can be detected in advance. The UN is currently setting up a tsunami warning system in the Asia-Pacific area, but other detection systems are also in use in other parts of the world. Flooding warning systems are already commonly used in Holland and other European countries. The use of these detection systems in accordance with the model represented in this report can have a major advantage. The first advantage is the information supply which can work the other way around. When a disaster is detected in advance, the coordination unit should be informed. They can then contact the local community, so the information flows the other way around and ends at the RT's. They can directly start evacuating the area. The second advantage is for the disaster relief operation. When this is known in advance, different organizations can be mobilized up front and measures can be taken on beforehand, like the evacuation of people. More research is needed on the implementation and working of detection systems and the usage of these systems in combination with the results from this report.

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References

1. Cosgrave, J., *Synthesis Report*: *Extended Summary. Joint Evaluation of the International Response to the Indian Ocean Tsunami.* Tsunami Evaluation Coalition, London, 2006.
2. Dilley, M., Chen, R., Deichmann, U., Lerner-Lam, A, and Arnold, M., *Natural Disaster Hotspots: A Global Risk Analysis,* The World Bank, Washington, D.C., 2005.
3. Fukushima, G., The Great Hashin Earthquake. *JPRI Occasional Paper,* 2, 1995, retrieved from: http://www.jpri.org/publications/occasionalpapers/op2.html.
4. Kovacs, G., and Spens, K., Humanitarian Logistics in Disaster Relief Operations. *International Journal of Physical Distribution & Logistics Management*, 37(2), 2007, pp. 99-114.
5. Leeuw, S. de, "De uitdagingen van humanitaire logistiek." *Logistiek.nl*, the Netherlands, 2010.
6. Leitmann, J., Cities and Calamities: Learning from Post-Disaster Response in Indonesia. *Journal of Urban Health: Bulletin of the New York Academy of Medicine,* 84(1), 2007, pp. 144-153.
7. Leonard, H. B., *2004 Tsunami management challenges*, Harvard Business School, Boston, Massachusett, 2005.
8. Litman, T., *Lessons from Katrina and Rita. What major disasters can teach transportation planners,* Victoria Transport Policy Institute, Victoria, Canada, 2006.
9. Sabdono, E., *Final Report*–2006 *Java earthquake,* Yayasan Emong Lansia, Jakarta, 2006.
10. Smith, M., *Case study of hurricane Katrina,* Weatherdata, Wichita, Kansas, 2005.
11. Taubenböck, H., Goseberg, N., Setiadi, N., Lämmel, G., Moder, F., Oczipka, M., Klüpfel, H., Wahl, R., Schlurmann, T., Strunz, G., Birkmann, J., Nagel, K., Siegert, F., Lehmann, F., Dech, S., Gress, A., and Klein R. "Last-Mile" Preparation for a Potential Disaster–Interdisciplinary Approach Towards Tsunami Early Warning and an Evacuation Information System for the Coastal City of Padang, Indonesia. *Natural Hazards and Earth System Sciences,* 9, 2009, pp. 1509-1528.
12. Tomasini, R. and Wassenhove, L. van, *Humanitarian Logistics*, Palgrave Macmillan, Hampshire, New York, 2009.
13. Wassenhove, L. van, Humanitarian Aid Logistics: Supply Chain Management in High Gear. *Journal of the Operational Research Society,* 57, 2006, pp. 475-489.
14. Yildrim, M., Iqbal, Q. and Mehler, K., *Comparison of disaster logistics planning and execution for 2005 hurricane season,* Midwest Transportation Consortium, Ames, Iowa, 2007.
15. Wolshon, B., Planning for the Evacuation of New Orleans. *ITE Journal,* Institute of Transportation Engineers, 72(2), 2002, pp. 44-49.