

Agile Humanitarian Relief Supply Chain in Cyclone Prone Bangladesh: Problems and Proposal

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1. Title

Agile Humanitarian Relief Supply Chain in Cyclone Prone Bangladesh: Problems and Proposal

2. Abstract

Rising incidents of cyclone in Bangladesh is an increasing concern. People have to suffer a lot every year because the humanitarian relief supply chain has to overcome a number of hurdles that are time consuming and there is no guarantee that it will reach all the victims. This paper aims to investigate the possible reasons behind the failure of agile humanitarian relief supply chain and give a proposal as solution to improve it. The cause-effect diagram has been analyzed to show why the supply chain cannot function properly after the cyclone and where the main fault lies. To overcome the hindrance, a five-recruited based solution is proposed which will eventually remove lots of challenges if it can be implemented properly. But there are also pros and cons to this proposal which will be a question of success unless used in grassroots areas. Due to limited data collection opportunities during the 2019-20 pandemic, only theoretical solution is provided in this paper which calls for more calculative research in the future.

Keywords: Bangladesh, Cyclone, Humanitarian Relief Supply Chain, Cause-Effect Diagram, Five-Recruited Based Proposal.

3. Introduction

The relief and rehabilitation assistance provided by various authorities in the coastal areas of Bangladesh every year to deal with the damage caused by cyclones cannot reach the deserving people in time. There are some challenges behind it as well as solutions.

3.1. Bangladesh and its climate

Bangladesh is a country which is located on the Indian Subcontinent in South Asia. It is called

a riverine country and its geography consists of deltaic plains fed by huge network of mountains and rivers. Because of its location just south of the foothills of the Himalayas, it is very much succumb to natural disaster. Bangladesh has a subtropical monsoon climate characterized by wide seasonal variations in rainfall, high temperatures and humidity. Significant changes are taking place in the climate of Bangladesh due to various man-made and natural causes, as a result of which the number of natural disasters here is increasing day by day.

3.2. Natural disaster and Bangladesh

A natural disaster is a major adverse event resulting from natural processes of the earth; examples are flood, hurricanes, tornadoes, volcanic eruptions, earthquakes, tsunamis, storms and other geologic processes. So it is the effect of a natural hazard. Bangladesh, a country in southern Asia that is home to 180 million people with 1, 47, 570 square kilometer volume is widely known as a land of natural disasters. These disasters have become regular phenomena and have been causing suffering to millions of residents for many decades. In recent days, cyclone is most founded disaster in Bangladesh. It is especially vulnerable to cyclones because of its location at the triangular shaped head of the Bay of Bengal, the sea-level geography of its coastal area, plains and lowlands along with dense settlements and the lack of coastal protection systems. In Bangladesh, November and April-May are considered to be the most risky months for cyclones, table 1 has been showed that clearly.

3.3. The Aftermath of Natural Disaster

Normal life comes to a standstill due to the massive destruction caused by various disaster. The residents of coastal areas suffer the most. Loss of life and property (machined boat, fishing net, domestic animal, homestead, field crops), massive storms, rains and floods inundated vast areas, breaking the embankment are common phenomenon after these calamities. In most of the times, necessary precautions are not executed well. Among the recent storms (table 1), the

most damage was in Sidr and Aila. Cyclone Sidr which struck at a speed of 223 km/h, put the official death toll at 6,000. More than nine lakh houses were destroyed. Besides, about two and a half lakh cattle and poultry died. As such, Ayla's damage has been less than that of Sidr. 193 people lost their lives and three lakh people were displaced. Storms uprooted trees and washed away important roads and bypasses, leaving many stranded. Infrastructural damages, humanitarian crisis and so negative impacts are the final results of these disasters. Food and water is a must need of these distress people. But communication system falls apart due to blockade of roads by tress. Electricity poles are uprooted and fall on the road. The rescue and relief systems are also collapsed due to lack of manpower, skills, proper management. As a result, the supply chain system cannot work properly as humanitarian supply chain is quite different from normal supply chain. It is a very cruel fact that when the wounds of one cyclone do not dry up, another cyclone comes and no lasting development is possible. Once a cyclone hits a place, the place is literally devastated and the victims there are in dire need of food and water.

Name of the biggest cyclone in Bangladesh	Year
Sidr	10 November, 2007
Aila	25 May, 2009
Mahasen	14 May, 2013
Roanu	21 May, 2016
Mora	30 May, 2018
Amphan	21 May, 2020

Table 1: Cyclones that took place in the last 20 years

3.4. Humanitarian Relief Supply Chain

In the event of a disaster, known-unknown agencies, volunteers come forward to rescue the helpless. Simply put, this is the humanitarian relief supply chain. Its configured network is very unstable as demand remains uncertain with timing and quantities. For insufficient data, it is difficult to predict demand here (Day et al., 2012). Moreover, instability with time, need very quick assessment and knowledge, as not to follow standard technique, it becomes more

challenging. The supply mostly mismatch with demand as no guarantee of supplier and supply in humanitarian relief supply chain where it is a very rare occurrence in the case of commercial supply chain (Manopiniwes & Irohara, 2014). In cyclone-hit Bangladesh, such relief initiatives are seen every year at the government and private levels. But the right person is deprived of its benefits at the right time as there are different kinds of challenges. Relief related problems have been randomly described in various research papers which are easy to read when shown in a systematic way with a diagram. That is why in this research paper, these problems will be identified in the perspective of Bangladesh with cause-effect diagram.

3.5. Cause-Effect Diagram

Cause-effect diagram evaluates causes, sub causes of a specific problem and consequently detect all the signs of that problem (Kanti Bose, 2012). It is also known as ‘Ishikawa Diagram’ because it was invented by Mr. Kaoru Ishikawa, a Japanese quality guru. Usually this diagram looks like a fish skeleton. For that structural appearance, it is also called fishbone diagram. Usually the main problem is kept at the head of fish, causes are shown at the bones and sub-causes are shown by the smaller bones. In this research work, the problems related to the provision of relief from the perspective of Bangladesh will be constructively shown through the cause-effect diagram by dividing them into causes and sub causes. And here not only the problems will be focused, but also the solution will be shown in detail which is missing in many research works.

3.6. Objectives

- I) To find the causes, sub causes and effect behind the failure of agile humanitarian relief supply chain through cause-effect diagram.
- II) To analyze these causes through description.
- III) To eradicate the effect of cause-effect diagram, a solution is proposed.

IV) To analyze the limitations of the proposed solution through description.

4. Literature Review

The importance of the humanitarian supply chain in disaster-stricken Bangladesh cannot be overstated. In order to help the people affected by the disaster, the government of Bangladesh has been seen operating two types of supply chains (Shareef et al., 2019). The first is to help people in an area regularly throughout the year in the event of a disaster (humanitarian) and the second is to help in the event of any disaster (emergency). Due to its geographical location, people in coastal areas are especially affected by storm, floods and tidal surges. These landless people borrow boats, fishing nets from someone. To repay the loan, they have to go to work every day on their stomachs. Even if the disaster preparedness message reaches them, it takes them a long time to understand what it really means (Howell, 2003). They have shelters in times of disaster which are inadequate compared to the large population of coastal areas. The people there do not want to leave their homes and go to the shelter, but when they decide to go again, it is so late that the road to their shelter is already flooded and creates a difficult environment for them. It is seen that on the way to the shelter, many people are blown away by the storm and die. Moreover, swimming in water infested with snakes is a hassle for men and women, especially for women with long hair and wearing Saree (traditional Bangladeshi dress for woman) (Howell, 2003). At the same time, crowded and unhygienic shelters, especially for women, make them feel uncomfortable for a variety of reasons such as being pregnant or menstruating. In perspective of Bangladesh, government as well as local governments, local people have a role to play in conducting relief and rehabilitation activities to help these severely stranded people. The Upazila Chairman and Upazila Executive Officer are at the core of this activities, the chairman of the Union Parishad is in the role of local coordinator and for each ward of the union (a union is divided into nine wards and each ward again consists of one or more villages), the ward member in charge works as the coordinator (Masud-All-Kamal &

Monirul Hassan, 2018). Not only government agencies but also military units, coast guard, private aid organization, nonprofit organization, for-profit companies/commercial organizations and private individuals may be directly or indirectly involved in this supply chain. In addition, help comes from different countries to cooperate with the government of the country concerned in the form of money, water, water purification tablet, food, sanitation equipment, mask, face shield, medicine, medical teams, personal protection materials (like sanitary napkin for women), shelter and engineers (Day et al., 2012). From (Oloruntoba & Gray, 2006) a common sequence of humanitarian supply chain is found, shown that in figure 1. The key players in the humanitarian supply chain can be seen here.



Figure 1: A typical humanitarian relief supply chain

From (Masud-All-Kamal & Monirul Hassan, 2018), come to know that the above-mentioned relief committee of Bangladesh, initially carry out its duties properly. After a few days, the committee becomes embroiled in nepotism and corruption so that those people who are close to the local politicians can easily get relief and those who deserve it can be deprived. A local representative of the Union Parishad admitted that if he takes care of his relatives and party members now, they will take care of him in the future as well. This paper which was conducted in the incident of hurricane Ayla, local governments and NGO professionals had acknowledged

that government donations were higher than those of NGOs. According to an NGO staff, 40% of the amount of foreign aid that Aila later entered the disaster area, if it used plan wise, the development of the area would be noticeable. Some were getting help from 3/4 agencies for unequal distribution, others were not getting anything. So it is understandable how effective synchronization or collaboration between these key players (figure 1) can play a role in the success of relief activities. This is difficult to do because there are so many stakeholders, they want to be associated here with different types of interests (Howell, 2003). Again no international agency or organization can play a role anywhere without the permission of the local government or even if it can, security issues (personal security) remain. In 2008, when cyclone Nargis struck in Myanmar, the military of that country did not allow to enter some organizations with aid (Day et al., 2012). Ships of France and the United States including supply aid, waited at offshore for about two weeks before the final departure. This means that not only the resources but also the co-ordination of all concerned is important. Again it is important to understand the origins, geography, culture, political nature of the people in the place where the relief will be distributed. In a word, need to have a good idea about local knowledge (Oloruntoba & Gray, 2006). A case study named 'The South African food crisis in 2002' (Van Wassenhove, 2006) where stated, the African nation of Malawi, Lesotho and Zimbabwe were faced with the worst crop failure in February-April, 2002. In collaboration with the WFP (World Food Programme), genetically modified food was sent from the United States which people there did not want to receive. Because the economics of African countries are much rely on non-genetically modified food and they were terrified of contamination. On the other hand, the United States argued that in Africa which was prone to HIV virus, the extra vitamins and minerals in genetically modified foods would boost the immune system. As a result, WFP fell into great dilemma. WFP later managed to change the plan, but it cost a lot of time and money. In addition, relief efforts will also be hampered if communication and

transportation systems in the affected areas are disrupted (power & telecommunications go down, roads blocked, flights canceled due to inclement weather, ports are closed, workers can't go to work) as happened during the conduct of relief operations in the Indian Ocean (Van Wassenhove, 2006). In this type of area, it is difficult to travel in normal times due to inadequate infrastructure and when thousands of kilometers of area are affected by a disaster, the whole communication system is disrupted. Moreover, the tires of ordinary cars on muddy roads become ineffective due to prolonged rains. Now, in the age of advanced telecommunications, warning signals are already available, but when the network, internet, electricity are cut off, the people of that area cannot contact outside, outsiders cannot communicate with them (Van Wassenhove, 2006). In other words, it takes various problems to get supply aid from outside. Once relief reach the disaster area, those should be kept in a dry place and dry place is a big problem in the aftermath of the disaster. Most important angle, at preparedness stage (before disaster) is that to select the right location of various facilities (permanent and temporary) and infrastructures like central warehouse for relief goods, local warehouses, shelters for people and domestic animal, mobile hospital (Manopiniwes & Irohara, 2014). From the above discussion, some common features of humanitarian supply chain are going to be inferred like extreme level of uncertainty about disaster time and location, poor communications, victims' demand, donors' roles, presence of unexpected players/responders, relief groups' co-ordination and after disaster, insufficient data creates severe situations. For this reason, unique management styles are often appointed and these traits make research on HDRSC (Humanitarian Disaster & Relief Supply Chain) very attractive (Day et al., 2012). As well as in a disaster-prone area, disaster is not the only problem as described above in Africa in 2002, during the famine, HIV situation make the crisis complex. These characteristics of the humanitarian supply chain again create similarities or differences with the business/commercial supply chain. In terms of similarities, the plan, budget, design, purchase,

inventory, warehouse, transportation, distribution and above all the satisfaction of the recipient have to be kept in mind as in general logistics (basics to set up a structured supply chain which can be reduced costs and lead time in order to right person get the right goods at the right place at the right time) (Van Wassenhove, 2006). In the same paper, it has been said that the first 72 hours are considered the most crucial for this work (to attain speed is difficult for various reasons). At this stage, arrangements need to be made so that relief goods can arrive from abroad in less time, although this is an expensive option. People can be helped by buying goods at a reasonable price from the local market without relying too much on outside relief. The wisest thing to do is to coordinate between this two. In addition, five key elements for effective disaster management is also said. They are human resources, knowledge management, process management, resources and community. These five elements will be linked to disaster preparedness and disaster response where the combination of these two can lead to effective disaster management. A clear idea about major activities for disaster operations management is shown in table 2 which is adopted from (Altay & Green, 2006), (Manopiniwes & Irohara, 2014) & (Masud-All-Kamal & Monirul Hassan, 2018) where activities are divided into four major categories: mitigation, response, preparedness, recovery. There are one common similarities between these activities and the transient supply chain event (once the event is closed, the supply chain is dispersed. In consequent, the whole management has to engage in every supply chain stages like preplan, budget, schedule design, invitation, sponsorship, ramp-up, steady state, transformation in a relatively short time as is heart challenges of humanitarian relief supply chain activities) like the World cup, the Olympics, the World Series, the Super Bowl, the construction of large project such as a bridge, metro rail, tunnel (Day et al., 2012). In addition to these similarities, the discrepancy between the humanitarian supply chain and the commercial supply chain is shown in Table 3 which is adopted from (Manopiniwes & Irohara, 2014). These differences have created a learning space so that the American Red Cross

(a humanitarian organization that provides emergency assistance, disaster relief and disaster preparedness education in the United States) can learn from Walmart (American multinational

Mitigation	Response
▪ Identify high risk areas and establish proper land-use plan. ▪ Improve communication and transportation systems so that people can go to the shelters easily and the relief can reach quickly. ▪ Use advanced warning system, so that people can get the right idea about the danger signal. ▪ Undertake extensive tree planting and animal husbandry programs in disaster prone areas. ▪ Provide training, awareness programme to the disaster affected people through public and private initiatives. ▪ Take infrastructure rehabilitation activities in compliance with building codes.	▪ Activate emergency operations plan. ▪ Activate emergency operations center. ▪ Open shelters for people and domestic animal (cattle, buffalo, goat, sheep, hen, duck, cat, dog). ▪ Arrange separate accommodation and toilets for men and women in the shelters. ▪ Do emergency rescue and give medical care. ▪ Provide emergency infrastructure protection such as roof of the house tied with something hard. ▪ Recover lifeline services such as bringing back the power connection. ▪ Establish fatality management.
Preparedness	Recovery
▪ Recruit personnel and train him/her for emergency services. ▪ Conduct disaster exercise to train personnel and test capabilities. ▪ Prepare community volunteer groups. ▪ Do emergency logistical plan. ▪ Make budget. ▪ Construct an emergency operation center. ▪ Construct central and regional warehouse centers. ▪ Keep useful vehicles (boat, rickshaw, van) to rescue people, animals and equipment (hand mike, flag, tents, plastic sheets, stoves, coal, kerosene, dry cloth for man, woman and children) ready. ▪ Stockpile and maintain emergency Supply. ▪ Give proper security to the emergency supplies and equipment.	▪ Rebury displaced human and animal remains. ▪ Give psychological support. ▪ Provide sustain mass care for displaced people. ▪ Give veterinary care of sick animals and birds. ▪ Clean disaster debris as fast as possible. ▪ Rebuild roads, bridges, embankment and key facilities. ▪ Restore lifeline services. ▪ Provide financial assistance to individuals and governments. ▪ Provide training on sewing operation, rain water harvest to the adverse people.

Table 2: Major activities of disaster operations management

retail corporation that operates a chain of hypermarkets, discount department stores and grocery stores) and Walmart can learn from the American Red Cross (Day et al., 2012). So it is understandable how much interesting research work can be done on the humanitarian relief supply chain. Many papers have been complicated by the terms HDR (Humanitarian & Disaster Relief) logistics, HDRSC (Humanitarian & Disaster Relief Supply Chain), HDRSCM (Humanitarian & Disaster Relief Supply Chain Management) etc. It would be foolish to follow

Characteristic	Commercial Supply Chain	Humanitarian Supply Chain
Parties involved	▪ Good link with everyone ▪ Long term relationship	▪ Unknown and voluntary ▪ Generally make instant relationship during the relief operation
Network configuration	▪ Relatively stable	▪ Unstable and many suppliers and volunteer groups with different interests are involved once during the relief operation
Demand	▪ Generally stable ▪ To forecast the level of demand, past data are used ▪ Customer has high level of control over supplies ▪ Standard technique available	▪ Unpredictable ▪ Need quick knowledge to take decision ▪ End user has little control over supplies ▪ No standard technique available
Supply	▪ Predetermined suppliers ▪ Push and pull supply chain ▪ The level of supply activities reflect the level of demand ▪ Oversee performance	▪ Known, unknown donor ▪ Only push supply chain ▪ Shortage most often seen ▪ Some work here out of humanitarian responsibility or some for selfish personal profits. No direct provision is done.
Determinant	▪ Profit and loss	▪ Life and death

Table 3: Dissimilarities between commercial supply chain and humanitarian supply chain

the same strategy for all disasters, in all countries, in all areas despite having common features. In the methodology section of this paper, various problems related to relief in Bangladesh will

be shown with cause effect diagram and possible problems will be eradicated by a proposed solution. In order to avoid variation, this paper will focus on the issue of humanitarian relief supply chain and highlights the cyclones that occur every year in the face of many disasters from Bangladesh.

5. Methodology

Methodology section is divided into two parts. The first part is to construct a cause-effect diagram to explain the problems and the second part is to show the proposed solution. Steps for constructing cause-effect diagram (figure 2), adopted from (E. Ilori et al., 2020)-

- I) Failure of agile HRSC (Humanitarian Relief Supply Chain) (effect) is written in a box on the right hand side (fish head).
- II) A horizontal line (spine) is drawn to the left of that effect.
- III) Four diagonal lines are drawn above and below (these are fish bones) of the horizontal line.
- IV) The causes are divided into four categories (rectangular box) and the diagonals are labeled by those.
- V) The categories are named respectively supplier, surrounding, skill, system.
- VI) List of causes for each category is generated (the small line attached to the diagonal).
- VII) The causes are divided into sub-causes according to need (sub causes are marked with small lines to understand the relationship with cause).

Description of each category of this cause-effect diagram is given below:

Supplier

The government of Bangladesh provides a good amount of relief to the victims in the aftermath

of the disaster. People extend their helping hand from the government as well as various non-governmental organizations (NGO, privet company, foreign aid), but there is no proper guarantee in this regard.

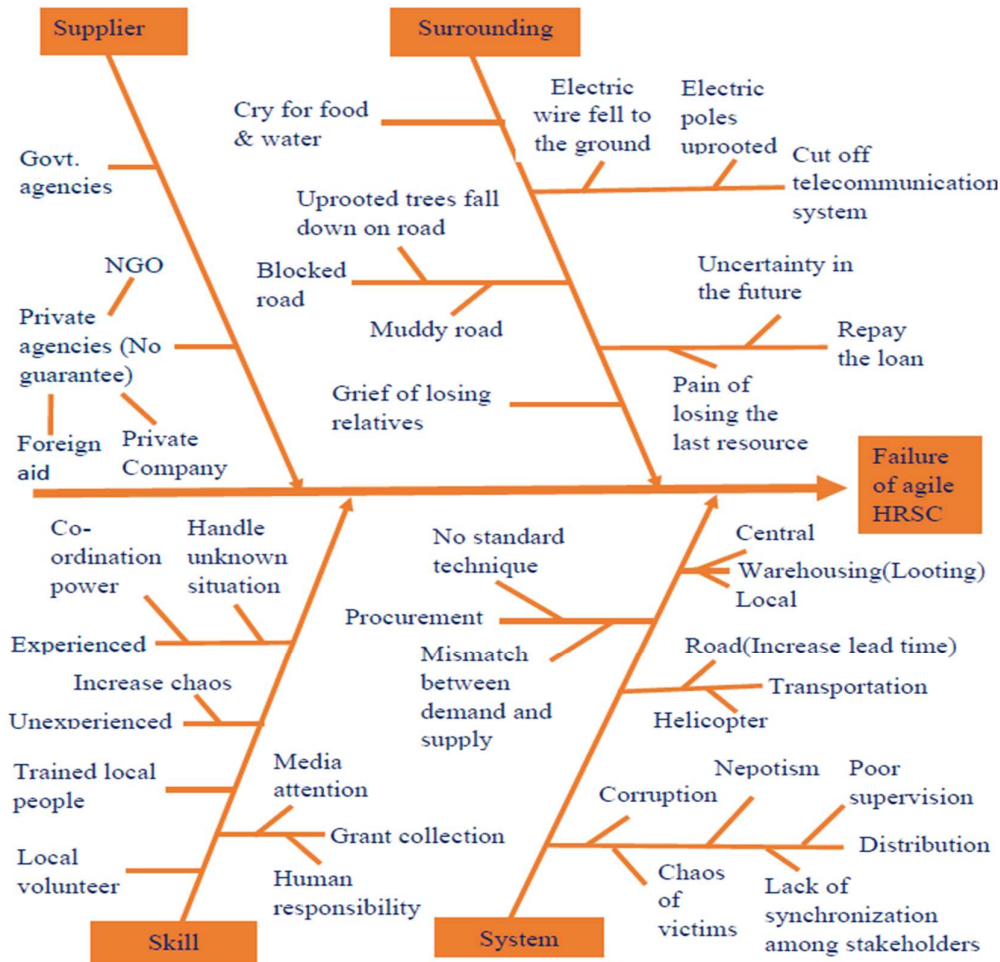


Figure 2: Cause-effect diagram for causes of failure of agile HRSC in the cyclone affected areas of Bangladesh

Surrounding

In this part, the post-disaster picture is presented. In strong winds, the electric poles are uprooted, electric cable just falls on the road and the telecommunication system goes down. Trees are uprooted and fallen on the road. Again the roads are muddy due to heavy rains which

make the roads impassable. All around food, water cries, grief of losing relatives and property, worries about the future because the debt has not been repaid.

System

This section shows how to reach relief in the same way as a normal supply chain and the problems associated with it. First of all, it is a matter of procurement where supply cannot fulfill demand because demand is not forecasted by following any standard technique. Relief goods need to be transported after procurement. This can be done in two ways, by helicopter and by road where lead time is increased by road transport. Then the relief is to keep in two types of warehouses, central and local. Lack of security can lead to loot from these two types of warehouses. Then comes the time to distribute relief. Severe fights are seen among the affected people at this time because the relief comes less in proportion to the people for mismanagement (lots of stakeholders are involved, but there is less synchronization between them). In addition, due to lack of adequate supervision, the opportunity for nepotism and corruption, relief cannot reach the hands of deserving people.

Skill

This section raises the issue of the skills of the people involved in the relief activities who can be divided into experienced and unexperienced. Experienced people know how to coordinate and handle unknown situations. On the other hand, unexperienced people can only create chaos by increasing the crowd. But whatever the experienced and unexperienced, the common purpose is to collect grants. In this case, the purpose of some people is to collect more grants by seeking media attention, but some people want to collect grants from the urging of humanity. The rest are local volunteers and local trained people. These people have become accustomed to fight the cyclones that have been raging for years which has made them experienced day after day.

In the second part of this section, a solution is proposed to solve the effect (failure of agile HRSC) associated with the causes and sub-causes found from the cause-effect diagram above. According to this proposal, for any particular area, five people from different professions (a teacher, a media person, a very experienced organizer/volunteer from native volunteer organization, a fire officer, a representative from foreign aid organization like UNICEF, USAID, UNHCR, UNDP, IFRC) will have to be recruited with utmost confidentiality who will be able to perform various duties in the pre-disaster, during-disaster and post-disaster seasons as well as in their own profession with competence and honesty. These people should be allowed to work in cyclone-hit areas (as 15 areas, if 5 people are taken, a total of 75 people need to be recruited) of Bangladesh with full independence who will be recruited from the Ministry of Relief and Disaster Management and from there they will be given necessary guidance, training and protection. Most importantly, these five recruits will carry out these additional responsibilities not only at a specific time, but throughout the year in addition to their respective professions. The fundamental responsibilities of these five people shown in figure 3 are described below-

Team formation

The recruits will be able to work with as many people as they need, depending on the needs of the area where they will be working. The number of team members will be given priority in determining the size of the area, the total population or the total number of households etc. However, the qualifications of team members of fire officers, media persons and representatives of foreign organizations should be more specific than others. For example, team members of fire officers must have the technical knowledge and ability to do heavy work. The team members of media persons should be closely associated with different parts of the media. Again it is good for the team members of representatives of foreign organizations to have knowledge about foreign aid policy.

Provide training

Conduct regular training activities based on the type of work so that confidence grows in each member of the team and they can work according to the situation.

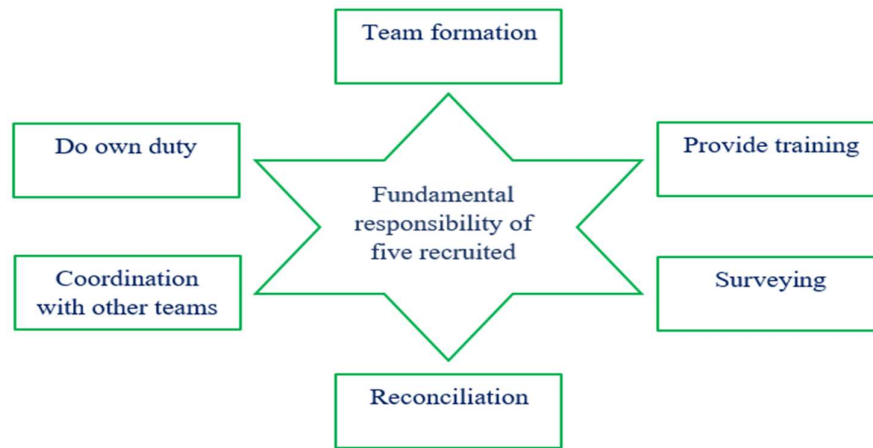


Figure 3: Fundamental responsibility of five recruited from different professions

Surveying

To facilitate their own work, they may need to conduct a variety of surveys on a regular basis through face-to-face interviews, visits to relevant sites or collect information from various websites or magazines.

Reconciliation

This can be done in different ways such as achieving different goals through the collective work of each team as soon as the cyclone is detected. This can also be done by organizing regular trainings or meetings with the active members of the team. In addition to conduct different surveys, everyone in the team should play different roles together. The people in the team will have to reconcile at different times in this way.

Coordination with other team

For the convenience of their own work, each team should work in coordination with the other team. This strengthens communication between the five teams and eliminates the possibility of making mistakes or any kind of chaos. Figure 4 shows the mutual networking of five teams through an interrelationship model, adopted from (Cozzolino, 2010).

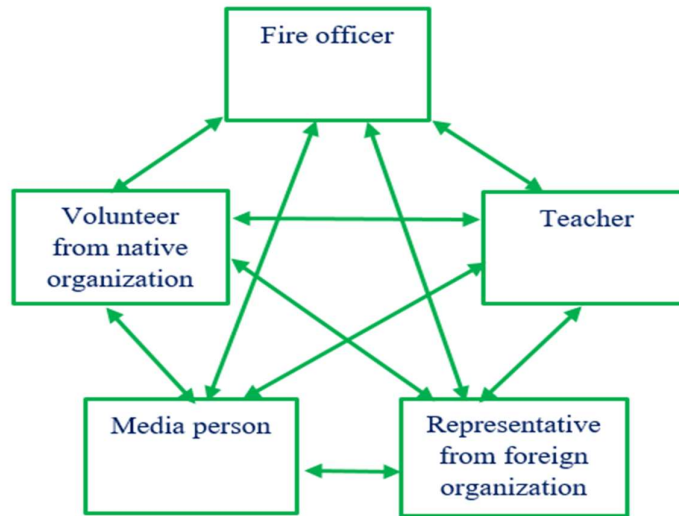


Figure 4: Interrelationship model

Do own duty

Here the self-responsibilities of five recruits are being presented one by one-

Responsibility of volunteer & his/her own team:

- Provide year-round training to poor people in the area such as sewing operations, rain water harvesting etc.
- Inform people about the benefits of tree planting.
- Inform the new generation about what to do before, during and after a disaster as adults are accustomed to seeing the horrors of storms but young people are less experienced (Howell, 2003).

- Go to people's homes at least a week before the disaster (the forecast is given by the Meteorological Department and is widely publicized) and chase them so that people have enough time to stockpile food, water, make sure that the roof of the house does not fly away and prepare to go to the shelter.
- Make sure everyone goes to the shelter.
- Provide mental strength to the people after the cyclone.
- Bury the dead quickly.

Responsibility of fire officer & his own team:

- Prepare to remove trees and electric poles which are uprooted on the roads causing severe inconvenience to people and vehicles. With this problem in mind, the necessary paperwork, equipment and manpower should be kept ready so that time is not wasted in removing them.
- Arrange for speedy restart of telecommunication system rather than taking action after people complain.

Responsibility of media person & his/her own team:

- Accomplish the long procedure of getting the necessary relief products as soon as the cyclone is forecasted so that the minimum time after the disaster is not wasted. If the formalities for taking relief after a cyclone start, it will naturally be too late to get relief funds and relief products as it takes a long process and at the same time maintain time bound written formalities.
- Broadcast the amount of relief in print and electronic media with the necessary documents to ensure transparency and accountability.
- Send the relief safely in cyclone affected areas within a short period of time along with the required documents.

- Broadcast every step of the relief activities so that any mishap can be noticed. This will definitely reduce the chances of nepotism and corruption as the media person and his/her team have all kinds of records.

Responsibility of teacher & his/her own team:

- Fix embankment so that the tidal water does not enter the locality as every year the embankment is damaged due to storms, floods and tidal surges.
- Take initiatives to repair small bamboo bridges that are easy to cross, latrine and tube well.
- Make the cyclone shelters suitable for people and cattle a week before the cyclone.
- Arrange separate toilets and accommodation for men and women in the shelter.
- Receive relief from the team of media person with following necessary procedures and documents.
- Increase surveillance of places where relief products will be kept (warehouse) safe so that insects do not enter or be damaged in any way.
- Strengthen security to prevent theft from those warehouses.
- Determine the right place to distribute relief.
- Provide relief tokens to the victims so that the victims can get relief in an orderly manner.
- Distribute relief to the victims according to the token.
- Strive to provide job opportunities to the poorest in the year-long rehabilitation programme like construction of cyclone center, embankment construction project, bridge repair etc. In this case, he/she and his/her team will consider everything from above corruption and nepotism.

Responsibility of representative of foreign organization & his/her own team:

- Act as a bridge between the concerned authority and the concerned area.
- Highlight the advantages and disadvantages of the area through intensive diplomacy so that the area is benefited and at the same time keep an eye on the assets invested by the authorities. With clear accountability, outside agencies will be encouraged to help in times of future danger.
- Observe, record video and report the entire relief distribution activity.
- Calculate how much relief may be required after the relief provided by the government.
- Inform the calculation to the concerned authorities.

6. Findings and Discussion

Analysis of the cause-effect diagram (figure 2) shows that a total of five sub causes have been shown for the distribution cause under the cause category called system, so many sub causes are nowhere to be seen. So distribution will be the root cause of this cause-effect diagram due to the highest sub causes. Again some of the causes are natural (uprooting trees) so that the human hand is limited and some of the causes are man-made (corruption, nepotism) which man can solve at will. Another thing is that the relationship between the causes cannot be shown by this diagram as the relationship between supplier and surrounding, that concept is found from (Kanti Bose, 2012). And as stated in second part of the methodology, the proposed solution will be successful when those five people of different professions and their own team have the opportunity to work independently in an area. In the context of Bangladesh, it is almost impossible to work by bypassing the local dishonest administration. In addition, those who have been recruited as appropriate may fall into the clutches of local and dishonest influencers in the pursuit of their own lives and the lives of their family members. Moreover, it is a voluntary work where humanitarian service is the last word and in return the recruits get

nothing but complacency. So this proposal will fail also if the right person is not recruited in any way and the recruits are not given enough time to work. The probability of success of this proposal will increase only when every person concerned will give priority to the larger interest over the selfishness. Again the issue of success cannot be understood without practical implementation. The concerned authorities may take steps to implement this proposal in any one area, if they wish. If this proposal is successful then apply it in other areas also. Otherwise accept the good aspects of this proposal, find out the disadvantages, then modify and apply it again.

7. Conclusion and Future Research

The history of cyclones in Bangladesh is very old and every year such a loss project has to accept huge expenses to compensate. To solve this unavoidable problem, a solution is proposed with the detailed procedure keeping all the possible factors and sustainability in mind. However, in order to examine the variables of this solution and to overcome its various disadvantages, it is necessary to apply it on a small scale to understand how much it benefits to the grassroots people. In addition, this proposal can be implemented in bigger networks to fulfil the demand without spoiling the relief goods and reach them at the exact time to the victims, if the negative aspects of the proposal can be overcome. Due to the pandemic situation of 2019-20, through face-to-face interviews with aid agencies and affected people by the cyclone, it was difficult to conduct this research work by gathering the necessary information from them, so only theoretical solutions have been offered here which could create scope for more calculative work in the future.

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