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Management of Water and Sanitation Sector in Gaza Strip in Emergencies

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(162, 163) -

Dedication

To my Lovely Mother

To my Beloved Husband

To my Lovely Twins Amr and Hala

To My Sister and my Brother

Eman Aqeel

Acknowledgment:

I am so grateful for the help given to me by my advisor, Pro. Dr. Yousif Ashour where his knowledge, guidance and advice were vital for the accomplishment of this thesis.

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Researcher: Eman Aqeel

Management of Water and Sanitation Sector in Gaza Strip in Emergencies

Abstract:

The aim of this thesis is to study the management of the water and sanitation sector in Gaza Strip in emergencies, where Gaza Strip and especially the water and sanitation sector are living very complicated circumstances in the past three years; these difficult circumstances put the sector in emergency.

The thesis provided detailed analysis of the current sector problems, where the closures are the main problem. Also presented two real case studies to describe the management of the sector in emergencies as examples, one of them is the management of the sector after the Israeli Offensive operation on Gaza started on 27 December, 2008 and lasted for 22 days and the other is related to Um AlNasser emergency in 27 March, 2007.

The research applied the descriptive analytical methodology. Data for the situation of the sector and its problems in Gaza is gathered from interviews and reports, and a questionnaire was developed to assess the management of the sector in emergencies by covering the four phases of emergency management which are mitigation phase, preparedness phase, response phase and recovery phase.

The questionnaire was distributed to the organizations working in the sector to be filled in by the responsible people in water and sanitation field.

It was found the results were positive and the management of the sector in emergencies is good, where the concerned people try to cope with these difficult circumstances by considering the mitigation actions, conducting the coordination meetings, responding quickly, having the plan and the emergency team.

And the thesis recommended the getting of the benefit from experts experience and developing new plans espial for Gaza circumstances, training should be given to the emergency team, more focusing on the media should be considered, the water and sanitation sector should be avoided from political division, keeping the good relations with partners is very important, and having an emergency center is necessary.

إدارة قطاع المياه والصرف الصحي في قطاع غزة في حالات الطوارئ

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Glossary of Terms:

ACF	Action Contre la Faim
CAP	Consolidated appeal process
CARE	Cooperative for Assistance and Relief Everywhere
CHF	Cooperative Housing Foundation
Cl	Chlorine
CMWU	Coastal Municipalities Water Utility
ECHO	European Community Humanitarian Aid Department
ERW	explosive remnants of war
EU	European Union
FEMA	The Federal Emergency Management Agency
GEWP	Gaza emergency water project
ICRC	International cross red committee
IDP	internally displaced persons
Infran	International operator for CMWU
ISDR	International Strategy for Disaster Reduction
IWE	Institute of water and environment
GVC	Gruppo Volontariato Civile (Italian organization)
Km	Kilometer
m³	Cubic meter
NIS	New Israeli Shekel
NGEST	North Gaza Emergency Sewage Treatment
NGO	Non-Governmental Organization
NO₃	Nitrate
OCHA	Office for the Coordination of Humanitarian Affairs
PE	Poly ethylene pipes
P.S	Pumping Station
PHG	Palestine Hydrology Group
PNA	Palestinian National Authority
ppm	Parts per million
PWA	Palestinian Water Authority

RO plants	Reverse Osmosis desalination plants
SEMP	Suburban emergency management project
TECC	Technical Engineering Consulting Company
UN	United nations
UNDP	United Nations Development Programme
UNICEF	United nations children fund
UNWRA	United Nations Works & Relief Agency
USAID	United States Agency for International Development
WASH	Water, sanitation and hygiene
WB	World Bank
WHO	World Health Organization
WWTP	Wastewater treatment plant

CHAPTER 1

GENERAL INTRODUCTION

- 1.1 Background
- 1.2 Problem of Research
- 1.3 Research variables
- 1.4 Research hypotheses
- 1.5 Research Objectives
- 1.6 Research Methodology
- 1.7 Research importance
- 1.8 Research Structure
- 1.9 Previous Studies

1.1 Background:

1.1.2 General Situation in Gaza:

The recent period in Gaza has witnessed significant political and environmental changes that have impacted the delivery of basic water supply services in most areas of the Gaza Strip. The situation of Gaza after the Israeli disengagement plan was completed in Sept 2005 has not really solved the problem of closures and blockages experienced by Gaza since years. All entrances to the Strip are controlled by the Israeli forces, including the control on import and export points on the borders (**UNICEF, 2006**).

Basic life indicators in most areas of Gaza are affected by the spread of the economic crisis and the problem of unpaid salaries or irregularity in paying them, including access to safe drinking water supplies and operation of basic water and wastewater facilities such as drinking water wells, wastewater, storm water and sanitary landfill installations. The effect of the crisis on water and sanitation services in Gaza Strip could be seen as two folds:

First the direct impact of destruction on water and wastewater facilities, especially in bordering areas such as Beit Hanun, Beit Lahia and Rafah. Direct damages on power installation (thermal plant of Gaza, June 2006) have also impacted the operation of essential water production, pumping stations and treatment system. Most direct damages occurred on secondary water or wastewater networks, often through pipe bursts due to direct shelling or passage of heavy military vehicles.

Second, indirect impacts on the sector: closures and restriction of imports of essential consumables (diesel, chlorine, spare parts) and water network repair material have also hindered the operation and efficiency of water production and wastewater management (**Jansen and consulting team, 2006**).

1.1.2 General Situation of Water and Sanitation Sector in Gaza:

Water and sanitation sector in Gaza is one of the sectors that have a lot of problems and it needs a special care from responsible bodies.

Palestinian water authority (PWA) which is the regulator of the sector and coastal municipalities water utility (CMWU) which is the service provider with all concerned organizations try a lot to manage the sector in the best way, where the political and economical situations had affected the sector badly in terms of development and maintenance after the second Intifada (2000).

And since 2006 (election) the situation has become worst, where the financial and institutional constraints are weakening the ability of both of them to meet their commitments of projects (**Jansen and consulting team, 2006**).

Then the situation has further deteriorated and now the water and sanitation sector is in a very vulnerable situation for the last three years (since the Israeli Forces had destroyed the transformers in Gaza Power Plant), and especially since June 2007 (conflict between Hamas and Fateh) where severe restrictions on the entry of goods into the Gaza Strip have disrupted the functioning of the water and sewage system in Gaza (**UNICEF, 2006**).

By November 2008, with the deterioration in the political and security situation, less than 2% of the investment program was being implemented. Even small relief projects had to be abandoned across the board, due to blocked imports of materials, while hardly any international contractor is prepared to work in Gaza. All conditions worsened with the December 2008/January 2009 military offensive on Gaza. Fundamental change in the political and security situation is needed to create an environment for renewed investment (**World Bank, 2009**).

Following the military operations by the Israeli Army on Gaza in 27 December – 18 January 2009, lives were lost and damages inflicted to the buildings and infrastructure including water and sanitation facilities. As Gaza is mainly urban area with dense population, the damages to water and sanitation facilities may have adverse impact on the health and well being of the general population (**Dongol, 2009**).

CMWU as the responsible authority for bulk water in Gaza, has not been able to maintain water and sanitation systems effectively due to lack of supplies resulting from the Israeli blockage for entry to Gaza. This was further aggravated after the Dec-Jan 2009 crisis in Gaza, which claimed lives, destroyed homes and damaged infrastructure including water and sanitation services (**Dongol, 2009**).

With all these conditions and complicated circumstances discussed above, water and sanitation sector is being managed most of the time under emergency management.

1.2 Research Problem:

The problem of this research can be summarized in the following question:

How do PWA, CMWU and concerned bodies in water and sanitation sector manage the sector in emergencies in terms of the four phases occurring before, during and after an emergency:

Mitigation, Preparedness, Response and Recovery??

1.3 Research variables:

- *Dependent variable:* management of the sector in emergencies

- *Independent variables:* the main independent variable is:

Used management strategies and techniques, and the sub variables are:

- Mitigations actions
- Preparedness for emergencies
- Response actions
- Recovery process

1.4 Research hypotheses:

There are two main hypotheses for this research:

1. There is a statistical relation between the used management strategies and techniques and management of water and sanitation sector in emergencies.

From this main hypothesis the following sub hypotheses result:

There is a statistical relation between management of the sector in emergencies at significant level $\alpha = 0.05$ and:

- a) Mitigation actions taken before emergencies
- b) Preparedness for emergencies
- c) Response actions during emergencies
- d) Recovery process after emergencies

2. There is no difference of the respondents' answers about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to demographic characters (Gender, Age, Type of organization, Job title, Qualifications, Experience).

1.5 Research Objectives:

The objectives of this research are the following specific points:

- a) To know the main problems that face water and sanitation sector in Gaza Strip, and the way that the sector is managed by in emergencies in Gaza.
- b) To evaluate emergency management for the sector in Gaza.
- c) To study emergency management rules and procedures in the four phases:
 - Mitigation,
 - Preparedness,
 - Response and
 - Recovery.
- d) To get recommendations that could help the concerned bodies in their management to the sector in emergencies.

1.6 Research Methodology:

The methodology of this research is descriptive analytical. Data for the situation of the water and sanitation sector and its problems in Gaza was gathered from interviews and reports. Two real case studies were presented to describe the management of the sector in emergencies as examples, and a questionnaire was developed to assess the management of the sector in emergencies.

1.7 Research importance:

water and sanitation sector is a very related sector to people life, and as mentioned previously Gaza Strip exposes to very difficult circumstances and the water and sanitation sector faces many problems, also there is a scarcity in studies that search in problems of the sector in emergencies in particular after the siege on Gaza since 2006, so:

- This research is very important where it will give a chance to study and evaluate the ways of water and sanitation sector management in emergencies in Gaza strip to keep the running of the systems and save access to water and sanitary services to people.
- It is important for interested people to know the main problems that face the sector in emergencies to prepare themselves to act with and to set their strategies.
- It is also important for interested people to take the benefit from research results and recommendations to know how to deal with crises and emergencies that water and sanitation sector can exposed to in Gaza Strip since the studies in this field are few.

1.8 Research Structure:

This thesis will be divided into seven chapters as follows:

- **Chapter 1:** General Introduction
- **Chapter 2:** Literature Review of emergency management
- **Chapter 3:** Water and sanitation sector in Gaza
- **Chapter 4:** Case Studies
- **Chapter 5:** Research methodology
- **Chapter 6:** Results and Analysis
- **Chapter 7:** Conclusion and Recommendations

1.9 Previous Studies:

First: English studies:

1) Metrouf and Poushant (1988): Crisis prone versus crisis avoiding organization

This article expands on that Organizations are often unaware of some of the most important forces influencing their actions for the subject of man-made, organizationally induced crises or disasters. Interviews with 30 executives in 23 organizations revealed that 19 companies saw themselves as being more vulnerable to crises than they were in the past. However, only 10 of them had a relatively integrated crisis management plan; 13 had no or only fragmented efforts in crisis management. The authors identify key cultural characteristics that explain the discrepancy between the two groups. The 'concept of self' or 'organizational identity' appears to be paramount in influencing strategic actions in crisis management. Many organizations need to be encouraged to examine their basic sense of identity.

2) Drabek, (1990): Emergency Management: Strategies for Maintaining Organizational Integrity.

In this study: emergency management traces the experiences of twelve successful emergency managers, detailing how these persons were able to maintain effective programs despite severe budgetary constraints and the generally low salience of hazards management within government and society in general. After outlining a theoretical

framework for his analysis -- the "stress-strain perspective" -- Drabek presents fifteen different successful managerial strategies and, using extensive quotations from the managers themselves, documents how these techniques have worked. He then presents the advice offered by those he interviewed, including recommendations to new emergency managers and suggestions for dealing with elected officials, volunteers, and individuals in other agencies.

3) Preble, (1997): Integrating the Crisis Management Perspective into the Strategic Management Process, 1997

This paper explicates how adding crisis management's defensive/preventative capability to strategic management's offensive market positioning orientation can yield a more comprehensive approach to the strategic management of organizations where the fields of strategic management and crisis management have been evolving separately despite their potential for synergistic integration. The traditional strategic management process is reviewed first and then analysed with respect to the gap that exists in this orientation. Examining the differences and similarities in perspectives between strategic management and crisis management and then reviewing the crisis management process provides a basis to proceed with a synthesis of the two fields. The paper concludes with the presentation of a new integrated strategic management process model that pushes forward the boundaries of strategic management and internalizes crisis management activities into that process.

4) Allan, (1999): Israel and water in the framework of the Arab-Israeli conflict

This paper illustrated how water is one of the important issues in the Peace Process. Settlement of Palestinian-Israeli water shares in a manner which appears to be publicly equitable is a necessary pre-condition of Palestine signing up to any treaty. The purpose of this paper has been to show that the asymmetries that exist between the two parties make the contention complex. One side may demand something for reasons of remedying the injustices suffered during recent history and may gain the prize. The reason the prize could be conceded is because one economy is substantially stronger than the other. Socio-economic development is the means by which the water problems of the region to the west of the Jordan will be ameliorated. Gaining the social adaptive capacity plus capital to enable scarce water to be part of the process to develop sound

livelihoods in Palestine should be the most important goal. Both sides can contribute to that end. Palestine should in the negotiations seek the material and institutional resources to transform its economy on the basis of scarce water. These are essential and linked issues that should have a high place on the agendas of the negotiators on both sides.

5) *Kislev, (2001): The water economy of Israel.*

This paper surveys the water sector of Israel. It describes sources and uses and reviews economic and political issues. The focus is solely on Israel; regional water questions. The public debate on water in Israel is overshadowed nowadays by the acute crisis; facing shortages and cuts in supply. One may easily conclude that the sector is in shambles. The review of the author for the issue has led to a more balanced conclusion: there was neglect, a lot should be repaired, and attention must be paid to changing circumstances; but the fundamental structure of the sector is sound, a basis for reforms exists, and the water economy can be expected fulfill its functions, now and in the future.

6) *Mathai, (2002): Surveying school counselors via the internet regarding their experience and training needs in crisis intervention.*

The aim of this article is to collect data about the training needs that the schools consultants in USA need for intervention in crises and studying their available skills to face emergencies.

The study was performed through the internet, the emails and the chatting sites.

The study reached many results where most of the participants in the survey had the skills and enough training to intervene in emergencies, and the important differences in training levels were due to age, experience and gender.

7) *Jain & McLean (2003): Simulation for emergency response: a framework for modeling and simulation for emergency response*

This paper proposes a framework for integration of modeling, simulation, and visualization tools for emergency response. A number of modeling and simulation tools have been developed and more are being developed for emergency response applications. The available simulation tools are meant mostly for standalone use.

Addressing an emergency incident requires addressing multiple interdependent aspects of the situation. The simulation tools addressing different aspects of an emergency situation need to be integrated to provide the whole picture to planners, trainers, and responders. A framework is required to ensure that modeling and simulation tools can be systematically integrated together to address the overall response. The development and implementation of the proposed framework will significantly improve the nation's capability in the emergency response area.

8) *Assaf, (2004): Water as a human right: The understanding of water in Palestine*

This study presents the current situation in the water sector in Palestine, along with the water sector policy and strategy, and existing legislation. The criteria for the Human Right to Water are then considered. It is concluded that closing the water gap in Palestine will be totally dependent on the development option and on that action plan that is best able to be implemented in the current political and economic situation.

Where throughout the Middle East, there is a gap between water supply and water demand. In Palestine, this gap is growing with time because water supply is artificially constrained. This gap is having severe adverse effects on both current and future Palestinian socio-economic development.

Water is essential to human life for basic health and survival, as well as food production and economic activities. Yet Palestine is presently facing a national emergency in that there is a lack of access to a basic supply of clean water and access to adequate sanitation, the primary cause of diseases linked to water – as well as a potential source of contamination to the water resources themselves.

9) *Reynolds & Seeger (2005): Crisis and Emergency Risk Communication as an Integrative Model*

This article describes a model of communication known as crisis and emergency risk communication (CERC). The model is outlined as a merger of many traditional notions of health and risk communication with work in crisis and disaster communication. The specific kinds of communication activities that should be called for at various stages of disaster or crisis development are outlined. Although crises are by definition uncertain, equivocal, and often chaotic situations, the CERC model is presented as a tool health communicators can use to help manage these complex events.

Second: Arabic Studies:

1) AlAmeer Study (2003): emergency plans and emergency management of Petrol Sector.

The aim of this article is to study emergency management in public companies that are working in petrol and Gas sector in Egypt.

The study was performed on four companies in the sector, and the researcher found that the emergency plans and procedures in the petrol sector didn't differ from each other, and they are like safety procedures and environment protection procedures, so they were not kind of emergencies or crises management.

The study recommended that the petrol companies in Egypt should consider the ways if emergency management to be ready to face different types of emergencies, and also recommended the importance of awareness raising about emergency management for the top management in the companies and then for all levels of management by changing the concept that emergencies are not for us.

2) Al-Jedaili Study (2006): emergency management in the big governmental hospitals in Gaza

The aim of the study is to identifying workers tendencies towards the availability of a system for crises management in its different phases (alone and collective) in the hospitals in Gaza Strip (AlShifa, Nasser, and Alorobi); to demonstrate the relationship among the crises management phases. The results stated that there is a low level system for crises management in the three hospitals. The study recommended that it is very important to have emergency management units in the Ministry of health and the big hospitals, and to have a team for the emergency and crises management.

3) Werdam (2007): summer water crisis in Jordan: solution by increasing the bill via increasing the pumped water quantity

This article illustrates that water pumping rates in Jordan are low especially in summer and how water and irrigation ministry tries to decrease water consumption by pumping once a week in many areas to be fair in water distribution to all citizens. The author considered that this decision from the ministry is unfair decision, and saw that increasing the pumping rate with increasing the bill is better. By this, the citizen will be

able to control his water consumption from his house not by government control. The wasted citizen then will pay additional cost for additional consumed water.

4) Ouda Study (2008): Emergency management in higher education institutions in Gaza, case study for the Islamic University.

The aim of this study was to identify the types of crises and risk management which can be exposed in institutions of higher education, and at the same time identify ways and crisis management strategies used by the Islamic University in Gaza, and discuss the different types of materials and human resources available in the university. The study showed that Islamic University is committed to the process of planning for crisis management. The study recommended the need to provide training and educational courses and workshops in emergency management for the employees in the University.

5) Washah (2009): Water crisis in Jordan: some ideas and solutions

This article illustrates that water large scale projects in Jordan may be delayed for funding reasons or political situation. So it is very important from the opinion of the author to have short and long term executive plans with scenarios consider that some large scale projects can not be implemented.

Some elements and solutions could be considered:

1. Development of water resources by determining safe pumping rates, saving the quality of available water, treatment of wastewater widely and mixing high quality water with low quality water.
2. Management of water demand in a balanced way by contribution of all related people in irrigation and agriculture.
3. Giving more priorities to save safe drinking water and domestic water and have safe sewage system as right for every one.
4. Investment in institutional and human capacity building since the water sector is in a need for trained and aware staff of challenges.

Comments on previous studies and articles:

- a. All previous studies indicated the importance of emergency management for organizations and institutes.
- b. The previous studies showed that providing training courses in emergency and crises management is very important, in addition to the necessity of having an emergency team in the organization.
- c. The previous studies stated that planning before occurrence of an emergency is very necessary.
- d. Some articles put new solutions and recommendation for water crisis.

However this research:

- a. Focuses on the water and sanitation sector in Gaza with its own problems, where these problems put the sector in emergency.
- b. Assess the management in emergencies for the water and sanitation sector in the special circumstances for Gaza Strip.
- c. Presents two real case studies to describe the management of the sector in emergencies.

CHAPTER 2

LITERATURE REVIEW OF EMERGENCY MANAGEMENT

- 2.1 What are Emergencies?
- 2.2 Emergency Management:
- 2.3 Phases of Emergency Management:
- 2.4 Principles of Emergency Management:
- 2.5 Qualities of good managers in emergencies and crises:

2.1 What are Emergencies?

Emergencies are related to sudden accidents can threaten people life if the response is not enough to cover them where sometimes even the well designed systems can't prevent the threats.

These accidents can occur in many fields and can have effects to many sectors such as education, public health, water and sanitation, protection,... and need to be managed in a proper way to avoid or at least decrease the bad effects and risks on people life.

To be more accurate: an **emergency** is a situation which poses an *immediate risk* to, life, health, property or environment. Most emergencies require urgent intervention to prevent a worsening of the situation, although in some situations, mitigation may not be possible and agencies may only be able to offer palliative care for the aftermath.

2.1.1 Defining an emergency:

In order to be defined as an emergency, the incident should be one of the following:

- a) Immediately threatening to life, health, property or environment.
- b) Have already caused loss of life, health detriments, property damage or environmental damage
- c) Have a high probability of escalating to cause immediate danger to life, health, property or environment (**Wikipedia, the free encyclopedia, 2008**).

2.1.2 What is the difference between an Emergency , a Crisis and disaster?

The words, "emergency" and "crisis" are often used interchangeably, that is why it has become useful to make a distinction between emergencies and crises in this research.

The Treasury Board Secretariat defines emergencies and crises as follows:

"An 'emergency' is an abnormal situation that requires prompt action, beyond normal procedures, in order to limit damage to persons, property or the environment."

"A 'crisis' is a situation that somehow challenges the public's sense of appropriateness, tradition, values, safety, security or the integrity of the government" (**Crisis and emergency management, 2008**).

Emergencies and crises share several characteristics in management terms, including the need to be proactive and coordinate a vast network of operations and communications.

The management of emergency situation involves having to deal with the problematic consequences of situations like a natural or man-made disaster. In such circumstances, the primary objective of emergency communications is to ensure an uninterrupted flow of information to the audiences affected in order to reduce risks and minimize fear or undesirable anxiety. Moreover, an emergency can turn into a crisis if it appears that the government or the responsible bodies are not in control of the situation.

On the other hand, crises do not always begin with an emergency and do not necessarily represent a serious threat to human life or property. Crises can be triggered simply by apparent failures in policies, regulations or programs, it is necessary to understand that crises are largely based on perception of a problem, regardless of whether the problem is real or only apparent. So a situation degenerates into a crisis when it is designated as such by the media, Parliament, or by powerful or credible interest groups **(Crisis and emergency management, 2008)**.

A disaster is the tragedy of a natural or human-made hazard that negatively affects society or environment.

A disaster can be defined as any tragic event that may involve at least one victim of circumstance, such as an accident, fire, or explosion **(Wikipedia, the free encyclopedia, 2008)**.

In general A disaster is an event of such significant scale that it is beyond the resources of the responsible bodies to handle, and/ or one that impacts one or more of the surrounding communities that may require isolated self sufficiency for 72 hours or more **(Brock University, 2006)**.

2.1.3 Types of emergency:

According to the last definition emergency can be classified into four types:

1. Dangers to life

Many emergencies cause an immediate danger to the life of people involved. This can range from emergencies affecting a single person, such as the entire range of medical emergencies which include heart attacks, strokes and trauma, to incidents affecting large numbers of people such as natural disasters including hurricanes, floods or mudslides.

Most agencies consider these to be the highest priority of emergency, which follows the general school of thought that nothing is more important than human life.

2. Dangers to health

Some emergencies are not immediately threatening to life, but might have serious implications for the continued health and well-being of a person or persons (although a health emergency can subsequently escalate to be threatening to life).

The causes of a 'health' emergency are often very similar to the causes of an emergency threatening to life, which includes medical emergencies and natural disasters, although the range of incidents which can be categorized here is far greater than those which cause a danger to life (such as broken limbs, which do not usually cause death, but immediate intervention is required if the person is to recover properly) (**Emergency Call, 2009**).

3. Dangers to property

Other emergencies do not threaten any people, but do threaten peoples' property. An example of this would be a fire in a warehouse which has been evacuated. The situation is treated as an emergency as the fire may spread to other buildings, or may cause sufficient damage to make the business unable to continue (affecting livelihood of the employees).

Many agencies categorize property emergency as the lowest priority, and may not take as many risks in dealing with it. For instance, firefighters are unlikely to enter a burning building which they know to be empty, as the risk is unjustified, whereas they are more likely to enter a building where people are reported as trapped.

4. Dangers to the environment

Some emergencies do not immediately endanger life, health or property, but do affect the natural environment and creatures living within it. Not all agencies consider this to be a genuine emergency, but it can have far reaching effects on animals and the long term condition of the land. Examples would include forest fires and marine oil spills (**Wikipedia, the free encyclopedia, 2008**).

2.2 Emergency Management:

Definition:

Emergency Management as defined by ISDR (International Strategy for Disaster Reduction) is the organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation.

Emergency management involves plans, structures and arrangements established to engage the normal endeavors of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management (ISDR, 2008).

In general, any Emergency management is the continuous process by which all individuals, groups, and communities manage hazards in an effort to avoid or ameliorate the impact of disasters resulting from the hazards. Actions taken depend in part on perceptions of risk of those exposed. Emergency management is a dynamic process. Planning, though critical, is not the only component. Training, conducting drills, testing equipment and coordinating activities with the community are other important functions (**Wikipedia, the free encyclopedia, 2008**).

Vision:

Emergency management seeks to promote safer, less vulnerable communities with the capacity to cope with hazards and disasters.

Mission:

Emergency management protects communities by coordinating and integrating all activities necessary to build, sustain, and improve the capability to mitigate against, prepare for, respond to, and recover from threatened or actual natural disasters, acts of terrorism, or other man-made disasters (IAEM, 2007).

2.2.1 Managing of an emergency:

There are many protocols which the emergency services use in dealing with an emergency, which usually start with planning before an emergency occurs.

The planning phase starts at **preparedness**, where the agencies decide on how they will respond to a given incident or set of circumstances. This should ideally include lines of command and control, and division of activities between organizations.

Following an emergency occurring, the organizations then move to a **response** phase, where they execute their plans, and may end up improvising some areas of their response.

Organizations may then be involved in **recovery** following the incident, where they assist in the clear up from the incident, or help the people involved overcome their mental trauma.

The final phase in the circle is **mitigation** which involves taking steps to ensure that no re-occurrence is possible, or putting additional plans in place to ensure less damage is done. This should feed back in to the preparedness stage, with updated plans in place to deal with future emergencies, thus completing the circle (Wikipedia, the free encyclopedia, 2008).

2.2.2 Why is Emergency Management Important?

1) Emergencies are inevitable and tend to multiply and become more complex:

Emergencies happen all the time and are inherent in all large organizations. The past has shown that it is not a question of knowing whether an organization will experience a crisis or major emergency, but rather one of knowing when this will take place, how serious it will be, and to what extent the organization itself will be prepared. For approximately 20 years, public and private organizations have increasingly come to rely on technology to support their communication, information and service-delivery systems. This factor has resulted in crisis and emergency management becoming more complex and systematized, even though this type of response existed well before a name was put to it. Thus, when an organization's systems stop working, we become practically helpless-hostages, as it were, to our own tools. Now, more than ever before, a catastrophe can upset the delicate balance of an organization and precipitate it down a slippery slope. Modern environment has increased tenfold the impact of work interruptions (**Crisis and emergency management, 2008**).

2) Emergencies can be managed but you have to be well prepared:

Emergencies are different from routine action. In crises and emergencies, managers and their employees are often required to perform novel and unfamiliar tasks. Every procedure, priority, and assignment of work or resources is altered. Moreover, crises and emergencies generally involve close collaboration with various organizations that we do not normally deal with. When an organization is in the heat of the action, there is very little time to discuss who will be responsible for managing the crisis or emergency. That is why, like any other management challenge, we have to generally anticipate and prepare for crises and emergencies — in other words, we have to agree ahead of time on what current responsibilities and procedures to follow in cases of crises or emergencies. Experience has shown that crises and emergencies are handled much more effectively when the organization concerned is well prepared. Crisis and emergency management also call into play the strengths and weaknesses of learning organizations, pointing up the need for the organization to deal with its weak

points and thereby become less vulnerable. Organizations must also be capable of "imagining the unthinkable," "thinking outside the box," and preparing for as many scenarios as possible (Crisis and emergency management, 2008).

2.3 Phases of Emergency Management:

There are four primary phases of emergency management relating to Campus: mitigation, preparedness, response and recovery activities occurring before, during, and after an emergency or disaster has occurred as in figure 3.1 (Wikipedia, the free encyclopedia, 2008).

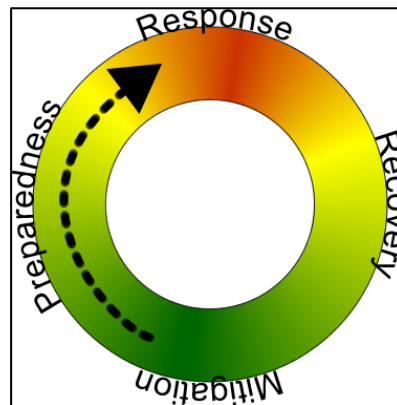


Fig. 2.1: A graphic representation of the four phases in emergency management (Wikipedia, the free encyclopedia, 2008).

- **Mitigation:** Mitigation is defined as "sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects."
- **Preparedness:** Preparedness takes the form of plans or procedures designed to save lives and to minimize damage when an emergency occurs. Planning, training, and disaster drills are the essential elements of preparedness. These activities ensure that when a disaster strikes, emergency managers will be able to provide the best response possible.
- **Response:** Response is defined as the actions taken to save lives and prevent further damage in a disaster or emergency situation. Response is putting preparedness plans into action. Response activities may include damage assessment, search and rescue, fire fighting, and sheltering victims.

- **Recovery:** Recovery is defined as the actions taken to return the community to normal following a disaster. Repairing, replacing, or rebuilding property are examples of recovery (**ACCEM, 2009**).

2.3.1 Mitigation Phase:

The mitigation phase includes actions taken to reduce the consequences of a crisis or an emergency. The mitigation activities aim at identifying and anticipating at best possible crises and emergencies. They consist in identifying the vulnerabilities of the organization and in taking proactive measures on the latter. Mitigation activities consist in:

- Conducting a review (identification of risks and critical situations);
- Assessing the risks (risks that are most likely by order of importance);
- Studying worst-case scenarios (scenario analyses and forecasting models);
- Studying previous situations (retrospective review of similar crises and emergencies);
- Arranging for expertise (identify specialists required for potential crises or emergencies);
- Setting up continuous monitoring systems. (**Crisis and emergency management, 2008**).

It is generally Activities that either prevent the occurrence of an emergency or reduce the community's vulnerability in ways that minimize the adverse impact of a disaster or other emergency are examples of mitigation (**California State University, 2008**).

2.3.2 Preparedness Phase:

The preparedness phase includes actions taken to prepare for effective crisis or emergency response. The preparedness activities consist in planning, both in terms of operations and communications, the main parameters of the response, the administrative modalities, the resources required as well as training and exercising the plans.

2.3.2.1 Planning (operations and communications)

Crisis and emergency management involves the development of two types of plans: operational and communications. The operational plan is the framework document that contains all of the information that managers will need to effectively manage crises or emergencies. In other words, the plan must provide guidelines to be followed in such situations. When managers design the plan, they should avoid making it too long or complicated. When a crisis or emergency strikes and the tension level is at its highest, there is no time to waste in looking through a voluminous plan full of narrative. The goal is to compile a document that contains all of the information managers will need to effectively manage crises and emergencies (**Crisis and emergency management, 2008**).

An operational crisis plan should include the following basic components:

- A definition of crises and emergencies covered in plan;
- Command structures, e.g. the management team, lead-agency responsibilities, relationships with other departments or agencies, and headquarters;
- Administrative policies and procedures necessary for activating and facilitating decision making during the crisis or emergency;
- Facilities (crisis or emergency management centre and logistics).

It is necessary to develop a communications plan to go along with the operational plan. The communications plan provides strategic guidelines and tactics that are necessary before, during and after crises or emergencies.

The plan will help all responders to have the same terms of reference and reactions during the response. The communications plan also determines the designated spokespersons, the target audiences, the facilities and training needs (**Crisis and emergency management, 2008**).

2.3.2.2 Plan elements:

1) Management, organization and coordination

Many agencies take part in emergency response operations: Civil Defense and emergency structures, Red Crescent/Red Cross Societies, international agencies, UN agencies and others. It is possible that several agencies may be performing the same task. In this case, clear coordination of activities is required to ensure that the

maximum number of people is assisted in the shortest possible time and to avoid unnecessary duplication of services (**International Federation of Red Cross and Red Cross Societies, 2000**).

A preparedness plan should list the name(s), responsibilities during emergency, and contact numbers and addresses for the emergency response focal point, the team members at each operational level and people in charge of:

- Activating the response services
- Communicating with headquarters
- Managing external relations and aid appeals from other sources, including governmental, international and public funds
- Communicating with the media
- Coordinating and liaising with other agencies and services
- Managing administrative work

When creating a preparedness plan each agency should also identify the activities it will be responsible for and its anticipated level of involvement in the event of an emergency. An agency should also determine where, within the agency, responsibility for each function will reside (**International Federation of Red Cross and Red Cross Societies, 2000**).

2) Assessment of probable needs

Another aspect of preparedness planning is planning for probable needs during an emergency. Based on previous disasters, planners should compile a list of likely needs and available resources. If planners anticipate a gap between needs and resources, they should identify, in advance, ways to reduce it.

3) Activating population emergency notification and disaster response systems

The plan should define ways to provide the population with emergency warnings as well as the people who are responsible for this function. Agencies should identify an officer (other than the public relations officer) who is in charge of sharing information with the media.

The officer should be experienced and have government, business and social contacts. The information officer should clarify which people are allowed to communicate necessary emergency data to the media. Other response team members should refer all communication and public relations issues to this particular officer.

In addition to providing the public with notification of the impending disaster, there must be a system for initiating a disaster or emergency response in case of an emergency. Who and how is early warning being monitored and communicated?

The plan should also ensure ways of involving volunteers and allowing staff to work extra hours (**International Federation of Red Cross and Red Cross Societies, 2000**).

4) Emergency needs assessment

Effective response operations are practically impossible without a precise emergency or disaster situation assessment and a thorough evaluation of required humanitarian and other relief. To be effective, assessment work should be well planned and organized before it is carried out. In most cases, a comprehensive needs assessment should be conducted immediately after an emergency and updated thereafter. Normally people assessing emergency needs and damages should receive training and should agree on the standards being used. When planning for an emergency needs assessment is being prepared, identify:

- Who and when (e.g. immediately, after 3 days, 2 weeks, etc.) is responsible for the assessment. Normally, multi-functional and multi-sectoral teams should conduct assessments
 - What information is required at each stage of the emergency
 - How and where research teams will be formed and trained
 - What standards are being used to indicate the severity of the emergency
- (Relief web, 2009).**

5) Resource mobilization and allocation

Responding to an emergency and implementing the preparedness plan will require resources. The preparedness plan, therefore, should consider:

- What resources are already available and in what quantities?
- Which staff and volunteers can be shifted over from other programs during times of emergency?
- What resources will be needed that we don't have?
- Plans for procuring the resources that are not currently available.

6) Communication between agencies

Sharing and exchanging information among representatives of various agencies is crucial during emergencies. To ensure clear and effective communication in an emergency the plan should specify how communication will take place and via what mediums (e.g. email, radio, telephone, in person, etc.)

If radio communication will be used, it is important to designate the radio frequency in the preparedness plan. This way, responding agencies will use the correct radio frequencies in the event of an emergency. The plan should also specify who will have (and maintain) the equipment and who will have access to a radio (**International Federation of Red Cross and Red Cross Societies, 2000**).

2.3.2.1 Establishing a Response Team

The response team assembles the organization's employees who may be called upon to manage a crisis or emergency. Such a team usually comprises key individuals in the organization, bearing in mind their areas of specialization and expertise. The roles and responsibilities of each team member can be defined and the powers assigned to the team can be specified in the operational plan (**Crisis and emergency management, 2008**).

2.3.2.2 Designating Partners

The designation of partners implies the establishment of early contacts between the lead department and partner organizations that will provide support during the response. The lead department should share its crisis or emergency management program and harmonize it with partner organizations. The relationships and agreements established with partners prior to crises or emergencies could help significantly to improve the coordination of response.

2.3.2.3 Setting up Systems

Systems include all the resources that will be necessary to ensure that crisis or emergency operations function smoothly, i.e., infrastructure, technology and human resources. A lack or insufficiency of one of these factors may contribute to paralyzing the action taken by the response team. It is therefore necessary to ensure in advance that these resources are available and that the equipment works (**Crisis and emergency management, 2008**).

2.3.2.4 Training and Exercising the Plans

The plans may turn out to be useless and ineffective if it is not tested. In itself, it can give managers a false feeling of security concerning the state of their organization's preparedness. To avoid the "paper plan" syndrome, the plans need to be periodically tested and the response team and their support personnel need to receive appropriate training. Although a small-scale or large-scale simulation exercise can be carried out, it is highly recommended that senior management be involved in the exercise itself, since they are the ones that will order the activation of the plans and related measures in a crisis or emergency. Training and exercise mainly help to:

- maintain an appropriately high level of awareness;
- familiarize personnel with the plans (operations and communications);
- make sure that all personnel involved know their role in the plans (roles and responsibilities);

- familiarize personnel with the mechanisms, equipment and procedures required to implement the plans;
- convert abstract plans into concrete actions;
- provide an opportunity to ask questions and express concerns.

Each simulation exercise should be followed by a debriefing session that brings out what worked and what did not. This type of session provides an opportunity to recalibrate the plans and reassess the responsibilities that the organization's personnel and partners would take on in a real crisis or emergency (**Crisis and emergency management, 2008**).

2.3.3 Response Phase

The response phase includes actions taken to deal with the consequence of a crisis or an emergency. The response activities are put forward to take control and contain negative impacts. It should be understood that the response activities are iterative or simultaneous because of the uncertainty surrounding crises or emergencies. The response will require a complex level of coordination of operations and communications depending on the nature of the crisis or emergency.

2.3.3.1 Assessing the situation

The assessment of the situation consists primarily in assembling information on the crisis or emergency and determining the reliability of information sources. This initial step helps assessing the scope of the problem and determining the lead department. The concerned level of authority authorizes the activation of the operational and communications plans if it deems necessary.

2.3.3.2 Activating the operational plan

The activation of the operational plan initially implies setting up the designated team to manage the response.

It is usually accompanied by contact with federal and external partners to re-examine the problem and establish response priorities. The lead department quickly puts forward short-term solutions to contain damages and reduce danger, and pursues to seek long term solutions (**Crisis and emergency management, 2008**).

2.3.3.3 Activating the communications plan

The activation of the communications plan will initially consist in quickly preparing the official position of the lead department. The initial activities will involve:

- Determining how interested the media could be in the situation;
- choosing and informing the designated spokesperson;
- Drafting and coordinating the transmission of the government's message;
- and
- Preparing what the media needs.

The response to the media will recognize and explain the scope of the problem and reassure the public that immediate measures are deployed to contain the situation. The lead department will maintain continuous communications with its internal and external audiences throughout the response phase in order to provide updates and share all appropriate information.

2.3.4 Recovery Phase

The recovery phase consists of the various types of action taken in the aftermath of a crisis or emergency.

Recovery activities include:

- a) An official declaration that the crisis or emergency is over;
- b) Keeping in touch with the media and partner organizations;
- c) Providing support to employees;
- d) Assessing organizational learning (lessons learned).

The return to normal operations requires an official statement to the effect that the crisis or emergency is over. Although the situation gradually disappears, the department concerned needs to maintain contact with the media and its partner organizations. This makes it possible to take stock of progress achieved in terms of implementing the long-term solutions identified during the response phase (**Crisis and emergency management, 2008**).

Particular attention should also be paid to supporting the organization's employees who could be suffering from stress or extreme fatigue as a result of the crisis or emergency. Lastly, the recovery phase should also include a process of organizational learning to assess the lessons learned from the experience. Crises or emergencies can have positive or negative effects on both the professional and public image of an organization. In either scenario, the organization concerned might be tempted to overlook the reflective component of crisis and emergency management. On the one hand, an organization that has just successfully emerged from a crisis or emergency might believe that it is now ready to overcome all other similar situations. On the other hand, other organizations that have barely survived a crisis or emergency may find it extremely difficult to look back and try to draw what must be painful lessons from the experience. Conscientious organizations will seize the opportunity to conduct a formal review and carefully examine, without assigning blame, what worked well and what did not. Such organizations will place the emphasis on improving their organizational ability to anticipate and prepare for other crises and emergencies in the future (**Crisis and emergency management, 2008**).

Plan Review

The only way to know if a plan can work is to implement it, evaluate it and revise it as appropriate. This can be done by review of plans after an actual emergency.

Based on the actual response, organizations can review their preparedness plans and update them to reflect the reality, opportunities and challenges experienced in the emergency situation. Questions that should be asked during this review include:

- a) What caused the most casualties and damages? What, if anything, can the organization do to mitigate or prevent this from happening in the future?
- b) What were the main difficulties in getting assistance to needy people? How might the organization improve this in the future?

- c) How did the warning system work? What improvements are required?
- d) What mistakes did made? What changes must made to avoid these changes in the future?
- e) What was done well? How can be guaranteed that organization will continue to do these things?
- f) What supplies were available and which were lacking? How might we compensate for this in the future?
- g) What was the level and quality of coordination with the NS and with other external organizations? What additional coordination is required? How might coordination in the future be improved?
- h) What were the strengths and weaknesses of the preparedness plan? How might it be modified or improved? (**International Federation of Red Cross and Red Cross Societies, 2000**).

2.4 Principles of Emergency Management:

The Federal Emergency Management Agency's Emergency Management Roundtable, a panel of twelve emergency management (EM) practitioners and academicians, released its set of "Principles of Emergency Management" on September 11, 2007 (**Maine.gov, 2008**).

Therefore Emergency management must be:

1. Comprehensive

Emergency managers consider and take into account all hazards, all phases, all impacts, and all stakeholders relevant to disasters.

Comprehensive emergency management can be defined as the preparation for and the carrying out of all emergency functions necessary to mitigate, prepare for, respond to, and recover from emergencies and disasters caused by all hazards, whether natural, technological, or human caused. Comprehensive emergency management consists of four related components: all hazards, all phases, all impacts, and all stakeholders (**IAEM, 2007**).

All Hazards: All hazards within a jurisdiction must be considered as part of a thorough risk assessment and prioritized on the basis of impact and likelihood of occurrence.

Treating all hazards the same in terms of planning resource allocation ultimately leads to failure. There are similarities in how one reacts to all disasters. These event-specific actions form the basis for most emergency plans. However, there are also distinct differences between disaster agents that must be addressed in agent or hazard-specific plans and these can only be identified through the risk assessment process.

All Phases: The Comprehensive Emergency Management Model on which modern emergency management is based defines four phases of emergency management: mitigation, preparedness, response, and recovery.

All Impacts: Emergencies and disasters cut across a broad spectrum in terms of impact on infrastructure, human services, and the economy. Just as all hazards need to be considered in developing plans and protocols, all impacts or predictable consequences relating to those hazards must also be analyzed and addressed.

All Stakeholders: This component is closely related to the emergency management principles of coordination and collaboration. Effective emergency management requires close working relationships among all levels of government, the private sector, and the general public (SEMP, 2009).

2. Progressive

Emergency managers anticipate future disasters and take preventive and preparatory measures to build disaster-resistant and disaster-resilient communities.

Research and data from natural and social scientists indicates that disasters are becoming more frequent, intense, dynamic, and complex. The number of federally declared disasters has risen dramatically over recent decades. Monetary losses are rising at exponential rates because more property is being put at risk. The location of communities and the construction of buildings and infrastructure have not considered potential hazards. Environmental mismanagement and a failure to develop and enforce sound building codes are producing more disasters. There is an increased risk of terrorist attacks using weapons of mass destruction

Emergency management must give greater attention to prevention and mitigation activities. Traditionally, emergency managers have confined their activities to

developing emergency response plans and coordinating the initial response to disasters. Given the escalating risks facing communities, however, emergency managers must become more progressive and strategic in their thinking. The role of the emergency manager can no longer be that of a technician but must evolve to that of a manager and senior policy advisor who oversees a community-wide program to address all hazards and all phases of the emergency management cycle **(IAEM, 2007)**.

Emergency managers must understand how to assess hazards and reduce vulnerability, seek the support of public officials and support the passage of laws and the enforcement of ordinances that reduce vulnerability. Collaborative efforts between experts and organizations in the public, private and non-profit sectors are needed to promote disaster prevention and preparedness. Efforts such as land-use planning, environmental management, building code enforcement, planning, training, and exercises are required and must emphasize vulnerability reduction and capacity building, not just compliance. Emergency management is progressive and not just reactive in orientation.

3. Risk-driven

Emergency managers use sound risk management principles (hazard identification, risk analysis, and impact analysis) in assigning priorities and resources.

Emergency managers are responsible for using available resources effectively and efficiently to manage risk. That means that the setting of policy and programmatic priorities should be based upon measured levels of risk to lives, property, and the environment. The emergency management programs shall identify hazards, monitor those hazards, the likelihood of their occurrence, and the vulnerability of people, property, the environment, and the entity [program] itself to those hazards. The Emergency Management Accreditation Program (EMAP) Standard echoes this requirement for public sector emergency management programs **(Maine.gov, 2008)**.

Effective risk management is based upon:

- (1) The identification of the natural and man-made hazards that may have significant effect on the community or organization;
- (2) The analysis of those hazards based on the vulnerability of the community to determine the nature of the risks they pose; and

(3) An impact analysis to determine the potential affect they may have on specific communities, organizations, and other entities. Mitigation strategies, emergency operations plans, continuity of operations plans, and pre- and post-disaster recovery plans should be based upon the specific risks identified and resources should be allocated appropriately to address those risks.

Communities across the United States have very different risks. It is the responsibility of emergency managers to address the risks specific to their communities. Budgets, human resource management decisions, plans, public education programs, training and exercising, and other efforts necessarily should focus on the hazards that pose the greatest risks first. An all-hazards focus ensures that plans are adaptable to a variety of disaster types and that, by addressing the hazards that pose the greatest risk, the community will be better prepared for lesser risks as well.

4. Integrated

Emergency managers ensure unity of effort among all levels of government and all elements of a community.

In the early 1980's, emergency managers adopted the Integrated Emergency Management System (IEMS), an all-hazards approach to the direction, control and coordination of disasters regardless of their location, size and complexity. IEMS integrates *partnerships* that include all stakeholders in the community's decision-making processes. IEMS is intended to create an organizational culture that is critical to achieving unity of effort between government, key community partners, non-governmental organizations (NGOs) and the private sector (IAEM, 2007).

Unity of effort is dependent on both vertical and horizontal integration. This means that at the local level, emergency programs must be integrated with other activities of government. For example, department emergency plans must be synchronized with and support the overall emergency operations plan for the community. In addition, plans at all levels of local government must ultimately be integrated with and support the community's vision and be consistent with its values.

Similarly, private sector continuity plans should take into account the community's emergency operations plan. Businesses are demanding greater interface with government to understand how to react to events that threaten business survival.

Additionally, businesses can provide significant resources during disasters and thus may be a critical component of the community's emergency operations plan. In addition, given the high percentage of critical infrastructure owned by the private sector, failure to include businesses in emergency programs could have grave consequences for the community.

The local emergency management program must also be synchronized with higher-level plans and programs. This is most noticeable in the dependence of local government on county, state and federal resources during a disaster. If plans have not been synchronized and integrated, resources may be delayed.

Emergency management must be integrated into daily decisions, not just during times of disasters. While protecting the population is a primary responsibility of government, it cannot be accomplished without building partnerships among disciplines and across all sectors, including the private sector and the media **(IAEM, 2007)**.

5. Collaborative

Emergency managers create and sustain broad and sincere relationships among individuals and organizations to encourage trust, advocate a team atmosphere, build consensus, and facilitate communication.

There is a difference between the terms "collaboration" and "coordination" and current usage often makes it difficult to distinguish between these words. Coordination refers to a process designed to ensure that functions, roles and responsibilities are identified and tasks accomplished; collaboration must be viewed as an attitude or an organizational culture that characterizes the degree of unity and cooperation that exists within a community. In essence, collaboration creates the environment in which coordination can function effectively **(Maine.gov, 2008)**.

6. Coordinated

Emergency managers synchronize the activities of all relevant stakeholders to achieve a common purpose.

Emergency managers are seldom in a position to direct the activities of the many agencies and organizations involved in the emergency management program. In most cases, the people in charge of these organizations are senior to the emergency manager, have direct line authority from the senior official, or are autonomous. Each stakeholder brings to the planning process their own authorities, legal mandates, culture and operating missions. The principle of coordination requires that the emergency manager gain agreement among these disparate agencies as to a common purpose and then ensure that their independent activities help to achieve this common purpose **(SEMP, 2009)**.

In essence, the principle of coordination requires that the emergency manager think strategically, that he or she see the “big picture” and how each stakeholder fits into that mosaic. In developing the strategic plan, the emergency manager facilitates the identification of agreed-upon goals and then persuades stakeholders to accept responsibility for specific performance objectives.

The strategic plan then becomes a mechanism for assessing program progress and accomplishments

This same process can be used on a smaller scale to develop a specific plan, such as a community recovery plan; it is also an inherent component of tactical and operational response. The principle of coordination is applicable to all four phases of the Comprehensive Emergency Management cycle and is essential for successful planning and operational activities related to the emergency management program. Application of the principle of coordination provides the emergency manager with the management tools that produce the results necessary to achieve a common purpose.

7. Flexible

Emergency managers use creative and innovative approaches in solving disaster challenges.

Due to their diverse and varied responsibilities, emergency managers constitute one of the most flexible organizational elements of government. Laws, policies and operating procedures that allow little flexibility in the performance of duties drive more traditional branches of government. Emergency managers are instead encouraged to develop creative solutions to solve problems and achieve goals (**IAEM, 2007**).

A principal role of the emergency manager is the assessment of vulnerability and risk and the development of corresponding strategies that could be used to reduce or eliminate risk. However, there can be more than one potential mitigation strategy for any given risk. The emergency manager must have the flexibility to choose not only the most efficient course of action but the one that would have the most chance of being implemented.

In the preparedness phase, the emergency manager uses many resources to create and maintain a well-organized community response structure. One such resource is the development of a risk-based community emergency operations plan. While most policies and procedures in government are specific and designed to offer little room for interpretation, the emergency operations plan is designed to be flexible and applicable to all community emergency operations. It is based on the consequences of the event, not the promulgating action (**SEMP, 2009**).

The most dramatic phase of emergency management is response. In this phase the emergency manager coordinates activities to ensure overall objectives are being met. The emergency manager must be flexible enough to suggest variations in tactics or procedures and adapt quickly to a rapidly changing and frequently unclear situation. The emphasis is on creative problem solving based on the event and not on rigid adherence to pre-existing plans.

As part of the community team that will determine recovery priorities the emergency manager must be capable of dealing with the political, economic and social pressures in making these decisions. It is natural to focus on short-term efforts in disaster recovery.

However, the emergency manager cannot lose sight of the long-term needs of the community and it is this aspect of recovery that often must be driven by the emergency manager.

Flexibility is a key trait of emergency management and success in the emergency management field is dependent upon it. Being able to provide alternate solutions to stakeholders and then having the flexibility to implement these solutions is a formula for success in emergency management.

8. Professional

Emergency managers value a science and knowledge-based approach based on education, training, experience, ethical practice, public stewardship and continuous improvement.

Professionalism in the context of the principles of emergency management pertains not to the personal attributes of the emergency manager but to a commitment to emergency management as a profession **(IAEM, 2007)**.

2.5 Qualities of good managers in emergencies:

Good leaders in emergencies are expected to be calm, decisive under pressure and confident in action. Such qualities, by their very nature, are difficult to gauge in standard selection procedures. This presents organizations with the problem of how to determine whether someone possesses the right personal qualities and skills for a command position **(Flin & Slaven, 1996)**.

These qualities are:

- a. Perceptive
- b. Intuitive
- c. Knowledgeable in one or more fields
- d. Able to take on additional responsibilities
- e. Able to think clearly
- f. Decisive
- g. Calm under pressure (Crisis and emergency management, 2008).**

CHAPTER 3

WATER AND SANITATION SECTOR IN GAZA: SITUATION AND PROBLEMS

3.1 Introduction about the sector:

3.2 Existing Water Situation:

3.3 Existing Sanitation Situation

3.4 The Problems that put Water and Sanitation Sector in Gaza in Emergencies:

3.1 Introduction about the sector:

3.1.1 The role of PWA and CMWU:

The Palestinian Water Authority (PWA) is a central and autonomous authority established under the presidential resolution No. 90 of 1995, acting under the direct responsibility of the President of the Palestinian National Authority **(UNICEF, 2006)**.

The PWA is the main regulatory body for water resources management and development in Palestine, with the following primary objectives:

- a) Execute the National Water Policy as approved by the National Water Council;
- b) Ensure most efficient management of available water resources in Palestine;
- c) Seek to achieve and develop water security through optimal planning of water resources investments; Explore further resources to ensure balanced management between supply/demand;
- d) Control the quality of the implementation of water projects;
- e) Seek to achieve strong co-operation between PWA and other relevant parties.

The PWA is in a transition from a project management role in water and waste water infrastructure development towards a regulatory role. Its future role is clearly defined in the Water Law which stresses the independency of PWA **(UNICEF, 2006)**.

PWA established a strong branch in Gaza, and had developed good capacity.

However, with the takeover of PWA offices in June 2008, PWA operations were effectively suspended **(World Bank, 2009)**.

The Coastal Municipalities Water Utility (CMWU) is a Semi – Public entity financially independent, responsible for the water supply services, wastewater treatment and disposal and storm water collection.

Today, the CMWU have 5 regional offices along with the main headquarter office which holds the Board of Directors office, The Project Management Unit (PMU) and the Operator for Gaza Emergency Water Project which is a management contract financed by the World Bank **(CMWU 1, 2009)**.

The CWMU has been set up and staffed, and is working with the existing 25 municipal entities. A path has been traced out by which the entities will receive technical support services from the CWMU, and will progressively transfer their staff and assets to CWMU. In the current turbulent circumstances, some municipalities are retreating from their commitments. Some object to losing control e.g. Gaza Municipality. Many municipalities want to keep the cash generated by the water supply operation. In some municipalities, there are politically appointed mayors, who are not acceptable to the donors. According to the CMWU, “those municipalities that remain outside will still receive chemicals and any emergency interventions, but will not benefit from investment support **(World Bank, 2009)**).

The CMWU goals are:

1. Develop and conserve water resources in cooperation with Palestinian Water Authority.
2. Water disinfection from source to consumer including water network.
3. Extend the water supply services to all Gaza Strip inhabitants.
4. To cover all costs of operation, maintenance and development by improving the billing system (Cost Recovery).

To improve wastewater and storm water collection and treatment according to the Palestinian standards for Re – use **(CMWU 1, 2009)**.

3.1.2 Key players in the sector:

The main organizations that are working in water and sanitation sector in Gaza Strip are:

- PWA,
- CMWU and municipalities,
- UN organizations; UNICEF, OCHA, UNRWA, WHO, UNDP, UN-Habitat.
- International organizations; ACF, CARE, GVC, International Relief, OXFAM, Save the children, Islamic Relief, CHF, ICRC, International Relief and Development and others
- Local organizations; PHG and Maan **(Najjar, 2008)**.

3.1.3 The sector' management:

CMWU as the service provider in its implementation of the different projects follows the master plan of Gaza Strip for 2006 and the CAMP project details, where these documents comprise the strategies for the water and sanitation sector as the documents determine all the needs of Gaza Strip in the water and sanitation sector for the coming 20 years after 2006 (**Najjar, 2009**).

3.1.3.1 Master Plan for water supply and sanitation:

The Master Plan is intended to be a “living and breathing” document which will be given the care and attention needed to support the high level of service that Gaza customers expect and deserve.

The purpose of the Master Plan is to address water supply and distribution issues in the water system of Governorates of Gaza Strip. The Master Plan describes and assesses the existing water/ wastewater infrastructure, examines current and projected water demands, and outlines viable alternatives.

The Master Plan is prepared in compliance with the requirements and recommendations of PWA. The plan also includes an evaluation, with its recommendations, of the water system's projected water supply, storage, and demands over the next 20 years up to year 2025(**TECC, 2006**).

The Gaza Master Plan provided for an integrated production and conveyance system, based on increased supply from local aquifers together with desalination as the two supply sources, construction of a water carrier from the West Bank, and the creation of a regional utility and an integrated bulk water system within Gaza.

The Master Plan proposed ambitious plans for Gaza sanitation and waste water treatment, including rehabilitation and extension of the three existing plants at Gaza, Beit Lahia and Rafah, and construction of three new regional treatment plants by 2005, to serve the northern, Gaza City and southern areas (**World Bank,2009**).

CMWU has its own plan for emergencies, and the plan is being used as applicable according to the emergency itself. The information is transferred from the regional offices to the management, and the decisions taken are given from the management to the regional offices (**Najjar, 2009**).

3.1.3.2 Master Plan implementation:

It has proved impossible to implement the plan under emergency closure conditions.

The Master Plan should have been completed four years ago, but implementation has been frustrated by the effect of the continual closures and incursions. PWA and CMWU staff say: “We tried with emergency funds to implement the main investments: (1) the main carrier; (2) replacement of 95% of the network and (3) brackish water desalination plants. But since 2002, there have been only “band-aids”.

With the deterioration in the political and security situation, only emergency projects were being implemented in November 2008. Records of 54 water and sanitation projects for Gaza show how implementation was being affected in November 2008 by delayed approvals and closures (**World Bank, 2009**).

CMWU operates some 155 water wells, 33 sewage pump stations, and three treatment plants. Ten of the wells run on fuel, and the others on electricity. Diesel-powered generators are used as a back-up system in the event of electricity disruptions. In March, 2007 an earth embankment around a sewage reservoir in the northern Gaza Strip collapsed spewing a river of waste and mud that killed at least five people.

Since June, 2007 CMWU has been unable to perform normal functions because it does not have spare parts (**Najjar, 2008**).

3.2 Existing Water Situation:

Gaza Strip is a semi-arid area of about 365 km² located along the southeastern part of Mediterranean sea over a distance of approximately 45 km long and 7 to 12 km wide. One of the primary concerns of the people in Gaza is having sufficient water to assure their economic and social development both now and in the future (CMWU, 2008).

The main source of water in Gaza Governorates is the groundwater which is confined in the coastal aquifer which is divided into three sub-aquifers composed mainly of sand, sandstone and pebbles of Pleistocene age. The sub-aquifers overlie each other and are separated by impervious silt clayey layers and /or impervious clayey layer. The thickness of the aquifer in the eastern boundary is about 10m and increasing gradually to about 150m thick in the northwestern area along the coast. The water bearing horizons are underlined by impermeable marl clayey layers of Pliocene age. Water level of the aquifer system is ranging between 10m and less than 2m above mean sea level in the southeastern area and along the coastal line respectively. Depth to water ranges between 90m in the east and less than 8m in the west. The permeability of the aquifer is ranging between 700-1000m²/day while porosity is about 25%.

This has led to depletion of the available ground water quantities and reduction of groundwater storage as well as the degradation of groundwater quality. In most of the area chloride and/or nitrate content of domestic water exceeds the WHO recommended limit as shown in table 3.1 (CMWU, 2008).

Table 3.1: Chloride and Nitrate concentration in the pumped water used for domestic purposes (CMWU, 2008)

Area	Total annual pumped water for domestic use (x106 m3)	Cl < 250 Ppm (%)	NO3 < 50 ppm (%)
Northern Area	17.26	90	10
Gaza City	29.6	30	8
Middle Area	9.46	8	81
Khan Yunis	12.25	30	47
Rafah	6.56	10	5

A major problem is water quality, with high concentrations of salts and nitrates, compounds that are difficult and costly to remove from drinking water supplies.

Between 5% and 10% of water supplied through the network meets potable standards. The poor quality is linked to aquifer overdraft, and to pollution from wastewater seepage and infiltration of agricultural fertilizers. As a coping strategy, the Gaza market has responded by providing private desalination. There are at least 40 private desalination plants selling both wholesale by tanker and retail by jerry can, producing about 2,000 m³ a day where about 20 of these plants are licensed by PWA although there is no capacity to monitor the distribution system of such small scale plants. Hundreds of trucks are transporting and distributing this desalinated water and thousands of small tanks exist at the small shops and supermarkets.

Importantly, this water lacks the basic minerals since the majority of minerals are removed by the reverse osmosis process. Unfortunately, this approach of reducing minerals became the competitive criterion among the private sector desalination plants **(World Bank, 2009)**.

Presently 5mcm/y of potable water for domestic use is purchased from Mekerot (Israeli water supply Company).

Two beach well seawater RO desalination plants have been already proposed by PWA and one at Deir Al Balah beach was completed and producing about 0.25 MCM/Y (Austrian Fund), where the other at Beit Lahia beach is still under construction. These two plants are considered also as new water resources that will provide when completed additional 2.25×10^6 m³/y of fresh potable water to the Gaza Strip for drinking.

The available fresh groundwater resources in the Gaza Coastal Aquifer that can be used for domestic uses and fit with the recommended WHO guidelines in terms of water quality is in the range of 15% of the total aquifer capacity. At the present, most of the domestic municipal water produced is far away from the acceptable level. Figs. 2.1& 2.2 show both chloride and nitrate concentration of the pumped water from the municipal wells in Gaza Strip (CMWU, 2008).

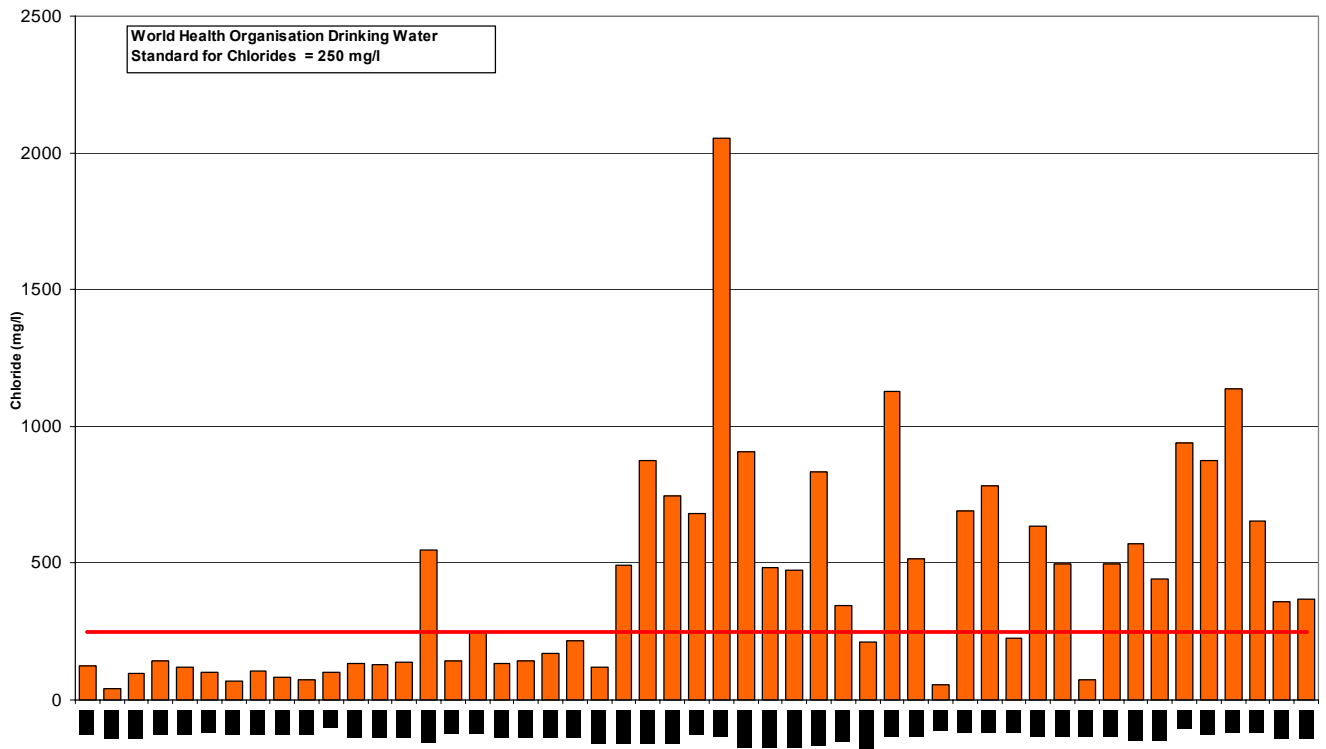


Fig.3.1: Chloride Concentration of Domestic Municipal Wells in Gaza (CMWU, 2008)

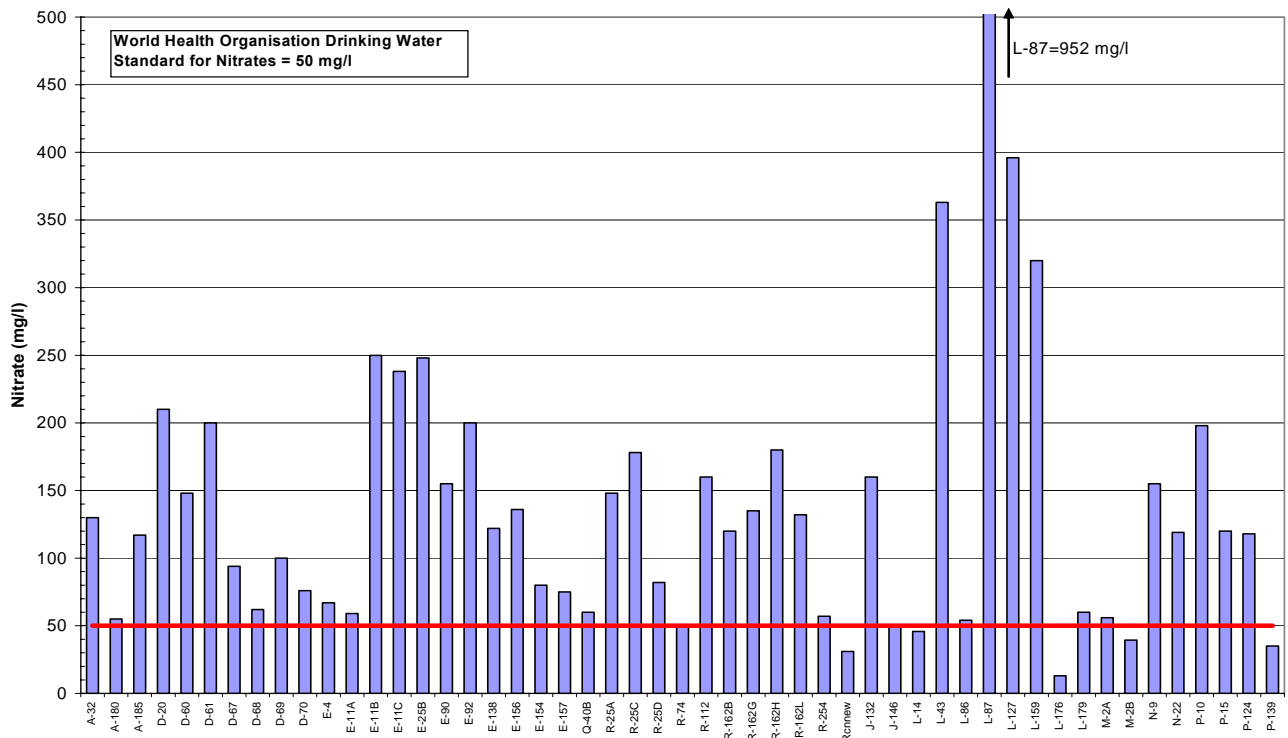


Fig.3.2: Nitrate Concentration of Domestic Municipal Wells in Gaza (CMWU, 2008)

3.3 Existing Sanitation Situation

The coverage of wastewater networks all over the Governorates in Gaza Strip is shown in the below table.

Table 3.2: Wastewater networks coverage in Gaza Strip(CMWU, 2008)

Governorate	Population capita	Coverage %	Wastewater production m³/day
North Area	298125	68.51%	16,340.58
Gaza	546959	79%	48,242.80
Middle area	223679	64%	11,419.68
Khanyounis	299918	20.60%	4941.55
Rafah	183649	59.79%	8,783.94
Total	1552330	61.26%	106,069.13

There are three treatment plants in Gaza Strip:

➤ **Beit Lahia wastewater treatment plant**

The existing Beit Lahia wastewater treatment plant was constructed in 1979. the treatment plant consists of two pond(settling and anaerobic ponds) , two aerated lagoon, two settling lagoon and one polishing lagoon , the influent is passing through a channel for screening and grit removing the discharge of the treatment plant disposed to a big neighbor ground (sandy dunes) where it forms a wastewater lake (CMWU, 2008).

➤ **Gaza wastewater treatment plant**

The existing Gaza wastewater treatment plant was constructed in 1979 initially with two ponds, In 1986, two additional ponds were add under an UNDP funded plant upgrading. A rehabilitation project for the Gaza plant was also completed under the Gaza Municipality and UNRWA in 1996. After the rehabilitation, the capacity of the plant was supposed to be 12000 m³/day, which was not sufficient at the time of finishing the rehabilitation. In 1998 the plant has been rehabilitated again by the USAID to meet the needs of the population of Gaza governorate in 2005 with total wastewater inflow of 35,000 m³/day. The quality has been highly improved. The current inflow of the treatment plant 45000 m³/day, which exceeds the capacity of the plant.

Now the plant is in need for new enlargement to cope with the capacity of the repaid increase of the inflow, which is expected to reach more than 70,000 m³/day by 2015

The treatment plant consists of three anaerobic pond, one aerated lagoon, two bio-towers final settling lagoon, sludge pond, and sludge beds **(CMWU, 2008)**.

➤ Rafah wastewater treatment plant

The wastewater treatment plant in Rafah consist of a screening and grit removal channel and one big aerated lagoon , the effluent of the treatment plant pumped to the sea via a pumping station and three kilometer pressure line **(CMWU, 2008)**.

Currently, about 60% of Gaza households are connected to a sewerage network, and there has been some investment in upgrading and extending treatment plants, although the proposed new plants have not been constructed. The system is currently encountering massive problems in both operations and in planned upgrading.

The three existing wastewater treatment plants function intermittently, so little sewage is being treated and most is returned raw to lagoons, wadis and the sea. The Gaza City treatment plant has been overloaded way beyond capacity.

Unconnected households use cess pits and in the current economic climate they are not being properly emptied (World Bank, 2009).

At Khan Younis, for example, cess pits have been releasing foul water into the aquifer, and also flooding on the roads. Typically, most emptying is by municipal trucks, and there are some discharge points. However, in the current impoverished situation, emptying by truck is too expensive for most households (NIS 20-30 each time). In any case, the treatment plants are not capable of dealing with the extra load. At Khan Younis, a new wastewater treatment plant is planned, but is far from complete and all sewage collected is dumped in storm water drains and into the lagoon.

In Beit Lahyia the North Gaza Emergency Sewage Treatment (NGEST) project is under construction to achieve secondary treatment and ultimately aquifer recharge from partially treated effluent now stored in the notorious Beit Lahyia “sewage lake”, whose emergency lagoon embankment failed in 2007 causing a deadly sewage flood. One of the two temporary lagoons built after the 2007 accident also collapsed in March 2009 **(World Bank, 2009)**.

3.4 The Problems that put Water and Sanitation Sector in Gaza in Emergencies:

Recently, problems in Gaza water supply and sanitation have reached crisis levels, largely connected to the deteriorating economic, political and security situation. The closures led to dramatic deterioration in service provision, and the utility has been living from hand to mouth, Electricity cuts, and lack of diesel for generators, had affected water distribution and pumping up to household reservoirs. All conditions worsened with the December 2008/January 2009 military offensive, with few of the materials needed for emergency maintenance being cleared by the Israeli military, and photographic evidence of installation of one consignment being required before a further consignment is authorized. Fundamental change in the political and security situation is needed to create an environment for renewed investment **(World Bank, 2009)**.

The Problems affected the sector are as follows:

1) Closures:

The closures were having a major impact on water supply. In November 2008, most water wells had stopped because of lack of spares, others were working at half capacity **(World Bank, 2009)**.

The Gaza Strip has 5 main crossings and entrances that link it to outside world. Among those, 3 entrances are used for commercial exchanges. Sofa Crossing is located on the north eastern part of Rafah city and it is specialized for entering building materials, especially aggregate. Most of building projects (including sector projects such as the Phase I of the North WWTP) were stopped or suspended as a result of the closing of

this crossing since the beginning of 2006. The closure of this crossing affected also the prices of building materials which increased rapidly as a result.

Al-shajaeya “Karni” crossing is the main commercial crossing, located on the east of Gaza City. This major crossing is closed most of the time in recent months, affecting directly the availability of basics such as medicines, energy, food products and other essential goods. Humanitarian supplies were also restricted during that period. Essential pipe materials and spare parts purchased by the CMWU under the Gaza Emergency Project (World Bank) could not be delivered until recently. The effects of closure of this crossing are one of the major causes of the deteriorating situation in the Gaza Strip (**Jansen and consulting team, 2006**).

2) Shortage in fuel and energy resources:

The Palestine General Petroleum Company (GPC) is a company owned by the Palestinian Authority (PA) that imports fuel (including benzene, diesel and gas) into the Gaza Strip through its Israeli counterpart "Dor Energy" using Al-Montar “Nahal Oz” pipelines. Shortage of diesel in some municipalities in Gaza Strip affected directly pumping of drinking water to people (**Coastal Municipalities Water Utility, 2008**).

The CMWU also reported that the operation of brakish water desalination plants (Middle Area, Khan Younis) and seawater desalination plants (Deir El Balah plant) is reduced due to shortage of fuel. For instance, the operation of the Deir El Balah plant has been reduced from 600-800 cubic meters per day to less than 250 cubic meters per day due to lack of energy. In general the CMWU estimates that despite the donation of fuel from various donors (UNDP, EU, ICRC, UNICEF), the total volume of drinking water supply to all service areas of Gaza has been reduced to 25-30%, as some well station are not equipped with backup generators (about 28 in total), and the running hours are being reduce from 20-24 hours (from the normal power grid source) to 12-16 hours.

Water and sewage pumps in Gaza run on electricity and when there is not enough electricity, they run on standby generators, which are powered by fuel. At various times, interruptions in electricity and fuel supplies have forced CMWU to stop

operating water and sewage pumps, this has had impact for the health and well-being of Gaza residents, Gaza's water system cannot afford further interruptions in electricity and fuel supplies.

In Gaza there are approximately 155 water wells, 33 sewage pump stations and 3 treatment plants. 10 of Gaza wells run on fuel, and the others on electricity. CMWU uses diesel-powered generators as a back-up for the system, in case of electricity disruptions. But it is a stand-by system that cannot operate for a long time and because spare parts for the generators are very limited or not existing, including the fuel, air and oil filters, and the ability to use the generators is also limited (**Coastal Municipalities Water Utility, 2008**).

3) Spare parts and basic materials shortage:

The continued closure, now preventing the import of pipes and other materials needed to rehabilitate destroyed water supply and sanitation systems, is therefore worsening negative impacts on Gaza's population and water institutions. It is noted that materials requested to repair damages due to the recent military offensive on Gaza are of the same type as needed for more than 18 months which have not been cleared by Israel (**World Bank, 2009**).

CMWU as service provider is suffering from severe shortages of spare parts, pumps, metal pipes, and other goods that must be obtained from outside Gaza but are delayed or are not permitted to enter at all, because of the Israeli military restrictions on the entry of goods. And because of this there is a fear of flood from sewage pump stations, water shortages, and other problems since the materials to respond to urgent needs do not exist and the ability of any preventive maintenance to make necessary repairs is very poor (**Coastal Municipalities Water Utility, 2008**).

On the other hand, the current closure policy has a direct negative impact on the operation of small RO plants and related mobile water tankers distributing good quality drinking water for most of the households in central, middle and southern Gaza (most families purchase drinking water from those water vendors, and use tap-water supply for other domestic needs such as cooking, bathing and cleaning)

The same problem occurred for sanitary facilities where now many pumping stations in a need to spare parts, generators and stand-by pumps. And this affects the efficiency of the system and puts the facilities under the risk of failure at any time (**Jansen and consulting team, 2006**).

4) Economic decline, security and impact on municipal water services:

The economic situation and households' incomes have deteriorated very rapidly in recent months, and more generally since the second Intifida started. With the current closure and the Israeli measures, it is expected that the situation will even deteriorate further.

In general, the situation in the Gaza Strip is worsening. This negatively affected access for humanitarian operations as well as the investment climate for donors to operate in Gaza. Internal conflict between Gazan families and tension between Fatah and Hamas movements added to the general insecurity and instability created by the Israeli Operations (**UNICEF, 2006**)

5) Stopping and freezing of projects

Financial aid to the Palestinian National Authority (PNA) has been suspended by almost all international community and countries that used to provide support to Palestinians previously. This came in the wake of the Palestinian legislative council elections that were held last January and resulted in the victory of the Islamic Resistance Movement (Hamas) and the subsequent formation of the Palestinian government by them. Most of the countries that provided financial support previously tried to compensate for their decision to cut aid to the PNA by providing humanitarian assistance through United Nations institutions (such as UNRWA or UNDP) and through non-governmental international and local organizations. As a result, all services provided by the Palestinian Authority are directly affected (**UNICEF, 2006**).

UN agencies reported in November 2008 that even work on smaller “relief” projects was impossible. UN agencies have a very large number of smaller “relief” projects suspended; in November 2008, contracts were being cancelled and engineers laid off (**World Bank, 2009**).

In general, it is very difficult for the local and international NGOs to take the role of the Palestinian Authority and provide the needed services. All sectors in the Palestinian area were affected including the water and wastewater sector. For instance, essential projects such as the USAID funded Water Carrier Project and Regional Seawater Desalination Plant has been suspended. Several donor-funded pre-agreement or proposals of interest for donors (such as the Finland Rafah Emergency Water Project) have not been confirmed for financing and implementation in the post-election period. Several EU-pledged water sector projects under the Facility Infrastructure Unit have also been suspended (**Jansen and consulting team, 2006**).

CHAPTER 4

CASE STUDIES

Case Study No.1: UM Al-Nasser Disaster- March, 2007

Case Study No.2: Israeli Offensive Operation on Gaza- from 27 December, 2008 to 18 January, 2009

Case Study No.1

UM Al-Nasser Disaster on March, 2007

- 4.1 Background
- 4.2 Emergency Response
- 4.3 Coordination activities
- 4.4 Recovery actions
- 4.5 Evaluation of emergency management in this case study

4.1 Background

1) Existing sewage treatment works:

The existing Beit Lahia wastewater treatment plant is located some 1.5 km east of the town of Beit Lahia in the northern part of Gaza. It was constructed in stages, commencing in 1976 during the Israeli occupation, and modifications were made in 1996 as a result of increased sewage inflow. The plant serves the town of Jabalia, as well as nearby refugee camps and the municipalities of Beit Lahia (part) and Beit Hanun. The area's total population amounts of 190,000 people. The plant has no pre-treatment facilities and has a designed peak flow capacity of 5,000 m³ per day. At present, about 12,000 m³ per day passes through the plant (UNICEF, 2007).

The major aim of the plant was to produce effluent of a quality suitable for direct use in irrigation. However, as a result of the poor quality of the treated wastewater, which is far below the World Health Organization guidelines for use in agriculture, plans for transporting treated wastewater to agricultural areas were never completed. The plant is located in a closed depression without a natural outlet to the sea, although the distance to the sea is only 4.5km. The original design of the wastewater treatment plant included 4 original effluent ponds that would recharge the aquifer or evaporate. However as time passed and the volume of effluent increased, the effluent overflow has formed a lake covering 40 hectares, which has become a significant pollutant of the aquifer and a major environmental health problem for the population surrounding the lake. As a result, 14 groundwater wells are no longer being used.

The water level in this lake continues to rise and is threatening to overflow the whole sewerage system and its neighboring communities at Northern Gaza governorate. Flooding has already occurred on 2 occasions in 1989 and 1992, when sand barriers collapsed under the pressure of the foul water (UNICEF, 2007).

2) Mitigation and preparedness actions:

PWA, the northern municipalities and CMWU used to control the lake's water level to eliminate the flooding risks, therefore a sewage pumping station has been constructed in 2004 to pump the water to two infiltration basins which were originally constructed to infiltrate storm water.

The wastewater treatment plant and the adjacent disposal lake had the following main problems:

1. Increase of wastewater flow
2. Limited disposal locations
3. Potential risk of flooding in the main lake which threatening a wide area in Beit lahia city.

Therefore the Palestinian water Authority had constructed a new infiltration lagoon at the far north east of the wastewater treatment plant. This new lagoon had been operated in September 2006 .This lagoon spelled out after the destruction of the lagoon's west edge. This flooding resulted in a human disaster in the Bedoum village. The flooding caused several fatalities, health problems and resulted in substantial damage to residential buildings in Beit Lahia (**Inframan, 2007**).

According to PWA, tens of thousands of people will be affected if the lake overflows into these communities again. PWA and other local agencies have intervened in the past years to strengthen and raise the height of the sand barriers around the lake to try to prevent such flooding, but these are only temporary solutions to a gathering threat to the residents of the area. With the continued Israeli military attacks in the vicinity of the plant and surrounding lands near the lake in the recent years, concern over the structural resistance of the sand barriers and possibly damages that may occur have been raised by the PWA and donor agencies since 2005. Construction of the new plant will probably take 2-4 years. In the meantime, urgent mitigation measures were required to address the environmental problems caused by the present situation. The issue of the Sewage Lake and measures to eliminate it has been addressed by the Joint Water Committee in 2004, including the final

location of the new WWTP and related pumping, transfer and infiltration facilities. However the hostilities in 2005 and 2006 have often disrupted the construction of the Phase I facilities, both in terms to restriction to procurement of imported material and physical construction works (UNICEF, 2007).

3) Impact of the crisis on sewage treatment:

The Beit Lahia treatment lagoons currently reach as close as 50 meters to the effluent lake, and the Um-An Nasser village in the East is separated only by a narrow sand fence of around five meters. The plant receives a daily average of 10,000 m³ and this amount of sewage largely exceeds the plant's capacity, overloading to a critical level the treatment lagoons. Therefore, the effluent is spilling over the basin and into the surrounding sand dunes). The created effluent lake covers more than 450 dunums today and has become a significant source of pollution to the aquifer. Moreover, since the water is stagnant and the soil is oversaturated, it has created a layer at the bottom, which minimizes the infiltration rate day by day. As a consequence, the overflow area has been enlarged tremendously over the past several years alone.

Beside the permanent hazards to the environment and to people's health and hygiene, the treatment pools also present a significant damage threat to the surrounding areas. The consequences of spills and flooding affect not only the Um-An Nasser village, but the entire area, including Beit Lahia population of around 55,000. As a result, the risk of sewage flooding houses and land in Beit Lahia is very high at the moment, and this may cause further severe environmental, economic and health problems if no emergency intervention takes place soon to discharge some effluent to other surrounding artificial lagoons with 1000-1500 meters hectares directly affected (UNICEF, 2007).

4.2 Emergency Response:

On 29th of March ECHO and UNICEF signed an agreement to provide emergency response to the population of Um-Al-Nasser and Beit Lahia. The joint response includes 4 components:

- a) Structural works to reinforce the embankments of the main lake of the Beit Lahia wastewater treatment plants, in order to protect 15,000 residents of Beit Lahia from immediate sewage spill-off from the main sewage lagoon
- b) Immediate works to restore basic sanitary conditions and infrastructure services (water, sewage, drainage, school, and PRMS clinic) for 4,000 residents and returnees of Um Al Naser resident
- c) Awareness activities among the same population to promote basic hygiene practice and safe use of water and sanitation facilities
- d) Coordination activities with the main stakeholders including PWA/CMWU, EQA, Civil Defence, World Bank and representatives from local & international organization

The total budget for the ECHO-UNICEF joint operation was €455.000 and was to be implemented from March to August 2007.

The main implementation partner of UNICEF for this operation is the Coastal Municipal Water Utility, also supported by an International Operator (InfraMAN) through the World Bank funded Gaza Emergency Water Project. UNICEF and the CMWU signed on 29th of March a memorandum of understanding valued 553,877 USD (UNICEF, 2007).

4.3 Coordination activities:

4.3.1 Organizing of Emergency coordination meetings:

After the crises, CMWU organized several coordination meetings with regular consultation with PWA/PMU (Project Management Unit of the North Gaza Sewage Project) and concerned donors Periodic consultation with other actors such as UNICEF, ACF, UNWRA, and OCHA. Periodic consultation of the team members and monitoring of project activities

- Meetings with Governmental members and the village citizens to convince the citizens that works must be proceeded
- Work shop for the technical study outputs and recommendation discussion had been held where donors and stake holders were invited.

4.3.2 Establishment of the Emergency Response Committee:

This committee has been established to support the coordination activities undertaken by UNICEF. The members of the committee are:

1. Coastal Municipalities water utility, (Represented by Eng. Maher El Najjar)
2. Palestinian water Authority (represented by eng. Sa'adi Ali –World bank project manager)
3. manager)
4. InfraMan (CMWU Operator Represented by wastewater manager Engineer Marwan Bardawil, Team Leader)
5. Northern Common Service council. (**Inframan, 2007**).

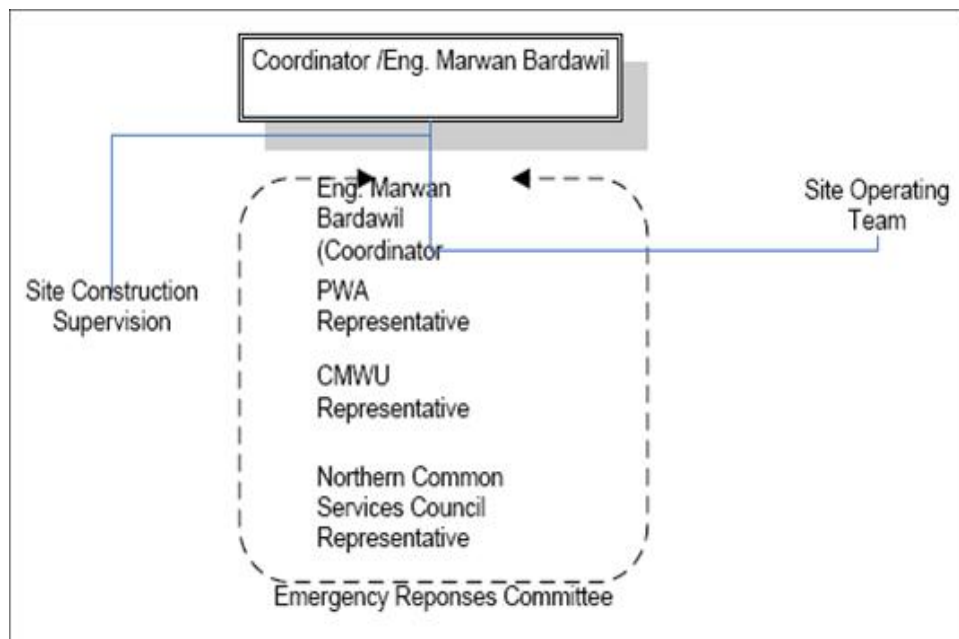


Fig. 4.1: Structure of the emergency response committee (Inframan, 2007).

The Committee coordinator reports to the CMWU – General Manager on weekly basis. The committee has a daily meeting with the presence of the international agencies who are supporting the emergency works mainly UNICEF, ICRC and ACF. The meetings agenda is:

- Works progress
- Site difficulties and difficulties
- Activities for the next day
- Assessment of the site safety and risks
- Any related issues.

Also, as part of its coordination and communication activities, CMWU has prepared and submitted monthly progress reports and evaluation reports for the Emergency Response measures at Biet Lahia.

4.4 Recovery Actions:

CMWU was in contact with Um Al Naseer municipality and its people to get them feel some comfort after protection of big lake embankment and construction of emergency lagoons.

CMWU kept in touch with the concerned parties by sharing information with them. Project management unit in PWA was working to finalize the wastewater treatment plant (CMWU, 2007).

4.5 Evaluation of emergency management in this case:

Emergency management in this case was successful, before occurring of this emergency many warnings launched in many meetings that it was very important to complete the NGEST project to evacuate beit Lahia lagoons.

Preparedness was good where CMWU has the equipments, the team and the emergency plan.

When the crises happened, response actions taken to respond to this emergency were great. All efforts came together to respond to the disaster. CMWU started directly service contracts by contacting their contractors to work immediately, coordination meetings organized and many organizations and in particular UNICEF and ACF helped CMWU to respond as detailed above.

After the emergency was over, CMWU kept in touch with the media and the partners during the following coordination meeting organized in the sector.

Case Study No.2

Israeli Offensive Operation on Gaza-from 27 December,2008 to 18 January, 2009

4.6 Background:

4.7 Situation of the sector before the cast lead operation:

4.8 Situation of the sector after the cast lead operation:

4.9 Rapid Assessment following the crisis:

4.10 Implementation Plan by CMWU and the assessment report:

4.11 Establishing of WASH cluster platform:

4.12 Response plan as per UN system

4.13 Evaluation of emergency management in this case study:

4.6 Background:

On the morning of December 27, 2008 the Israeli Forces launched the offensive military Operation on Gaza, after which the Strip was under continuous attack for 22 consecutive days further multiplying the pressure on the Strip after almost two years of strangling closure that left residents in a very fragile and vulnerable state. During the attack the water and sanitation infrastructure were hardly hit depriving many from a reliable safe water source and threatening many others from the risk of being infected with water-borne diseases as a result of water contamination by leaking wastewater.

After the Operation ceased on the January 18, 2009 CMWU in cooperation with numerous organizations and donors began the fast track rehabilitation of some of these lines in order to provide minimum services to most of the effected areas, in parallel to this the CMWU team carried out a comprehensive field survey to assess the damaged infrastructure of the water and sanitation infrastructure including wells, reservoirs, networks, pumping stations and treatment plants **(PHG, 2009)**.

Few days after the cease fire, a meeting for the organizations working in water and sanitation sector in Gaza was held in order to present the draft Damages Assessment Report prepared by CMWU for all water and wastewater infrastructure and facilities which had been damaged during the Israeli Military Offensive on Gaza Strip, which lasted 22 days of the Palestinian infrastructures destructions **(CMWU 2, 2009)**.

After CMWU' report was issued, and complimentary to this effort the Palestinian Hydrology Group took the initiative to conduct an assessment survey in the sector on a household level mainly aiming to identify the damage and help direct the interventions to meet the most urgent needs in the Strip on a household level.

From the findings it was realized that the damage on a household level is substantial for the roof tanks, solar heaters and household water supply connections **(PHG, 2009)**.

4.7 Situation of the sector before the offensive military operation:

1) Mitigation actions: all responsible bodies conducted reviews before occurring of this emergency, since the media at that time was talking of probability of offensive operation on Gaza. In the coordination meetings, worse case scenarios were studied, the ability of the concerned bodies and in particular CMWU was discussed, list of supplies needed was prepared, previous incursions were reviewed, and the monitoring system of CMWU for all its facilities was established since many years.

2) Preparedness phase: because of all problems of the sector, and in particular the closures, CMWU stated that they were not prepared to response to any large scale emergency in terms of supplies and spare parts, but in terms of facilitation of the decisions making, response team, communication and coordination they were ready **(UNICEF, 2008)**.

4.8 Situation of the sector during and after the offensive military operation:

There were an estimated 500,000 people without access to a safe and adequate water supply. Gaza consists primarily of densely populated urban areas, and the collapse of water and sanitation services therefore poses a particularly dangerous public health risk for the population. The damage to some of the sewage networks and pumping stations has affected thousands of people. Large quantities of raw sewage contaminated an area around Sheikh Ajleen/Gaza City Wastewater Treatment Plant, and it is feared that the aquifer has been contaminated in this area.

The shortage of drinking water and overflowing sewage in residential areas, creating the conditions for cross-contamination between water and wastewater networks is an imminent public health risk. **(UN, 2009)**.

Immediate assistance is needed to repair, and rebuild the water and sewage infrastructure in order to re-establish minimum services.

Movement of people in search of water is still dangerous, particularly for women and children, due to the dangers posed by ERW. Hundreds of families have been displaced, putting pressure on water and sanitation facilities in host families, public shelters and community centres where they sought shelter. Such locations were not designed for such an additional number of people. Schools have been particularly badly affected in this regard. The restoration of water, sanitation and hygiene services at the household level is also a key priority and will encourage families to return to their homes. An estimated 21,000 homes have been damaged or destroyed, meaning people will require assistance with re-establishing services, ensuring that high levels of hygiene are met and that good hygiene practices are re-started. Meeting the specific needs of women and children in all water, sanitation and hygiene interventions will be critical in protecting public health (UN, 2009).

4.9 Rapid Assessment following the crisis:

Based on “The Palestinian National Recovery and Reconstruction Plan for Gaza 2009-2010”, in the last Israeli military actions in Gaza had the following consequences:

- Over 1,300 people in Gaza have been killed;
- 100,000 people displaced;
- At least 5,300 injured (including 1,855 children and 795 women);
- 15,000 homes damaged;
- Hundreds of thousands cut off from basic essential services such as water and sanitation, health care, food supply and markets, and even availability of cash;
- Basic infrastructure (electricity, water, sanitation, health facilities) have been badly damaged;
- Much economic infrastructure (factories, agriculture) has been destroyed or badly damaged.

Subsequently after the cessation of military operations, Coastal Municipalities Water Utility (CMWU) carried out a rapid assessment of the extent of damages to the water and sanitation facilities in Gaza and produced Damage Assessment Report – Water and Wastewater Infrastructure and Facilities (Gaza: 27 Dec. 2008 – 18 Jan. 2009). The assessment is focussed on the water production sites, transmission and distribution networks, sewage networks and pumping stations, and sewage treatment plant (**Dongol, 2009**).

4.10 Implementation Plan by CMWU and the assessment report:

CMWU had proposed an implementation plan to re-establish the water and waste water facilities to the normal services especially in the most affected areas (Northern area, Gaza city and Rafah) by proposing three tracks (Fast, Intermediate and Long Term Plans) and as time passing, the first stage was started directly after the offensive operation, the other two tracks is still under document preparation and fund appraisals. These two tracks are also important as well as the fast track, where it will secure water and waste water to re-allocated peoples and it will be in parallel to the Gaza housing reconstruction projects (**CMWU 2, 2009**).

The report prepared by CMWU as mentioned above, spells out three stages of implementation strategies;

i) Fast tract: This track concerns in the re-establishing some of the main water and sewage carriers damage in order to provide minimum services to the most affected areas especially in the Gaza and Northern area. This track has been fully supported by our partners UNICEF and ICRC who allocated a direct emergency budget beside GEWP World Bank finance in order to repair damages.

Following the crisis, The Coastal Municipalities Water Utility in Gaza carried out a rapid assessment. Accordingly, the summary of damages assessed is as below:

- i) A total 9 wells have been partially damaged that include two in Bait Hanoun Area, two in Bait Lahia Area and five in Gaza Area, and two well facilities in Nawar Well Group in Jabalia Area have been completely damaged.
- ii) A total of four water reservoirs have been damaged. These reservoirs are located in North Jabaila, Gaza Johr Deek, Middle Mogruga and Middle Wadi Salqa and are of capacities 350 cum except for North Jabaila which is 5,000 cum.
- iii) A total of 19,920 metre of pipes (type PE, UPVC and Steel, sizes 50 mm to 315 mm) have been damaged these include 11,140 from North, 3,200 m from Gaza, 230 m in Middle, 1,020 m in Khan Younis and 4,330 m in Rafah governorate.
- iv) Sewerage networks and sewage pumping stations at four locations Beit Hanon, Beit Lahia, Gaza and Gaza wastewater treatment plant have been damaged.
- v) North Gaza Emergency Sewage Treatment (NGEST) has been damaged. The extent of damages includes service room, control room, and piping system.

The damages can e seen in the maps as in fig. 4.2 and 4.3.

ii) Intermediate Tract: The concept of this track will be in areas where partially destruction of the water and waste water facilities by preparing project packages from the assessment damages data sheet for bidding as National Shopping. The finance of these projects will be part of World Bank support under GEWP and other donors (QRC, UNDP, UNICEF, ACF, etc.)

iii) Long term Plan: Some of areas have been totally destroyed buildings, water and waste water infrastructure and other facilities. These areas are mostly in Beit Lahia, Jabalia, Beit Hanoun, part of Zaitoun area in Gaza city, south of Rafah and Eastern Villages. Those areas needs a complete water and waste water infrastructure which may require re-designing the networks based on the new population in the area. The design will take place during debris removal and in cooperation with Ministry of Housing. These projects will be formulated to be financed through GEWP - World Bank and CMWU other partners **(Dongol, 2009).**

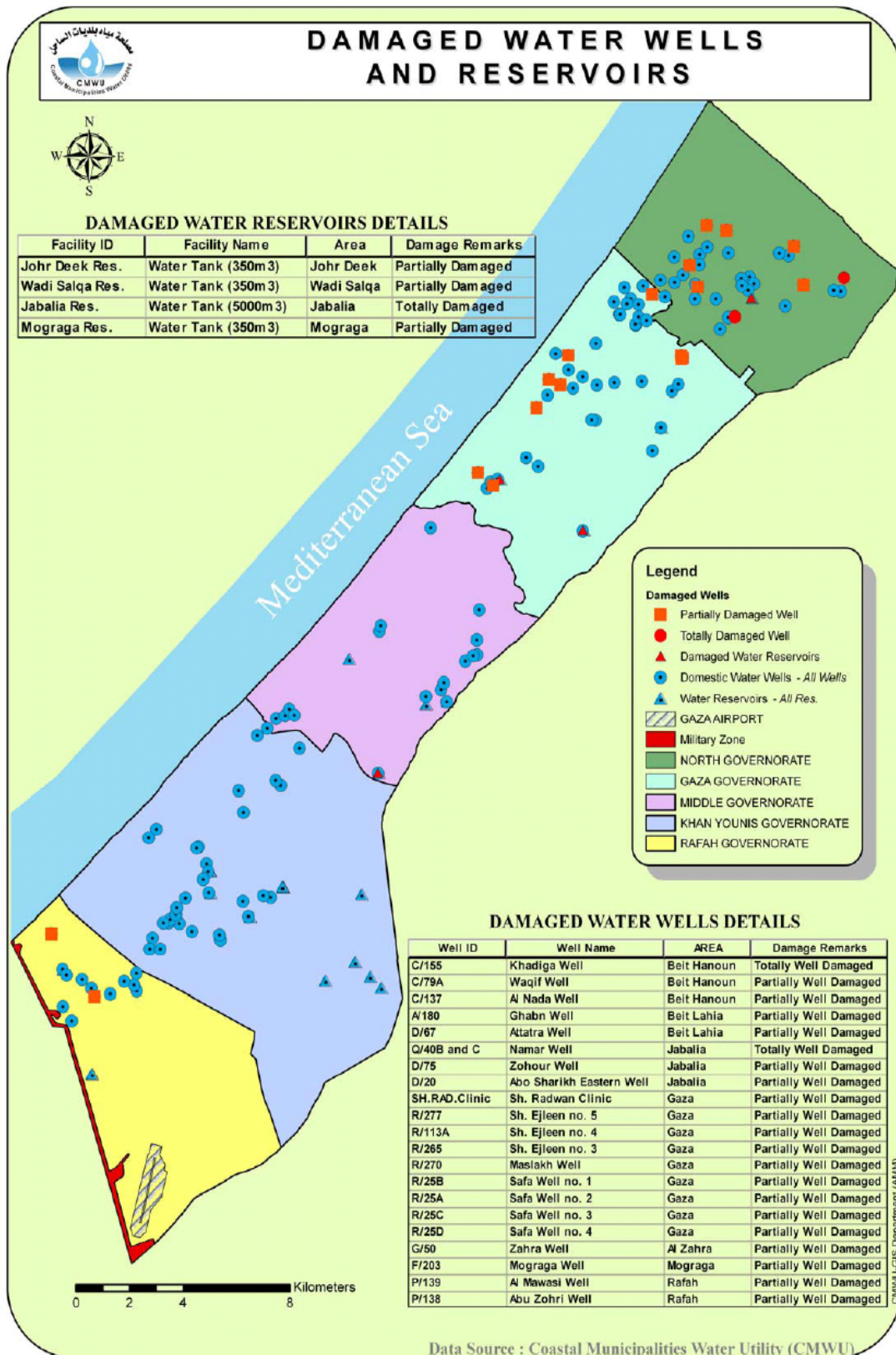


Fig. 4.1: Damaged water wells (Dongol, 2009)

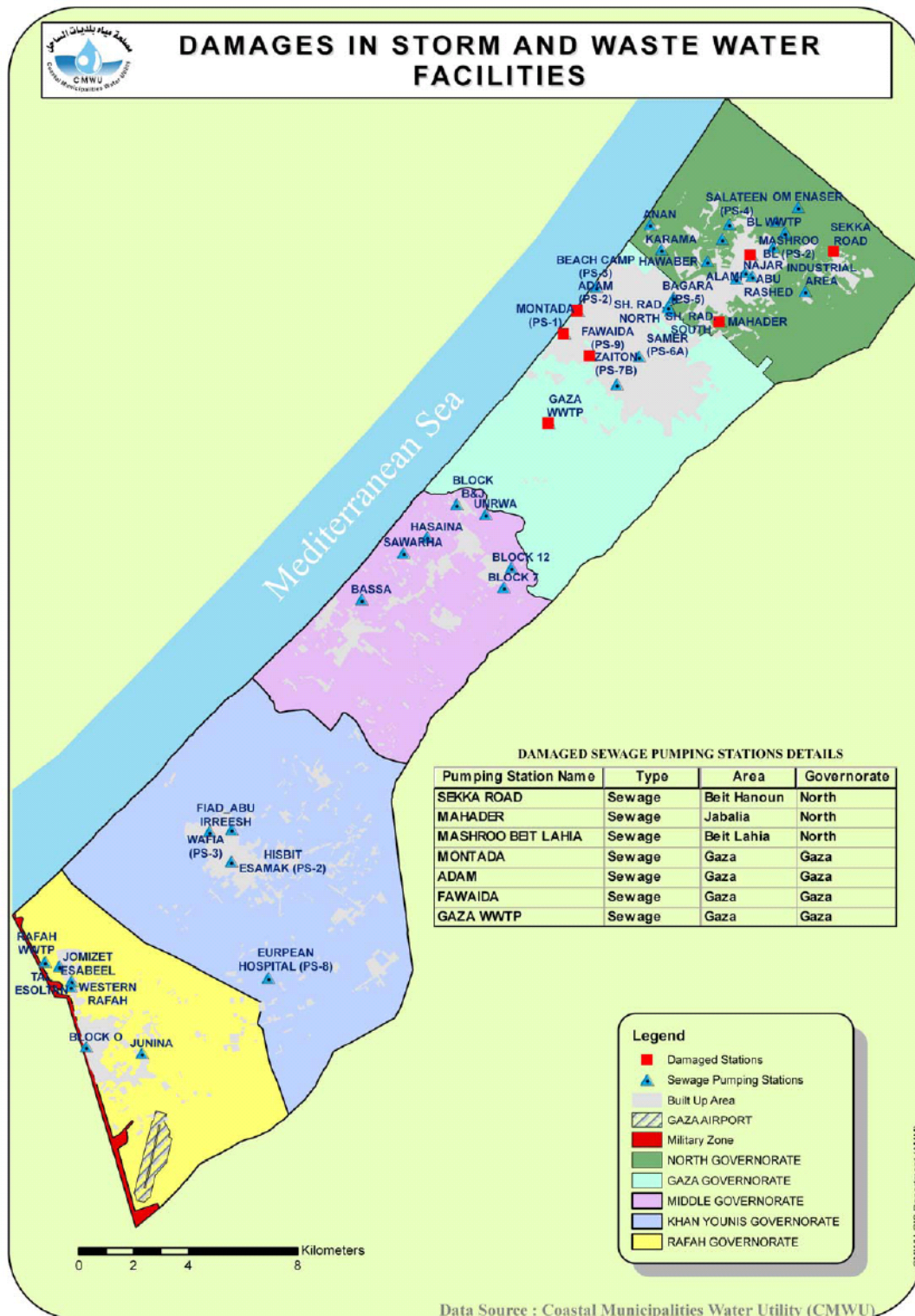


Fig. 4.2: Damages in storm and wastewater facilities (Dongol, 2009)

4.11 Establishing of WASH cluster platform:

Following the request of the UN Country Team and humanitarian partners in the Palestinian Territory, UNICEF has assumed its responsibility as the WASH Cluster Lead Agency.

The aim of the WASH Cluster is to strengthen the humanitarian response through partnership in order to achieve better prioritization of available resources.

The development of the Water Sanitation and Hygiene (WASH) Cluster from the water sector group provides an open formal platform for all emergency WASH actors and working together, the development of a workplan which addresses the key gaps as identified both by those key actors, but also verification from the field. The cluster approach presents many opportunities to bring the sector as a whole closer together in ensuring a predictable, effective, timely and coherent WASH humanitarian response (OCHA, 2009).

Lead Agency: UNICEF

Members: CMWU, PWA, Ministry of Education (MoE), ACF, CARE, CHF, *Gruppo Volontariato Civile* (GVC), House of Water and Environment (HWE), IRC, save the children, UNDP, UN-HABITAT, UNICEF, UNRWA.

The sector's overall response strategy is to ensure adequate provision of water and sanitation facilities to IDPs, host families, refugees, women and children through water tankering, domestic water storage, disinfection tablets, appropriate sanitation, sanitary towels, soap, hygiene educational materials and appropriate training. The sector response will contribute to the emergency repairs to existing WASH infrastructure. In addition, the sector will ensure a clean environment through the provision of adequate waste management practices, including environmental clean-ups and contributing to environmental impact assessments. All activities of the sector players will be guided by internationally accepted minimum standards (OCHA, 2009).

4.11.1 Objectives:

Provide minimum vital supply of safe water, and support the reestablishment of minimum water, wastewater and sanitation services to prevent public health risks in conflict-affected populations.

Estimated beneficiaries will include the entire population of the Gaza Strip, up to 1.4 million people, with emphasis on refugees, IDPs, women, children and other vulnerable groups.

4.11.2 Activities:

1) Coordination

- Coordinate the WASH response, organise and implement effective interventions using the
- Cluster approach in conjunction with the existing e-WASH platform.

2) Needs assessment

- Assess the damage to existing water and sanitation facilities, in both rural and urban contexts and identify needs for immediate interventions.
- Assess any needs for emergency water supply and excreta disposal facilities in community centres, relocation sites, IDP and host families and schools.
- Assess the damage to water and wastewater infrastructure with the authorities.

3) Provision of safe water supplies

- Provide the appropriate means for the safe treatment, transportation and storage of water at household level.
- Provide safe water via water tankers and set up of distribution points.
- Rehabilitate damaged/contaminated private wells and re-establishing private desalination services for the population.
- Undertake emergency repair of water and wastewater networks **(UN, 2009)**.

4) Improve sanitation and hygiene and promote good hygiene practices

- Provide soap and other basic hygiene supplies, including special kits for children, menstruating women and other groups with specific needs, in coordination with the Shelter Cluster.
- Disseminate key hygiene messages on hand washing, safe excreta disposal, safe water and food storage and handling.
- Create community-based health groups, and training of hygiene promoters.
- *Wastewater and solid waste management*
- Rehabilitate existing damaged toilets and sewage systems at the household level.
- Emergency repairs to wastewater infrastructure and wastewater removal campaigns at a community level.
- Re-establish minimum refuse collection/disposal services in conjunction with communities.
- Manage solid waste in welfare centres and relocation sites.
- Provide technical support for large-scale rubble clean-up operations focusing on recycling and re-use.

4.11.3 Expected Outcomes:

- Priority areas and scale of interventions are identified.
- Safe water is available to satisfy the immediate needs of the affected population.
- Community centres, family centres, relocation sites, IDP and host families and schools and kindergartens have access to water and sanitation services.
- The affected population has access to soap and other basic hygiene supplies, and practice hand washing, safe excreta disposal, safe water and food storage and handling.
- Damaged water & wastewater systems are repaired and patched up to provide minimum services.
- Minimum refuse collection services are functioning, and the environmental clean-up has started (UN, 2009).

4.12 Response plan as per UN system:

Prior to the offensive operation, a Consolidated Appeal had recently been completed, based on an in-depth needs analysis, to respond to anticipated humanitarian needs in oPt during 2009. The Gaza Flash Appeal has since been developed by clusters/sectors based on needs assessments undertaken immediately after the war.

Access to Gaza has remained difficult despite the recent truce and information was gathered by local staff in Gaza in close liaison with partners based in Jerusalem and Ramallah. On January 22, the Emergency Relief Coordinator, at the request of the Secretary-General, initiated a supportive rapid field assessment undertaken by a high-level team. The Gaza Flash Appeal contains projects to meet immediate humanitarian needs for nine months, as well as a limited number of early recovery projects to re-establish basic services and to prevent irreparable loss of livelihoods. Proposed projects will focus on:

1. Direct relief;
2. Beginning livelihood recovery; and
3. Infrastructure repairs necessary to deliver humanitarian aid or directly address humanitarian needs.

A fundamental aim is to try to restore a measure of normality to Gaza by stabilizing the lives of children, who compose 56% of the population. In parallel with the Gaza Flash Appeal, an assessment of needs for a 24-month period will be completed by the Early Recovery cluster. The assessment will form the basis for the development of the Palestinian Early Recovery Rapid Damage and Needs Assessment Report and Planning & Response Framework for Gaza. It will build on the initial humanitarian response presented in this appeal to ensure the reliable continuity of services and provide a basis for future recovery and development (UN, 2009).

4.13 Evaluation of emergency management in this case:

This emergency was too strong, where the Israeli operation lasted for 22 days and Gaza was under heavy attacks that cause great destruction.

Before 27 December, 2008, many coordination meetings were organized to assess the ability of the service provider to respond.

Preparedness in terms of human resources was good, but in terms of materials and spare parts preparedness wasn't enough because of closures.

The response was quick and good in spite of all the surrounding circumstances, each organization had a role to help, direct payments provided to CMWU, flash appeal was prepared and projects directly started with the available materials.

CHAPTER 5

RESEARCH METHODOLOGY

- 5.1 Introduction:
- 5.2 Research Methodology:
- 5.3 Data Collection:
- 5.4 Research Tools:
- 5.5 Research Design:
- 5.6 Research Population:
- 5.7 Research Location
- 5.8 Pilot Study
- 5.9 Questionnaire Design and Content:
- 5.10 Validity of the Questionnaire:
- 5.11 Structure Validity of the Questionnaire:
- 5.12 Reliability of the Questionnaire:
- 5.13 Sample Kolmogorov-Smirnov Test:
- 5.14 Statistical Manipulation:

5.1 Introduction:

This chapter describes the methodology that was used in this research.

Also this chapter introduces the information about the research design, research population, research location research, questionnaire design, statistical data analysis, content validity and pilot study.

5.2 Research Methodology:

The adopted methodology in this research is descriptive analytical. Data for the situation of the water and sanitation sector and its problems in Gaza was gathered from interviews and reports, two real case studies were presented to describe the management of the sector in emergencies as examples, and a questionnaire was designed to assess the management of the sector in emergencies.

5.3 Data Collection:

5.3.1 Primary Data:

The data is collected here through developing a questionnaire to assess the management of water and sanitation sector in emergencies, and presenting of two real case studies in the sector as examples of management in emergencies.

5.3.2 Secondary Data:

The data is collected here depending on reviewing of: available reports and in water and sanitation sector in Gaza, papers, previous studies and books, and conducting interviews with some concerned people in the sector.

5.4 Research Tools:

- a. Questionnaire
- b. Case studies
- c. Interviews
- d. Reports, books and previous studies.

5.5 Research Design:

The first phase of the research thesis includes identifying and defining the problems and establishment objective of the study and development research plan.

The second phase of the research includes a summary of the comprehensive literature review where literature on emergency management was reviewed.

The third phase of the research included a field survey which was conducted in management of the water and sanitation sector in Gaza Strip in emergencies.

The fourth phase of the research focused on the modification of the questionnaire design, through distributing the questionnaire to pilot study.

The purpose of the pilot study was to test and prove that the questionnaire questions are clear to be answered in a way that help to achieve the target of the study. In addition, it was important to ensure that the information received would be useful in achieving the research objective. The questionnaire was modified based on the results of the pilot study.

The fifth phase of the research focused on distributing questionnaire. This questionnaire was used to collect the required data in order to achieve the research objective. 50 questionnaires were distributed to the research population but 45 questionnaires were received.

The sixth phase of the research was data analysis and discussion. Statistical Package for the Social Sciences, (SPSS) was used to perform the required analysis. The final phase includes the conclusions and recommendations. Figure 5.1 shows the methodology flowchart, which leads to achieve the research objective.

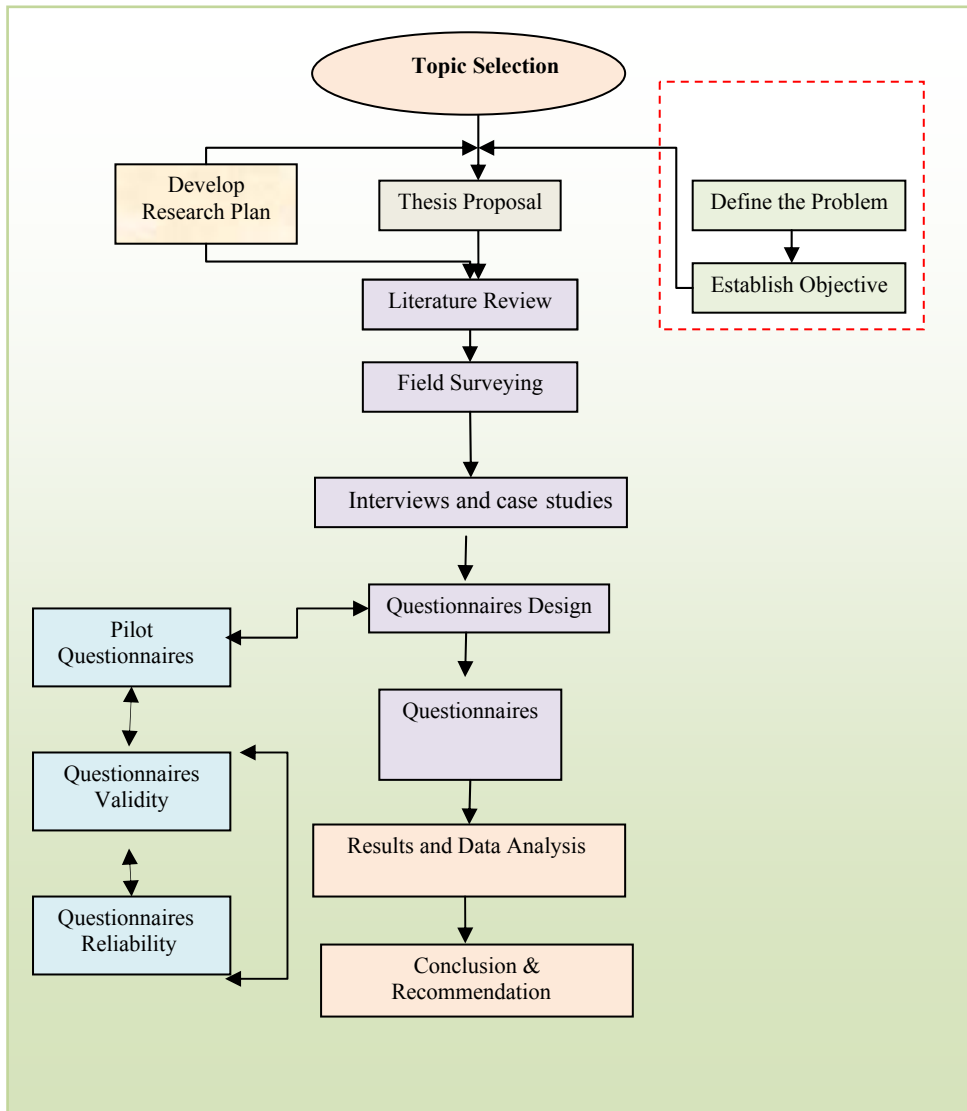


Figure 5.1: Illustration of the methodology flow chart.

5.6 Research Population:

The population of research will be the employees and responsible people in the organizations that are working in water and sanitation sector in Gaza Strip. These organizations are:

- PWA,
- CMWU and municipalities,
- UN organizations; UNICEF, OCHA, UNRWA, WHO, UNDP, UN-Habitat.

- International organizations; ACF, CARE, GVC, International Relief, OXFAM, Save the children, Islamic Relief, CHF, and International Relief and Development.
- Local organizations; PHG, Maan and IWE

The research will use comprehensive universal survey for all these persons. Therefore the number of employees being surveyed is 50.

To ensure good representation of each stratum, the percentage of representation within strata was calculated as shown in Table no. (5.1)

Table no. (5.1): Classification of sample size

Number of (population/sample)	Number of distributed questionnaires	Number of respondents	Number of valid respondents	percentages
50	50	45	45	90.0%

5.7 Research Location

The research was carried out in Water and sanitation sector in Gaza Strip.

5.8 Pilot Study

It is customary practice that the survey instrument should be piloted to measure its validity and reliability and test the collected data. The pilot study was conducted by distributing the prepared questionnaire to panels of concerned people working in the water and sanitation sector to have their remarks on the questionnaire.

Ten persons representing two panels were contacted to assess the questionnaire validity. The first panel, which consisted of eight persons in water and sanitation sector, was asked to verify the validity of the questionnaire topics and its relevance to the research objective. The second panel was asked to identify that the instrument used was valid statistically and that the questionnaire was designed well enough to provide relations and tests among variables.

Persons' comments and suggestions were collected and evaluated carefully. All the suggested comments and modifications were discussed with the study's supervisor before taking them into consideration. At the end of this process, some minor changes, modifications and additions were introduced to the questions and the final questionnaire was constructed.

5.9 Questionnaire Design and Content:

According to the review of literature and after interviewing experts who were dealing with the subject at different levels, all the information that could help in achieving the study objectives were collected, reviewed and formalized to be suitable for the study survey and after many stages of brain storming, consulting, amending, and reviewing executed by the researcher with the supervisor, a questionnaire was developed with closed and open-ended questions.

The questionnaire was designed in the English language (appendex 1), as all members of the target population were familiar with the English language. Unnecessary personal data, complex and duplicated questions were avoided. The questionnaire was provided with a covering letter which explained the purpose of the study, the way of responding, the aim of the research and the security of the information in order to encourage high response.

The questionnaire design was composed of fifth sections to accomplish the aim of the research, as follows:

1. The first section contained General information about the population.
2. The second section contained information of mitigation phase actions.
3. The third section was about preparedness for emergencies.
4. The fourth section was about Response Phase actions.
5. The fourth section was about Recovery Phase process.

And all questions follow Likert scale as the following:

Level	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
Scale	5	4	3	2	1

5.10 Validity of the Questionnaire:

Validity refers to the degree to which an instrument measures what it is supposed to be measuring (**Pilot and Hungler,1985**). Validity has a number of different aspects and assessment approaches. There are two ways to evaluate instrument validity: content validity and statistical validity, which include criterion-related validity and construct validity.

5.10.1 Content Validity of the Questionnaire:

Content validity test was conducted by consulting two groups of concerned people. The first was requested to evaluate and identify whether the questions agreed with the scope of the items and the extent to which these items reflect the concept of the research problem. The other was requested to evaluate that the instrument used is valid statistically and that the questionnaire was designed well enough to provide relations and tests between variables. The two groups did agree that the questionnaire was valid and suitable enough to measure the concept of interest with some amendments.

5.10.2 Statistical Validity of the Questionnaire:

To insure the validity of the questionnaire, two statistical tests should be applied. The first test is Criterion-related validity test (Pearson test) which measures the correlation coefficient between each paragraph in one field and the whole field. The second test is structure validity test (Pearson test) that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all the fields of the questionnaire that have the same level of similar scale.

5.10.3 Criterion Related Validity

Internal consistency of the questionnaire is measured by a scouting sample, which consisted of thirty questionnaires through measuring the correlation coefficients between each paragraph in one field and the whole field. The table No.(5.2) show the correlation coefficient and p-value for each field paragraph. As shown the p- Values are less than 0.05 or 0.01,so the correlation coefficients of this field are significant at

$\alpha=0.01$ or $\alpha = 0.05$, so it can be said that the paragraphs of this field are consistent and valid to be measure what it was set for.

Table No.(5.2): Correlation coefficient between each paragraph in one field and the whole field

NO.	Item	Correlation	p- value	Sig/ level
A	Mitigation phase			
1)	Concerned bodies conduct reviews to identify the risks and critical situations in water and sanitation sector.	0.622	0.001	**
2)	Concerned bodies assess the risks that are most likely to happen by order of importance.	0.681	0.000	**
3)	Concerned bodies study worst-case scenarios.	0.750	0.000	**
4)	Concerned bodies develop scenario analyses and forecasting models.	0.865	0.000	**
5)	Concerned bodies give high attention and required support to forecast the emergencies in water and sanitation sector.	0.768	0.000	**
6)	Concerned bodies study previous situations in the sector to have retrospective review of similar crises and emergencies.	0.673	0.000	**
7)	Concerned bodies arrange for expertise and identify specialists required for potential crises or emergencies in water and sanitation sector.	0.772	0.000	**
8)	Concerned bodies set up continuous monitoring systems in the sector.	0.727	0.000	**
B	Preparedness phase			
9)	Putting a definition of crises and emergencies covered in plan.	0.809	0.000	**
10)	Having a ready emergency response team for emergencies.	0.647	0.000	**
11)	Giving required support to the emergency team.	0.718	0.000	**
12)	Identifying lead-agency responsibilities.	0.481	0.015	*
13)	Determining relationships with other departments and organizations.	0.485	0.014	*

NO.	Item	Correlation	p-value	Sig/ level
14)	Putting administrative policies and procedures necessary for activating and facilitating decision making during the emergencies.	0.753	0.000	**
15)	Having facilities and crisis or emergency management centre.	0.838	0.000	**
16)	Having equipments and logistics needed.	0.794	0.000	**
17)	Determining the designated spokespersons, the target audiences, the facilities and training needs.	0.736	0.000	**
18)	Designating Partners in a contingency plan.	0.659	0.000	**
19)	Identifying the resources of infrastructure and equipments to ensure that emergency operations function smoothly.	0.703	0.000	**
20)	Identifying the resources of technology to ensure that emergency operations function smoothly.	0.733	0.000	**
21)	Identifying the human resources to ensure that emergency operations function smoothly.	0.826	0.000	**
22)	Conducting training of the team.	0.642	0.001	**
23)	Conducting regular meetings for the emergency team to forecast the emergencies.	0.831	0.000	**
24)	Testing of the plan.	0.809	0.000	**
C	Response Phase			
25)	Concerned bodies respond quickly to reduce the risks in water and sanitation sector.	0.797	0.000	**
26)	Concerned bodies activate the designed plan in the sector.	0.759	0.000	**
27)	Concerned bodies communicate effectively during the crises or emergencies in the sector.	0.841	0.000	**
28)	Concerned bodies determine the needs to respond effectively in the sector.	0.644	0.001	**
29)	Concerned bodies consider the time in determining the needs to reduce the risks in the sector.	0.728	0.000	**
30)	Concerned bodies assess the situation by assembling the required information.	0.807	0.000	**
31)	Concerned bodies determine the reliability of information sources.	0.803	0.000	**

NO.	Item	Correlation	p-value	Sig/ level
32)	Concerned bodies put forward short-term solutions to contain damages and reduce danger in the sector.	0.788	0.000	**
33)	Concerned bodies pursue to seek long term solutions for the sector.	0.736	0.000	**
34)	Concerned bodies determine how interested the media could be in the situation.	0.704	0.000	**
35)	Concerned bodies Prepare what the media needs.	0.706	0.000	**
D	Recovery Phase			
36)	Concerned bodies declare officially that the crisis or emergency is over.	0.826	0.000	**
37)	Concerned bodies Keep in touch with the media and partner organizations.	0.815	0.000	**
38)	Concerned bodies provide support to their employees who could be suffering from stress.	0.841	0.000	**
39)	Concerned bodies assess their used plans after the end of the sector crises.	0.907	0.000	**
40)	Concerned bodies have organizational learning to assess the lessons learned	0.879	0.000	**
41)	Concerned bodies use the lessons learned in the sector future plans.	0.850	0.000	**

* Correlation coefficient is significant at the $\alpha = 0.05$

** Correlation coefficient is significant at the $\alpha = 0.01$

5.11 Structure Validity of the Questionnaire:

Structure validity is the second statistical test that used to test the validity of the questionnaire structure by testing the validity of each field and the validity of the whole questionnaire. It measures the correlation coefficient between one field and all the fields of the questionnaire that have the same level of liker scale.

As shown in table no. (5.3), the significance values are less than 0.05 or 0.01, so the correlation coefficients of all the fields are significant at $\alpha = 0.01$ or $\alpha = 0.05$, so it can be said that the fields are valid to be measured what it was set for to achieve the main aim of the study .

Table No.(5.3): Correlation coefficient between one filed and all the fields

No.	Section	Correlation	p- value	Sig.level
1	Mitigation phase	0.921	0.000	**
2	Preparedness phase	0.957	0.000	**
3	Response Phase	0.921	0.000	**
4	Recovery Phase	0.899	0.000	**

** Correlation coefficient is significant at the $\alpha = 0.01$

5.12 Reliability of the Questionnaire:

The reliability of an instrument is the degree of consistency which measures the attribute; it is supposed to be measuring. The less variation an instrument produces in repeated measurements of an attribute, the higher its reliability. Reliability can be equated with the stability, consistency, or dependability of a measuring tool. The test is repeated to the same sample of people on two occasions and then compares the scores obtained by computing a reliability coefficient.

It is difficult to return the scouting sample of the questionnaire-that is used to measure the questionnaire validity to the same respondents due to the different work conditions to this sample. Therefore two tests can be applied to the scouting sample in order to measure the consistency of the questionnaire. The first test is the Half Split Method and the second is Cronbach's Coefficient Alpha.

5.12.1 Half Split Method:

This method depends on finding Pearson correlation coefficient between the means of odd questions and even questions of each section of the questionnaire. Then, correcting the Pearson correlation coefficients can be done by using Spearman Brown correlation coefficient of correction. The corrected correlation coefficient (consistency coefficient) is computed according to the following equation:

Consistency coefficient = $2r/(r+1)$, where r is the Pearson correlation coefficient. The normal range of corrected correlation coefficient ($2r/ r+1$) is between 0.0 and + 1.0 As shown in Table no.(5.4), all the corrected correlation coefficients values are between 0.0 and +1.0 and the significant (α) is less than 0.05 so all the corrected correlation coefficients are significance at $\alpha = 0.05$. It can be said that according to the Half Split method, the dispute causes group are reliable. And The results were in the range from 0.8497 and 0.9295. This range is considered high; *the result ensures the reliability of the questionnaire.*

Table No.(5.4): Half Split Method

No.	Section	person- correlation	Spearman- Brown Coefficient	p-value
1	Mitigation phase	0.8683	0.9295	0.000
2	Preparedness phase	0.8501	0.9190	0.000
3	Response Phase	0.8020	0.8901	0.000
4	Recovery Phase	0.7387	0.8497	0.000
	Total	0.8956	0.9449	0.000

5.12.2 Cronbach's Coefficient Alpha

This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The normal range of Cronbach's coefficient alpha value between 0.0 and + 1.0, and the higher values reflects a higher degree of internal consistency. As shown in Table no.(5.5), the Cronbach's coefficient alpha was calculated for the each sections. The results were in the range from 0.8995 and 0.9300. This range is considered high; *the result ensures the reliability of the questionnaire.*

Table No.(5.5): Cronbach's Coefficient Alpha

No.	Section	No. of Items	Cronbach's coefficient alpha
1	Mitigation phase	9	0.8995
2	Preparedness phase	15	0.9300
3	Response Phase	11	0.9215
4	Recovery Phase	6	0.9249
	Total	41	0.9735

Thereby, it can be said that the researcher proved that the questionnaire was valid, reliable, and ready for distribution for the population sample.

5.13 Sample Kolmogorov-Smirnov Test:

Kolmogorove- Smirnov test will be used to identify if the data follow normal distribution or not, this test is considered necessary in case testing hypotheses as most parametric Test stipulate data to be normality distributed.

Results test as shown in table (5.6), clarifies that the calculated p-value is greater than the significant level which is equal 0.05 (p-value > 0.05), this in turn denotes that data follows normal distribution, and so parametric Tests must be used.

Table (5.6): One-Sample Kolmogorov-Smirnov Test

NO.	section	Kolmogorov-Smirnov Z	P-value
1	Mitigation phase	0.804	0.537
2	Preparedness phase	0.902	0.391
3	Response Phase	0.905	0.386
4	Recovery Phase	0.926	0.358
	Total	0.788	0.564

5.14 Statistical Manipulation:

To achieve the research goal, researcher used the statistical package for the Social Science (SPSS) for Manipulating and analyzing the data.

Statistical methods are as follows:

1. Frequencies and Percentile
2. Alpha- Cronbach Test for measuring reliability of the items of the questionnaires
3. Person correlation coefficients for measuring validity of the items of the questionnaires.
4. Spearman –Brown Coefficient
5. One sample t test
6. Independent Sample T Test
7. One way ANOVA

CHAPTER 6

DATA ANALYSIS AND DISCUSSION

6.1 Data results and interpretation:

6.2 Research hypotheses:

6.1 Data results and interpretation:

6.1.1 Discussion and interpretation of each section's items:

First: Demographic characters:

- *Gender*

Table no.(6.1) shows that 77.8% from the sample are male, and 22.2% from the sample are female.

And the reason here as noted by the researcher is due to the big number of males who are working in this field comparing with the female number.

Table No.(6.1): Distribution of sample according to gender

Gender	Frequency	Percent
Male	35	77.8
Female	10	22.2
Total	45	100.0

- *Age*

Table no.(6.2) shows that 31.1% from the sample ages from 25 to 35 years, and 37.8% from the sample ages from 36 to 45 years , and 31.1% from the sample ages from 46 to 55 years.

So the respondents from different ages and all of them respond to questionnaires effectively.

Table No.(6.2): Distribution of sample according to age

Age	Frequency	Percent
From 25 to 35 years	14	31.1
From 36 to 45 years	17	37.8
From 46 to 55 years	14	31.1
Total	45	100.0

- **Type of organization:**

Table no.(6.3) shows that 24.4% from the sample the Type of organization are "UN" , and 8.9% from the sample the Type of organization are "Local NGO" , and 28.9% from the sample the Type of organization are "International NGO" , and 22.2% from the sample the Type of organization are "CMWU" , 8.9% from the sample the Type of organization are "Governmental" and 6.7% from the sample the Type of organization are "Others".

The researcher distributed the questionnaire to different organizations, where it is clear from the table that UN agencies with International NGOs and CMWU are contributing with the large number of employees working in water and sanitation field.

Table No.(6.3): Distribution of sample according to Type of organizations

Type of organization	Frequency	Percent
UN	11	24.4
Local NGO	4	8.9
International NGO	13	28.9
CMWU	10	22.2
Governmental	4	8.9
Others	3	6.7
Total	45	100.0

- **Job type:**

Table no.(6.4) shows that 66.7% from the sample there's job type are "Engineer" and 33.3% from the sample there's job type are "others"

As noticed by the researcher, most of employees and responsible people working in the sector are engineers since this field needs the engineer capacity and specialization.

Table No.(6.4): Distribution of sample according to job type

Job type	Frequency	Percent
Engineer	30	66.7
Others	15	33.3
Total	45	100.0

- **Qualifications:**

Table no.(6.5) shows that 2.2% from the sample their qualification is "Diploma", and 37.8% from the sample their qualification is "Bachelor", and 46.7% from the sample their qualification is "Master degree", and 13.3% from the sample their qualifications is "PHD degree".

The researcher noticed that the large number of respondents have master degree following with the bachelor degree, in addition to some people who have PHD and this means that the sector is not easy sector, it needs high qualifications.

Table No.(6.5): Distribution of sample according to Qualifications

Qualifications	Frequency	Percent
Diploma	1	2.2
Bachelor	17	37.8
Master degree	21	46.7
PHD degree	6	13.3
Total	45	100.0

- **Experience:**

Table no.(6.6) shows that 8.9% from the experience sample less than 5 years, and 22.2% from the experience sample ranges "from 6 to 10 years" , and 26.7% from the experience sample ranges "from 11 to 15 years" , and 42.2% from the experience sample "more than 15 years".

And here the researcher noticed that the correspondents have the suitable experience to work in the sector.

Table No.(6.6): Distribution of sample according to Experience

Experience	Frequency	Percent
Less than 5 years	4	8.9
From 6 to 10 years	10	22.2
From 11 to 15 years	12	26.7
More than 15 years	19	42.2
Total	45	100.0

6.1.2 T test for testing opinions of respondents:

In the following tables We use a one sample t test to test if the opinion of the respondents in the content of the sentences are positive (*Relative importance Index greater than "0.60" and the p-value less than 0.05*) or the opinion of the respondent in the content of the sentences are neutral (*p- value is greater than 0.05*) or the opinion of the respondent in the content of the sentences are negative (*Relative importance Index less than "0.60 and the p-value less than 0.05*).

The interviewers were asked to provide their opinions on the Management of the water and sanitation sector in Gaza Strip in emergencies by scores 1 to 5, where "1" represents *strongly Disagree* and "5" represents *strongly agreed*.

To determine the relative ranking of the factors, these scores were then transformed to importance indices based on the formula (**tam et., 2000, and Dousman, 2002**)

$$\text{Formula Relative Importance Index} = \frac{\sum w}{AN} = \frac{5n_5 + 4n_4 + 3n_3 + 2n_2 + 1n_1}{5N}$$

Where W is the weighting given to each factor by the respondent, ranging from 1 to 5, (n_1 = number of respondents for Strongly Disagree, n_2 = number of respondents for Disagree, n_3 = number of respondents for neutral, n_4 = number of respondents for agree, n_5 = number of respondents for Strongly agreed). A is the highest weight (i.e 5 in the study) and N is the total number of samples. The relative importance index ranges from 0 to 1.

A) Analysis of items in the first phase of the questionnaire (Mitigation phase):

Table no.(6.7) shows the opinions of the respondents about Mitigation phase items and the ranking of the items according to relative important index from high to down, where it was found that all the opinions of respondents for each item were positive since the relative important index for all the items was greater than 0.6 and the p-value was 0.00 which is less than 0.05.

Table No.(6.7): Analysis of items in the Mitigation phase

No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree	Mean	Relative important index	T test	p-value	Ranking
1	Concerned bodies conduct reviews to identify the risks and critical situations in water and sanitation	26.7	57.8	11.1	2.2	2.2	4.04	0.81	8.498	0.00	2
2	Concerned bodies assess the risks that are most likely to happen by order of importance.	31.1	53.3	8.9	4.4	2.2	4.07	0.81	8.046	0.00	2
3	Concerned bodies study worst-case scenarios.	42.2	40.0	8.9	8.9	0.0	4.16	0.83	8.351	0.00	1
4	Concerned bodies develop scenario analyses and forecasting models.	28.9	26.7	35.6	8.9	0.0	3.76	0.75	5.169	0.00	8
5	Concerned bodies give high attention and required support to forecast the emergencies in water and sanitation sector.	33.3	35.6	22.2	8.9	0.0	3.93	0.79	6.502	0.00	5
6	Concerned bodies study previous situations in the sector to have retrospective review of similar crises and emergencies.	28.9	46.7	15.6	8.9	0.0	3.96	0.79	7.095	0.00	5
7	Concerned bodies arrange for expertise and identify specialists required for potential crises or emergencies in water and sanitation sector.	22.2	48.9	24.4	4.4	0.0	3.89	0.78	7.416	0.00	7
8	Concerned bodies set up continuous monitoring systems in the sector.	44.4	24.4	24.4	6.7	0.0	4.07	0.81	7.255	0.00	2
	All item						3.98	0.80	8.957	0.00	

In general, the relative important index for the opinions of the respondents about the Mitigation phase actions is "0.80" and p-value equal "0.000" which is less than 0.05 and the value of t test equal "8.957" which is greater than the critical value "2.02", this means that all respondents support the actions of the mitigation phase. Accordingly, the mitigation phase in emergency management of the water and sanitation sector is applicable.

The researcher noticed that the mitigation phase actions that taken before the emergency in the water and sanitation sector are not considered roughly and they are applied after studying worst-case scenarios and conducting reviews to identify the risks, where the water and sanitation sector is a complicated sector in these difficult situations in Gaza.

B) Analysis of items in the second phase of the questionnaire (Preparedness phase):

Table no.(6.8) shows the opinions of the respondents about Preparedness phase items and the ranking of the items according to relative important index from high to down, where it was found that all the opinions of respondents for each item were positive since the relative important index for all the items was greater than 0.6 and the p-value was 0.00 which is less than 0.05.

In general, the relative important index for the opinions of the respondents about the preparedness phase actions is "0.78" and p-value equal "0.000" which is less than 0.05 and the value of t test equal "9.699" which is greater than the critical value "2.02", this means that all respondents support the actions of the preparedness phase. Accordingly, the preparedness phase in emergency management of the water and sanitation sector is strong.

Table No.(6.8): Analysis of items in the Preparedness phase

No.	Item	Strongly	Agreed	Neutral	Disagre	Strongly	Mean	import	T test	p-value	Rankin
1	Putting a definition of crises and emergencies covered in plan.	37.8	37.8	17.8	6.7	0.0	4.07	0.81	7.82	0.00	3
2	Having a ready emergency response team for emergencies.	31.1	46.7	20.0	2.2	0.0	4.07	0.81	9.16	0.00	3
3	Giving required support to the emergency team.	44.4	46.7	8.9	0.0	0.0	4.36	0.87	14.09	0.00	1
4	Identifying lead-agency responsibilities.	40.0	40.0	20.0	0.0	0.0	4.20	0.84	10.63	0.00	2
5	Determining relationships with other departments and organizations.	28.9	53.3	13.3	4.4	0.0	4.07	0.81	9.16	0.00	3
6	Putting administrative policies and procedures necessary for activating and facilitating decision making during the emergencies.	20.0	51.1	22.2	6.7	0.0	3.84	0.77	6.87	0.00	9
7	Having facilities and crisis or emergency management centre.	20.0	37.8	24.4	17.8	0.0	3.60	0.72	3.98	0.00	16
8	Having equipments and logistics needed.	33.3	28.9	22.2	15.6	0.0	3.80	0.76	4.97	0.00	11
9	Determining the designated spokespersons, the target audiences, the facilities and training needs.	20.0	48.9	22.2	6.7	2.2	3.78	0.76	5.63	0.000	11
10	Designating Partners in a contingency plan.	24.4	44.4	26.7	2.2	2.2	3.87	0.77	6.50	0.00	9
11	Identifying the resources of infrastructure and equipments to ensure that emergency operations function	26.7	46.7	20.0	6.7	0.0	3.93	0.79	7.25	0.00	7
12	Identifying the resources of technology to ensure that emergency operations function smoothly.	20.0	48.9	22.2	8.9	0.0	3.80	0.76	6.17	0.00	11
13	Identifying the human resources to ensure that emergency operations function smoothly.	26.7	51.1	17.8	4.4	0.0	4.00	0.80	8.40	0.00	6
14	Conducting training of the team.	28.9	35.6	20.0	13.3	2.2	3.76	0.75	4.64	0.00	14
15	Conducting regular meetings for the emergency team to forecast the	35.6	40.0	11.1	11.1	2.2	3.96	0.79	6.01	0.00	7
16	Testing of the plan.	33.3	17.8	33.3	13.3	2.2	3.67	0.73	3.89	0.00	15
	All item						3.92	0.78	9.69	0.00	

That result was reached because the concerned bodies in the water and sanitation sector are having a plan for emergencies, giving the support to the emergency team, and identifying the lead organization responsibilities. All of that is achieved in spite of facing many emergency cases in this difficult circumstances that Gaza is living.

The preparedness phase in emergency management is very important phase, and this phase takes a lot from all concerned bodies to be prepared for emergencies, this is coming in agreement with **(Ouda Study, 2008)** that confirms that planning and preparedness for emergencies have large effect in the management.

C) Analysis of items in the third phase of the questionnaire (Response phase):

Table no.(6.9) shows the opinions of the respondents about response phase items and the ranking of the items according to relative important index from high to down, where it was found that all the opinions of respondents for each item were positive since the relative important index for all the items was greater than 0.6 and the p-value was 0.00 which is less than 0.05.

Table No.(6.9): Analysis of items in the Response Phase

No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree	Mean	Relative important index	T test	p-value	Ranking
1	Concerned bodies respond quickly to reduce the risks in water and sanitation sector.	48.9	40.0	4.4	6.7	0.0	4.31	0.86	10.37	0.000	1
2	Concerned bodies activate the designed plan in the sector.	24.4	51.1	22.2	2.2	0.0	3.98	0.80	8.70 6	0.00	7
3	Concerned bodies communicate effectively during the crises or emergencies in the sector.	51.1	33.3	6.7	8.9	0.0	4.27	0.85	9.049	0.000	2
4	Concerned bodies determine the needs to respond effectively in the sector.	33.3	48.9	46.7	15.6	2.2	4.13	0.83	10.0 4	0.00	5
5	Concerned bodies consider the time in determining the needs to reduce the risks in the sector.	42.2	42.2	11.1	4.4	0.0	4.22	0.84	9.966	0.000	4
No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree	Mean	Relative important index	T test	p-value	Ranking

6	Concerned bodies assess the situation by assembling the required information.	35.6	40.0	17.8	6.7	0.0	4.04	0.81	7.755	0.000	6
7	Concerned bodies determine the reliability of information sources.	24.4	40.0	26.7	8.9	0.0	3.80	0.76	5.83	0.00	8
8	Concerned bodies put forward short-term solutions to contain damages and reduce danger in the sector.	44.4	44.4	6.7	2.2	2.2	4.27	0.85	9.841	0.000	2
9	Concerned bodies pursue to seek long term solutions	26.7	40.0	17.8	15.6	0.0	3.78	0.76	5.11	0.00	8
10	Concerned bodies determine how interested the media could be in the situation.	20.0	44.4	26.7	8.9	0.0	3.76	0.75	5.740	0.000	11
11	Concerned bodies Prepare what the media needs.	22.2	44.4	2.2	11.1	0.0	3.78	0.76	5.63	0.00	8
	All item						4.03	0.81	10.35	0.00	

In general, the relative important index for the opinions of the respondents about the response phase actions is "0.81" and p-value equal "0.000" which is less than 0.05 and the value of t test equal "10.350" which is greater than the critical value "2.02", this means that all respondents support the actions of the response phase. Accordingly, the response phase actions in emergency management of the water and sanitation sector are good.

The researcher noticed that this result was achieved by the quick response actions from the concerned bodies in the sector, and by the effectiveness of the communication between the organizations by organizing the coordination meetings during the emergencies where sharing information is very important in this phase. Here in Gaza it is not easy to respond to emergency in water and sanitation sector where the challenges and constraints are big, in spite of this the concerned bodies succeeded in their response, this occurred in the presented case studies in the study.

This is coming in agreement with **(Ouda Study, 2008)** that stated that communication and sharing information during the emergencies have effective effect in the emergency management. And the result comes in disagreement with **(Al-judaili Study, 2006)** that showed how the planning for emergencies and crises in Gaza hospital was weak.

D) Analysis of items in the last phase of the questionnaire (Recovery Phase):

Table no.(6.10) shows the opinions of the respondents about recovery phase items and the ranking of the items according to relative important index from high to down, where it was found that all the opinions of respondents for each item were positive since the relative important index for all the items was greater than 0.6 and the p-value was 0.00 which is less than 0.05.

Table No.(6.10): Analysis of items in the Recovery Phase

No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree	Mean	Relative important index	T test	p-value	Ranking
1	Concerned bodies declare officially that the crisis or emergency is over.	24.4	28.9	24.4	22.2	0.0	3.56	0.71	3.392	0.001	6
2	Concerned bodies Keep in touch with the media and partner organizations.	31.1	46.7	15.6	6.7	0.0	4.02	0.80	7.921	0.000	1
3	Concerned bodies provide support to their employees who could be suffering from stress.	15.6	42.2	28.9	13.3	0.0	3.60	0.72	4.401	0.000	5
4	Concerned bodies assess their used plans after the end of the sector crises.	31.1	20.0	37.8	11.1	10.0	3.71	0.74	4.604	0.000	3
5	Concerned bodies have organizational learning to assess the lessons learned	28.9	31.1	26.7	11.1	2.2	3.73	0.75	4.578	0.000	3
6	Concerned bodies use the lessons learned in the sector future plans.	33.3	28.9	28.9	8.9	0.0	3.87	0.77	5.867	0.000	2
	All item						3.75	0.75	6.063	0.000	

In general, the relative important index for the opinions of the respondents about the recovery phase actions is "0.75" and p-value equal "0.000" which is less than 0.05 and the value of t test equal "6.063" which is greater than the critical value "2.02", this means that all respondents support the actions of the recovery phase. Accordingly, the recovery phase actions in emergency management of the water and sanitation sector are good.

The researcher noticed that concerned bodies in water and sanitation sector in Gaza reached this result by keeping in touch with the media and partners, and by using the lessons learned from the emergencies in the future plans. This is coming in agreement with (Ouda Study, 2008) that emphasized on the importance of public relations and its role with the media. Recently CMWU as the service provider focused on media and had media person to insure its communication with the world.

E) Analysis of all phases of the questionnaire:

Table no.(6.11) shows the opinions of the respondents about all phases items in the emergency management

Table No.(6.11): Analysis of items in All Phases in emergency management

No.	Item	Mean	Relative important index	T test	p-value
1	Mitigation phase	3.98	0.80	8.957	0.000
2	Preparedness phase	3.92	0.78	9.699	0.000
3	Response Phase	4.03	0.81	10.350	0.000
4	Recovery Phase	3.75	0.75	6.063	0.000
	All section	3.94	0.79	10.005	0.000

In general, the relative important index for the opinions of the respondents about the all phases actions is "0.79" and p-value equal "0.000" which is less than 0.05 and the value of t test equal "10.005" which is greater than the critical value "2.02", this means that all respondents support the actions taken to manage the sector in emergencies. Accordingly, the emergency management actions in the water and sanitation sector in Gaza Strip are good.

From the opinion of the researcher, this result clarifies that the concerned bodies in the water and sanitation sector in Gaza succeed to manage the sector in emergencies in spite of all this complex situations in Gaza by considering the actions needed to manage the sector before, during and after the emergencies where the success of the management in

emergencies is achieved by the successful contribution of all the phases as a whole package.

And in general, the result is coming in agreement with (Ouda Study, 2008) that showed the ability of Islamic University in Gaza to overcome its crises and emergency, and in disagreement with (Al-Judaili Study, 2006) that showed the Gaza hospitals had no enough capacity to overcome the emergencies.

6.2 Research hypotheses:

There is a main hypothesis for this research:

1. There is a statistical relation between the used management strategies and techniques and management of water and sanitation sector in emergencies. And from this hypothesis the following sub hypotheses result:

1.1 There is a statistical relation between management of the sector in emergencies and mitigation actions taken before emergencies at significant level $\alpha = 0.05$.

To test the hypothesis we use Pearson test which measure the correlation coefficient between mitigation actions taken before emergencies and management of the sector in emergencies and the result shown in table No.(6.12) which illustrated that the value of $r = 0.888$ which is greater than the critical value of $r = 0.295$, and the p-value equal 0.000 which is less than 0.05.

Table NO.(6.12): Pearson Correlation between management of the sector in emergencies and mitigation actions

variables	statistics	management of the sector in emergencies
mitigation actions	Pearson coefficient	0.888
	p-value	0.000
	sample size	45

The value of critical value of r at significant level 0.05 and df "43" equal "0.295"

This means there is a statistical relationship between management of the sector in emergencies and mitigation actions taken before emergencies at significant level $\alpha = 0.05$.

From the opinion of the researcher, this is logical, where all the mitigation actions taken by the concerned bodies in the water and sanitation sector contribute to manage the sector in better way in emergencies, where as presented in the literature review in the study, the mitigation phase is one of the four phases in the emergency management, success in this phase will contribute in the success of the management of the sector in emergencies.

1.2 There is a statistical relation between management of the sector in emergencies and preparedness for emergencies at significant level $\alpha = 0.05$.

To test the hypothesis we use Pearson test which measure the correlation coefficient between preparedness for emergencies and management of the sector in emergencies at significant level $\alpha = 0.05$ and the result shown in table No.(6.13) which illustrated that the value of $r = 0.943$ which is greater than the critical value of $r = 0.295$, and the p-value equal 0.000 which is less than 0.05.

Table NO.(6.13): Pearson Correlation between management of the sector in emergencies and preparedness for emergencies

variables	statistics	management of the sector in emergencies
Preparedness for emergencies	Pearson coefficient	0.943
	p-value	0.000
	sample size	45

The value of critical value of r at significant level 0.05 and df "43" equal " 0.295

This means that there is a statistical relation between preparedness for emergencies and management of the sector in emergencies at significant level $\alpha = 0.05$.at significant level $\alpha = 0.05$.

This result shows that preparedness phase is very important in the emergency management of the water and sanitation sector in Gaza, by doing all actions in this phase; planning, reviewing, assessment,... the concerned bodies can succeed in managing the water and sanitation sector in emergencies. So focusing on preparedness

and planning will contribute to succeed in the emergency management of the sector. This comes in agreement with (Ouda Study, 2008) that emphasized the importance of preparedness for emergencies.

1.3 There is a statistical relation between management of the sector in emergencies and response actions during emergencies at significant level $\alpha = 0.05$.

To test the hypothesis we use Pearson test which measure the correlation coefficient between response actions during emergencies and management of the sector in emergencies and the result shown in table No.(6.14) which illustrated that the value of $r= 0.867$ which is greater than the critical value of $r= 0.295$, and the p-value equal 0.000 which is less than 0.05.

Table NO.(6.14): Pearson Correlation between management of the sector in emergencies and response actions during emergencies

variables	statistics	management of the sector in emergencies
Response actions	Pearson coefficient	0.867
	p-value	0.000
	sample size	45

The value of critical value of r at significant level 0.05 and df "43" equal " "0.295

This means there is a statistical relation between response actions during emergencies and management of the sector in emergencies at significant level $\alpha = 0.05$.

This result shows that to achieve the better management of the water and sanitation sector in Gaza in emergencies, all the response actions are required in terms of communications, quick response, conducting quick assessment,...

Response phase is part of the four phases of the emergency management and concerned bodies should respond effectively to any emergency, by this they will contribute to have better management of the sector in emergencies.

1.4 There is a statistical relation between recovery process after emergencies and management of the sector in emergencies at significant level $\alpha = 0.05$.

To test the hypothesis we use Pearson test which measure the correlation coefficient between recovery process after emergencies and management of the sector in emergencies and the result shown in table No.(6.15) which illustrated that the value of $r = 0.917$ which is greater than the critical value of $r = 0.295$, and the p-value equal 0.000 which is less than 0.05.

Table NO.(6.15): Pearson Correlation between management of the sector in emergencies and recovery process after emergencies

variables	statistics	management of the sector in emergencies
Recovery process	Pearson coefficient	0.917
	p-value	0.000
	sample size	45

The value of critical value of r at significant level 0.05 and $df = 43$ equal " 0.295

This means there is a statistical relation between recovery process after emergencies and management of the sector in emergencies at significant level $\alpha = 0.05$.

The result shows how the recovery process is important to achieve the good management of the water and sanitation sector in emergencies. This comes in agreement with (Ouda Study, 2008) that showed the role of media and public relations in emergency management.

As for the three previous phases, recovery phase is essential in emergency management, success in this phase will lead to success in the emergency management. So success in the four phases of the emergency management will lead to comprehensive success in management in emergencies.

2. There is no difference of the respondents' answers about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to demographic characters (Gender, Age, Type of organization, Job title, Qualifications, Experience)

And from this hypothesis the following sub hypotheses result:

2.1 There is no difference of the respondents' answers about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to gender

To test the hypothesis we use an independent t test and the result shown in table No.(6.16) . The value of t test for each section is less than the critical value which is equal 2.02, and the p-value for each section are greater than 0.05, that's mean there is no difference of the respondents' answers about each section (Mitigation phase, Preparedness phase, Response Phase, Recovery Phase) due to gender.

Table No.(6.16): Independent t test for respondents' answers on Management of the sector in emergencies due to gender

phase	Gender	N	Mean	Std. Deviation	T	P-value
Mitigation phase	Male	35	3.8750	0.7512	-1.900	0.064
	Female	10	4.3625	0.5604		
Preparedness phase	Male	35	3.9054	0.6184	-0.328	0.744
	Female	10	3.9813	0.7342		
Response Phase	Male	35	3.9325	0.6925	-1.892	0.065
	Female	10	4.3727	0.4483		
Recovery Phase	Male	35	3.7095	0.7821	-0.581	0.564
	Female	10	3.8833	1.0063		
TOTAL	Male	35	3.8780	0.6246	-1.196	0.238
	Female	10	4.1463	0.6295		

The critical value t at degrees of freedom "43" and significant level 0.05 equal **2.02**

In general, the value of t value for all sections equal -1.196 which is less than the critical value - 2.02 and the p-value equal 0.238 which is greater than 0.05, this means there is no difference of the respondents answers about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to gender. The results support this hypothesis, where is no relation between the gender of the respondents of the questionnaire and their answers to the questions and items, where all the working females in the sector are qualified same as the males, this comes in agreement with (Ouda study, 2008) that showed the same result.

2.2 There is no difference of the respondents' answers about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to Job title

To test the hypothesis we use an independent t test and the result shown in table No.(6.17) . the value of t test for sections (Mitigation phase, Preparedness phase) are equal -2.181, -2.113 respectively which is less than the critical vale which is equal 2.02 and the p-value for the section are equal 0.035, 0.040 which are less than 0.05, that's mean there is a difference of the respondents about section (Mitigation phase, Preparedness phase) due to Job type. And the value of t test for other section is less than the critical vale which is equal 2.02 and the p-value are greater than 0.05, that's mean there is no difference of the correspondent about each section (Response Phase, Recovery Phase) due to Job type.

Table No.(6.17):Independent t test for respondent's answers on Management of the sector in emergencies due to Job type

Phase	Job type	N	Mean	Std. Deviation	T	P-value
Mitigation phase	Engineer	30	3.8208	0.7534	-2.181	0.035
	Others	15	4.3083	0.5992		
Preparedness phase	Engineer	30	3.7854	0.6472	-2.113	0.040
	Others	15	4.1958	0.5391		
Response Phase	Engineer	30	3.9424	0.6545	-1.257	0.216
	Others	15	4.2061	0.6816		
Recovery Phase	Engineer	30	3.6500	0.8659	-1.128	0.265
	Others	15	3.9444	0.7337		
TOTAL	Engineer	30	3.8146	0.6408	-1.912	0.063
	Other	15	4.1837	0.5426		

The critical value t at degrees of freedom "43" and significant level 0.05 equal **2.02**

In general the value of t value for all domain equal 1.912- which is less than the critical value -2.02 and the p-value equal 0.063 which is greater than 0.05 that means there is no difference of the correspondent about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to Job title.

The researcher noticed that the job type of the respondents has an impact on the answers in the mitigation and preparedness phases, and no impact in the response and recovery phases, and from the opinion of the researcher, this is achieved because the first two phases are before the emergency happened and many of the respondents have not the perfect information in these two phases. But in the other phases after the emergency occurrence, all the concerned people are involved strongly in response.

2.3 There is no difference of the respondents' answers about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to age

To test the hypothesis we use one way ANOVA test and the result shown in table No.(6.18). The value of F test for each section is less than the critical value which is equal 3.22 and the p-value for each section is greater than 0.05 that mean there is no difference of the respondents' answers about each section (Mitigation phase, Preparedness phase, Response Phase, Recovery Phase) due to age.

Table No.(6.18): One way ANOVA test for respondents' answers on Management of the sector in emergencies due to age

Phase	Source	Sum of Squares	df	Mean Square	F	P-
Mitigation phase	Between	0.7963	2	0.398	0.725	0.490
	Within Groups	23.0662	42	0.549		
	Total	23.8625	44			
Preparedness phase	Between	0.2268	2	0.113	0.270	0.765
	Within Groups	17.6728	42	0.421		
	Total	17.8997	44			
Response Phase	Between	0.7375	2	0.369	0.820	0.447
	Within Groups	18.8823	42	0.450		
	Total	19.6198	44			
Recovery Phase	Between	1.8537	2	0.927	1.376	0.264
	Within Groups	28.2920	42	0.674		
	Total	30.1457	44			
total	Between	0.5947	2	0.297	0.743	0.482
	Within Groups	16.7968	42	0.400		
	Total	17.3915	44			

The critical value F at degrees of freedom "2,42" and significant level 0.05 equal 3.22

In general, the value of F value for all sections equal 0.743 which is less than the critical value 3.22 and the p-value equal 0.482 which is greater than 0.05 that means There is no difference of the correspondent about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to age.

And this result is achieved because there is no difference in dealing with emergency situations either if the respondent is young or old as occurred in (Ouda Study, 2008).

2.4 There is no difference of the respondents' answers on the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to Type of organization

To test the hypothesis we use one way ANOVA test and the result shown in table No.(6.19) . the value of F test for each section is less than the critical value which is equal 2.64 and the p-value for each section are greater than 0.05 that mean there is no difference of the respondents' answers about each section (Mitigation phase, Preparedness phase, Response Phase, Recovery Phase) due to **Type of organization**.

Table No.(6.19): One way ANOVA test for respondents' answers on Management of the sector in emergencies due to Type of organization

Phase	Source	Sum of Squares	df	Mean Square	F	P-Value
Mitigation phase	Between Groups	2.7144	5	0.543	1.001	0.430
	Within Groups	21.1481	39	0.542		
	Total	23.8625	44			
Preparedness phase	Between Groups	1.0520	5	0.210	0.487	0.784
	Within Groups	16.8476	39	0.432		
	Total	17.8997	44			
Response Phase	Between Groups	1.5167	5	0.303	0.653	0.661
	Within Groups	18.1032	39	0.464		
	Total	19.6198	44			
Recovery Phase	Between Groups	3.3753	5	0.675	0.983	0.440
	Within Groups	26.7704	39	0.686		
	Total	30.1457	44			
total	Between Groups	1.1992	5	0.240	0.578	0.717
	Within Groups	16.1923	39	0.415		
	Total	17.3915	44			

The critical value F at degrees of freedom "5,39" and significant level 0.05 equal 2.64

In general, the value of F value for all sections equal 0.578 which is less than the critical value 2.64 and the p-value equal 0.717 which is greater than 0.05 that means There is no difference of the correspondent about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to Type of organization.

This is true from the opinion of the researcher, the type of organization that the respondents are working in has no impact to the answers, if any emergency happens all the organizations will try to participate to face the emergency regardless the type of organization, and this happens in the sector since the water and sanitation sector is a vital sector related to people lives. And as presented in the two case studies in the study, all the organizations either UN, governmental, INGOs, LNGOs,... respond to the sector' emergencies

2.5 There is no difference of the respondents' answers on the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to Qualifications

To test the hypothesis we use one way ANOVA test and the result shown in table No.(6.20). The value of F test for each section is less than the critical value which is equal 2.83 and the p-value for each section are greater than 0.05 that mean there is no difference of the respondents' answers about each section (Mitigation phase, Preparedness phase, Response Phase, Recovery Phase) due to **Qualifications**.

Table No.(6.20):One way ANOVA test for respondents' answers on Management of the sector in emergencies due to Qualifications

Phase	Source	Sum of	df	Mean Square	F	P-Value
Mitigation phase	Between Groups	0.7256	3	0.242	0.429	0.734
	Within Groups	23.1369	41	0.564		
	Total	23.8625	44			
Preparedness phase	Between Groups	1.2305	3	0.410	1.009	0.399
	Within Groups	16.6692	41	0.407		
	Total	17.8997	44			
Response Phase	Between Groups	1.6057	3	0.535	1.218	0.315
	Within Groups	18.0141	41	0.439		
	Total	19.6198	44			
Recovery Phase	Between Groups	1.3455	3	0.448	0.638	0.595
	Within Groups	28.8002	41	0.702		
	Total	30.1457	44			
total	Between Groups	1.0065	3	0.336	0.840	0.480
	Within Groups	16.3850	41	0.400		
	Total	17.3915	44			

The critical value F at degrees of freedom "3,41" and significant level 0.05 equal 2.83

In general, the value of F value for all domain equal 0.840 which is less than the critical value 2.83 and the p-value equal 0.480 which is greater than 0.05 that means There is no difference of the correspondent about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha = 0.05$ due to Qualifications.

Also this result is logical from the point of view of the researcher, because all the respondents are working in the sector since many years and most of them have the high qualifications to assess the emergency management of the sector in Gaza, this gave

them the ability to answers the questionnaire questions regardless their qualifications. This result is coming in disagreement with (Ouda Study, 2008) because large number of her sample has diploma and this affected the answers to her questionnaire.

2.6-There is no difference of the respondents’ answers on the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha =0.05$ due to Experience

To test the hypothesis we use one way ANOVA test and the result shown in table No.(6.21) . The value of F test for each section is less than the critical vale which is equal 3.22 and the p-value for each section are greater than 0.05 that mean there is no difference of the respondents’ answers about each section (Mitigation phase, Preparedness phase, Response Phase, Recovery Phase) due to **Experience**.

In general, the value of F value for all domain equal 0.676 which is less than the critical value 2.83 and the p-value equal 0.730 which is greater than 0.05 that means There is no difference of the correspondent about the Management of the water and sanitation sector in Gaza Strip in emergencies at significant level $\alpha =0.05$ due to Experience.

Table No.(6.21): One way ANOVA test for respondents’ answers on Management of the sector in emergencies due to Experience

Phase	Source	Sum of Squares	df	Mean	F	P-Value
Mitigation phase	Between Groups	1.1945	3	0.398	0.720	0.546
	Within Groups	22.6680	41	0.553		
	Total	23.8625	44			
Preparedness phase	Between Groups	0.9186	3	0.306	0.739	0.535
	Within Groups	16.9810	41	0.414		
	Total	17.8997	44			
Response Phase	Between Groups	0.2975	3	0.099	0.210	0.889
	Within Groups	19.3223	41	0.471		
	Total	19.6198	44			
Recovery Phase	Between Groups	2.8547	3	0.952	1.430	0.248
	Within Groups	27.2910	41	0.666		
	Total	30.1457	44			
total	Between Groups	0.5353	3	0.178	0.434	0.730
	Within Groups	16.8562	41	0.411		
	Total	17.3915	44			

The critical value F at degrees of freedom "3,41" and significant level 0.05 equal 2.83

As mentioned before, the richer noticed that working in the sector and participation in the coordination meetings that are organized in the sector gave the respondents the ability to answer. And since all the respondents have the enough experience to answer, there will be no difference to answer the questionnaire questions.

This result comes in agreement with **(Ouda Study, 2008)** that showed the same result and comes in disagreement with Al **(Ameer Study, 2003)** that showed that there is a difference in correspondents answers due to experience.

CHAPTER 7

CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

7.2 Major findings

7.3 Conclusion

7.4 Recommendation

7.5 Suggested future studies

7.1 Introduction:

This chapter summarized the major findings of the research, and presented conclusion and recommendations that were derived from combined results of literature review, methodology and the case studies.

And this research has presented the management of the water and sanitation sector in emergencies, where water and sanitation sector' situation in Gaza is very difficult, and as a result the sector most of the times is managed under emergencies.

7.2 Major findings:

After data analysis and presenting the literature review and the case studies, the major findings can be summarized in each phase of the emergency management in the followings:

- **Mitigation phase:**
 - The concerned bodies in the sector take mitigation actions before the occurrence of the emergency, they study the worst case scenarios that are most likely to happen, conduct reviews and coordination meetings to predict emergencies, and set up monitoring systems in the sector.
 - Studying previous situations in the sector to have retrospective review of similar crises and emergencies is very considerable in the sector. The coordination meetings that organized in the sector are very important to review and to share information.
 - Also it was clear that developing models to predict emergencies is not highly considered by the concerned bodies.
 - The case studies showed that responsible organizations try to do the best to mitigate the risks in spite of the difficult surrounding circumstances.

- **Preparedness phase:**

- In this phase, the study showed that the concerned bodies give the required support to their teams and identify the lead agency responsibilities, having a plan, and emergency team.
- And also the study showed that there is no emergency center for the sector, and the concerned bodies don't test their plan before the emergency and don't give training to team.
- Another result occurred that the equipments are in need for the sector as this is a main cause of the closures.
- The case studies showed that preparedness is very important, communication and organizing coordination meetings to seek the ability of response for expected emergencies are highly considerable by all; UN agencies, INGOs, CMWU and governmental bodies.

- **Response phase:**

- The results showed that the concerned bodies respond quickly to reduce the risks in water and sanitation sector, they communicate effectively by the organizing of the coordination meetings and sharing information, try to put the fast solutions by fixing short term solutions to contain damages.
- Also the concerned bodies don't pursue to seek long term solutions for the sector, but this as mentioned before as a result from the problem of the closures. And they don't activate the plan as designed exactly.
- And the result showed that preparing what the media needs during the emergency didn't consider highly from the concerned bodies.
- The case studies showed how the response to the emergencies and crises in Gaza is quick. It was clear that in spite of shortages of materials and closures, all efforts unite to face the emergency and help the people.

- **Recovery phase:**

- The results in this phase showed that the concerned bodies use the lessons learned from any emergency in the sector' future plans. They keep in touch with partners and organizations to continue the recovery process.
- Also other results occurred that the concerned bodies in the sector don't provide support to their employees who could be suffering from stress, and don't clear officially that the emergency is over.

In general, and after presenting of the case studies as realistic examples in the emergency management of the water and sanitation sector in Gaza Strip, the study showed that the management of the water and sanitation sector in Gaza Strip in emergencies is good, most of actions needed to manage the emergency are considerable in spite of the complicated circumstances that Gaza is living for the past three years, where these circumstances are challenging all the concerned bodies in all sectors in Gaza.

The closures and shortages of materials and equipments are the main cause of these emergency situations.

7.3 Conclusion:

The study achieved the main objectives that were set in the beginning, which were:

- Studying the main problems that face water and sanitation sector in Gaza Strip, the way that the sector is managed by in emergencies in Gaza.
- Evaluation of emergency management for the sector in Gaza. And
- Study emergency management rules and procedures in the four phases:
 - Mitigation,
 - Preparedness,
 - Response and
 - Recovery.

The mentioned objectives of this study were achieved by presenting of the main problems that face water and sanitation sector in Gaza Strip, and the way that the sector is managed by in emergencies in Gaza by presenting of two real case studies which related to the disaster of Um AlNasser in March, 2007 and the offensive cast lead operation on Gaza started in December 2008.

And the study presented in the literature review details of the emergency management rules, procedures in the four phases.

The questionnaire also was designed to cover the four phases in the emergency management to evaluate the management of the sector in emergencies.

7.4 Recommendations:

According to the results mentioned above, the following recommendations should be considered to improve the management of the water and sanitation sector in emergencies in Gaza Strip:

- Keeping the good relations with partners and donors by providing the required data, proposals for the sector, same as with the local NGOs.
- Supporting the existing monitoring system by having more staff and spare parts.
- It is very important to have training courses specialized for emergency teams, same as developing scenarios and testing of the designed plan for emergency.
- It is necessary to have an emergency budget to be used only in emergencies.
- Arranging for the experts to develop plans special for Gaza under its complex circumstances.
- Trying to get materials and spare parts as much as possible to keep in the stores.
- Giving more consideration to the media with focusing on the international media to put more pressure on Israel and to have more advocacies.
- Avoiding the water and sanitation sector from the political situations, since it is a vital sector and any crises in it is related to people lives.
- Trying to assess the solutions used to determine the gaps as possible and keeping using the lessons learned in the future plans.

- Having ready volunteers to cope with emergencies.
- Preparing of comprehensive plan that sets different scenarios and alternatives to face emergencies.
- Conducting expanded studies for the water and sanitation sector by participation of the people as end users for the service.
- Models with different scenarios to be developed in future studies.

7.5 Suggested future studies:

This research can be expanded to cover other areas in the management of the water and sanitation sector. Accordingly the following future studies are suggested:

- Media and public relations roles in the management water and sanitation sector.
- Development of comprehensive planning for emergency management of water and sanitation sector.
- Development of scenarios and models to forecast emergencies situations in the water and sanitation sector.
- Management of water and sanitation sector in emergencies from people perspective.

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Appendixes

Appendix (1): Questionnaire

Appendix (2): Names of questionnaire referees

Appendix (1) Questionnaire

Islamic University of Gaza
Deanery of Graduate Studies
Faculty of Commerce
Department of Business Administration



Questionnaire No.

Date:

Dear Colleagues,

This questionnaire is a tool of collecting data in order to assess the concerned bodies' management of the water and sanitation sector in emergencies, where this assessment will be used in the thesis about: **“Management of the water and sanitation sector in Gaza Strip in emergencies”** to be submitted in a partial fulfillment of the requirement for MBA degree.

The questionnaire is designed to cover the four phases of the emergency management in the sector, which are:

- Mitigation phase,
- Preparedness phase,
- Response phase, and
- Recovery phase.

Therefore, your participation in answering the questionnaire is highly appreciated to achieve the objectives of this assessment.

Thank You for your cooperation

Researcher: Eman Aqeel

Personal Information:

Gender

Male

Female

Age

From 25 to 35 years

From 36 to 45 years

From 46 to 55 years

Name of organization:.....

Type of organization:

UN

Local NGO

International NGO

CMWU

Governmental

Others

Job title:.....

Engineer

Others

Qualifications:

Diploma

Bachelor

Master degree

PHD degree

Experience:

Less than 5 years

From 6 to 10 years

From 11 to 15 years

More than 15 years

Please indicate your answer by putting the sign X in the appropriate place.

Please indicate your answer by putting the sign X in the appropriate place.

No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
(A) Mitigation phase						
1)	Concerned bodies conduct reviews to identify the risks and critical situations in water and sanitation sector.					
2)	Concerned bodies assess the risks that are most likely to happen by order of importance.					
3)	Concerned bodies study worst-case scenarios.					
4)	Concerned bodies develop scenario analyses and forecasting models.					
5)	Concerned bodies give high attention and required support to forecast the emergencies in water and sanitation sector.					
6)	Concerned bodies study previous situations in the sector to have retrospective review of similar crises and emergencies.					
7)	Concerned bodies arrange for expertise and identify specialists required for potential crises or emergencies in water and sanitation sector.					
8)	Concerned bodies set up continuous monitoring systems in the sector.					
(B) Preparedness phase						
Concerned bodies provide frameworks and guidelines to be followed in water and sanitation sector' emergencies as follows:						
No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
9)	Putting a definition of crises and emergencies covered in plan.					
10)	Having a ready emergency response team for emergencies.					
11)	Giving required support to the emergency team.					
12)	Identifying lead-agency responsibilities.					
13)	Determining relationships with other departments and organizations.					

No.	Continued Preparedness Phase	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
14)	Putting administrative policies and procedures necessary for activating and facilitating decision making during the emergencies.					
15)	Having facilities and crisis or emergency management centre.					
16)	Having equipments and logistics needed.					
17)	Determining the designated spokespersons, the target audiences, the facilities and training needs.					
18)	Designating Partners in a contingency plan.					
19)	Identifying the resources of infrastructure and equipments to ensure that emergency operations function smoothly.					
20)	Identifying the resources of technology to ensure that emergency operations function smoothly.					
21)	Identifying the human resources to ensure that emergency operations function smoothly.					
22)	Conducting training of the team.					
23)	Conducting regular meetings for the emergency team to forecast the emergencies.					
24)	Testing of the plan.					
(C)	Response Phase					
No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
25)	Concerned bodies respond quickly to reduce the risks in water and sanitation sector.					
26)	Concerned bodies activate the designed plan in the sector.					
27)	Concerned bodies communicate effectively during the crises or emergencies in the sector.					
28)	Concerned bodies determine the needs to respond effectively in the sector.					

No.	Continued Response Phase	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
29)	Concerned bodies consider the time in determining the needs to reduce the risks in the sector.					
30)	Concerned bodies assess the situation by assembling the required information.					
31)	Concerned bodies determine the reliability of information sources.					
32)	Concerned bodies put forward short-term solutions to contain damages and reduce danger in the sector.					
33)	Concerned bodies pursue to seek long term solutions for the sector.					
34)	Concerned bodies determine how interested the media could be in the situation.					
35)	Concerned bodies Prepare what the media needs.					
(D)	Recovery Phase					
No.	Item	Strongly agreed	Agreed	Neutral	Disagree	Strongly Disagree
36)	Concerned bodies declare officially that the crisis or emergency is over.					
37)	Concerned bodies Keep in touch with the media and partner organizations.					
38)	Concerned bodies provide support to their employees who could be suffering from stress.					
39)	Concerned bodies assess their used plans after the end of the sector crises.					
40)	Concerned bodies have organizational learning to assess the lessons learned					
41)	Concerned bodies use the lessons learned in the sector future plans.					

Thanks for your cooperation

Appendix (2):

Names of questionnaire referees

- Dr. yousif Ashour
- Dr. Roshdi Wadi
- Dr. Abd ElMajeed Nassar
- Dr. Majed el Farra
- Dr. Salim Helles