Shelter Location: To Plan Evacuation in Case of Emergency for the Displaced from the Village of Umm El-Nasser-Gaza Strip

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Abstract: The main objective of this study is to clarify the potential dangers that may affect Umm El-Nasr village (North of Gaza Strip) people and oblige them to leave their village completely or partially. Therefore, we worked on making a plan that contains procedures that manage the displacement of the citizens according to the type of the disaster. As well as suggesting a safe shelter. For the citizen. Then, we draw up the right responding procedures for the emergency committee in Umm El-Nasr municipality to deal with displaced people. We worked on designing a mathematical model for the possibilities of choosing a shelter for the citizens of this village. This sample showed the different conditions that may affect the displacement operation such as; the displacement operation such as; the type of shelter, the allocated area, the number of displaced citizens and the required speed to reach the shelter. Finally, this study recommended advancing the capabilities of the community to confront catastrophe. Besides, perfect planning plays a significant role in saving lives, time and effort. Therefore, we have to cooperate with the local authorities such as: municipalities, ministry of health, civil defense and international institutions to implement response action during disasters.

INTRODUCTION

The management of displacement is one of the branches of crisis and disaster management which is specialized in directing Internally Displaced People (IDPs) to safe places; displacement may be before during or after the start of the disaster, each stage has its own procedure and how to deal with the displaced as well as how to guide them to the shelter. Displacement management will avoid collisions resulting from random movements. The method also determines the two independent way for each evacuation movement and also identifies an alternative strategy in case of confronting obstacles such as roadblocks.

Provides a design and analysis for vehicles evacuation. Besides, it suggests a planning strategy for the evacuation development in the time of catastrophes. In this strategy, the distribution of

vehicles as many roads, the place of shelters and the required time for evacuation was demonstrated[1].

It is probable to interpret the geographical distribution of the homeless camps internally by using the geographical factors such as to pagraphy, population and availability of open spaces. In addition, to that there factors of distributing the internal refugees camps which are the distance from the international airport, the distance to the center of the city and the height[2].

Kongsomsaksakul *et al.*[3], shows that determining the best site of shelter is one of the most important elements of the evacuation plan because it saves lives, time and effortandwe have to deal with the problem of identifying the temporary shelters places after catastrophe by determining a mathematical sample to choose the best sites of shelters according to same criterion such as the number of refugee, the proximity of this shelter to citizens and the uses of the shelter[4]. The purpose of this mathematical model is assisting in the planning stage for the possible process of getting rid of catastrophes. Therefore, we can have a precise decision in <1 sec decision in <1 sec, we can suppose that the decision maker has enough time to activate the model to a large number of scenario's.

That it necessary to prepare evacuation plans to get a good response in the emergency condition. These plans in dude the distribution of people who should be dis placed to safe areas, so a number of missions should be considered such as choosing the safe arcos and specifying the nearest available safe areas to their houses[5]. To find safe areas we should upload three tiers of data-which are building blocks, safe areas and the road system of the case study by using the Geographical Information System (QIS) and computer processing, a buffer zone. For each building block has established. Also, the temporary shelter distance is determined.

After managing the displacement, prepare for the stage of sheltering the displaced from disasters and focus on many important issues including:

Identifying the appropriate shelter type, identifying services for the displaced, adaptation techniques in shelters such as improving shelter conditions in cold weather by using removable insulation materials to prevent cold-related deaths without sacrificing shelter flexibility[6]. All shelters should be designed in accordance with international standards "Sphere" as well as logistical constraints of cost, weight and size and It must also be adapted to the requirements and to the solid and local materials. Besides and working to full fill the refugees requirements and building process taking in their consideration the cost and the climate of the Hasting country[7].

MATERIALS AND METHODS

The researcher is going to follow the descriptive and analytical approach to answer the questions of this study, to a chive the aims of the study the researcher is going to analyze the content of the reports and the researches of the national and international institutions that has worked in Gaza Strip during catastrophes and 2014 war to get benefit from them in designing a plan to manage the displacement of the village people. Also, to help in determining the safe shelters and to work on designing a mathematical model to the probable of choosing a shelter to Umm EL Nasser village and We have met workers of Umm El _Nasser municipality of know the catastrophes and crises that happened in previous years. In addition, to that meeting the local citizens of this village than we contacted with the officials from water and environment authority.

Figure 1 clarifier the suggested technique for the evacuation of people by specifying he village catastrophes, safe areas, probable of total and partial evacuation and connecting processes to the up elated mathematical model.

Study objectives:
- Develop a refugee evacuation scheme based on the type of disaster
- Develop a sample for the possibility of evacuation before the disaster for the displaced from the village of Umm El-Nasser
- Preparing an emergency shelter plan at Hamza Bin Abi Talib School to deal with the displaced during the flood
- Preparing an emergency shelter plan at Khalifa Bin Zayed School to deal with the displaced during the wars
- Designing a mathematical model for the possibility of choosing a shelter in case of total or partial displacement of the population
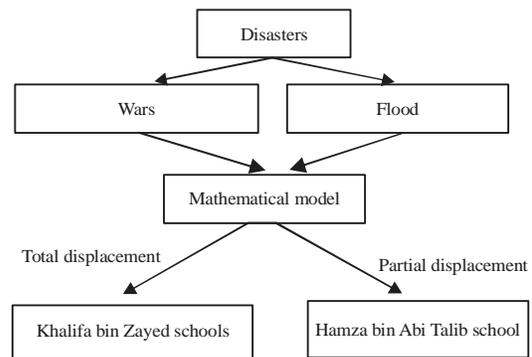

Fig. 1: The proposed evacuation planning procedure

Fig. 2: General location of Umm Al-Nasr village

Table 1: Influential elements in the probability of occurrence of disasters
Structural elements

Planned	Area by acres	Details
Agricultural areas	260	Are exposed to pollution from the sewage basins, so that, the soil and water are contaminated
Residential areas	153	Most of the village houses are built of tinplate or asbestos-roofed bricks
Areas of public	23	Hamza Bin Abi Talib Elementary school
buildings		Kindergarten of Sincerity
		Umm Al-Nasr Clinic, operated by the Medical relief society in cooperation and coordination with the Ministry of Health
		Mosque of Okasha bin Mahsin, Al Fath Al Muben Mosque, Umm El Nasr Mosque
		Community Center Association
		Bedouin village development and Reconstruction Association
Commercial areas	5	
Green areas	51	
Areas of workshops	10	
Sewage water	119	
Structural roads	179	
	800 acres	Total

Study problem: The geographical nature of the village of Umm Al-Nasr makes it vulnerable to many dangers; especially, wars that threaten lives. This study will examine the processes of managing the displacement of the population in case of war and man-made disasters as well as work to determine accommodation based on the potential disaster and through the development of a security scheme to guide the population to places depending on the nature of the event. Also, it provides enough space for refugee based on international standards.

Umm El Nasr village: Umm El-Nasser is located in the northern Gaza Strip near the border with Israel. Most of the Palestinian Bedouin families live in the village. They were taken from their area of residence and housed near the sewage treatment area (Fig. 2).

The village is located half a kilometer from the green line and rises about 40 m above sea level. The village is a population settlement located northeast of the town of Beit Lahia. It covers an area of about 800 acres and has a population of about 5,500.

Account influential elements in the probability of occurrence of risk: The structural elements include the components of the urban planning of Umm El-Nasr village and its properties and their ability to increase the danger to the population (Table 1). Explains the structural elements affecting the probability of disasters and includes all components of the urban planning focusing on residential urban areas and public facilities.

The vulnerable elements of the residents of the Umm El-Nasser increase the impact of the risks in case they occur (Table 2). It illustrates the elements of the society vulnerable in the village of Umm El-Nasser which include the rates of poverty and unemployment and disability and other elements that increase the vulnerability of society to bear to disasters.

Table 2: Elements vulnerable community in the village of Umm El-Nasr

Vulnerable community

Elements	Rates	Details
Population	5500	
Poverty rates	82%	The 50% of the population lives so poor that UNRWA and NGOs support them
Percentage of refugee population in the village	95%	Most of the population is Bedouin
Unemployment rate among the population	80%	A large number of villagers depend on aid
Percentage of females in society	50%	
Traditions of the people in the village		The girl is married at an early age of 16 still usually "marriage only from the family" it's hard that girls get married to non -relations
Disability of the population	2%	The 84 disabled persons, 35% of them are handicapped

Table 3: Risk analysis matrix for Umm El -Nasr village

Risk	Risk level	Risk potential 5×5	Degree of impact 1-5	Frequent hazard	Elements at risk
The fall of the sewage ponds causing the flood 1-5	High	12	4	3	The 1000 people live on sewage basins, 120 houses in danger
Wars and military actions	Very high	15	3	5	The 5000 people are in danger, all facilities are at risk

(a)

(b)

Fig. 3: Sewage basin

RESULTS AND DISCUSSION

The risk of the village that requires displacement: The village is exposed to many dangers that affect the lives of the population, property and agricultural land but in this study, we will highlight the disasters that may cause the displacement of people from their places of residence within the village or displacement outside the village to safe places. The risk matrices and charts are used extensively to present a clear vision about all dangers which may face this region by analyzing and evaluating the dangers and obstacles to help in successful management of dangers[8].

Table 3 the risk analysis matrix for the displacement village identifies the level of risk expected as well as the elements at risk, contemplating the number of vulnerable populations to be directed to the proposed displacement locations.

Catastrophe of Umm El Nasr Village in 2007: With the increase in water consumption requirements and the increase in population density, large drainage basins were not sufficient to collect and pump water, causing the collapse of the ponds and the destruction of a large part of the village and causing to killing five civilians, injuring about 60 others, destroying 200 houses in totally or partially and displacing 630 families (Fig. 3).

Response measures to be taken by the village municipality to manage displacement: Table 4 shows the response procedures to be taken by the emergency committee in the municipality of Umm El-Nasr in the event of a disaster requiring population displacement. The table also shows the probability of displacement based on the type of disaster. So that, the place of displacement will change into a shelter in the village in the event of a tsunami or to displace them outside the village in a situation of war on the region.

A mathematical model for the possibility of sheltering the village of Umm El-Nasr: The model algorithms[9] have been adapted to suit the displacement management processes in the village of Umm Al-Nasr by developing a mathematical probability of displacement in the shelter such as the type of shelter, the allocated area, the number of displaced persons and the speed required to reach the shelter on the assumption that the village population is concentrated in the center of the village and also assuming that all residents will go to the same shelter at the same speed.

The model is designed to establish a probability of appropriate shelter based on the type of disaster with the ability to determine the number of displaced persons and

Table 4: Response procedures to be taken by the emergency committee in the municipality of Umm El-Nasir village

Disaster	Number of IDPs	Place of displacement	Measures
Flood	700	Hamza bin Abi Talib School in the village Umm Al-Nasr (Fig. 4)	Follow up indicators of water level rise in water basins
			Develop an early warning system to warn the population
			Evacuation of the population close to the danger to the school Hamza bin Abi Talib
			Working to provide transportation for the population
Wars	5000	Khalifa bin Zayed Schools in the town of Beit Lahia (Fig. 5)	Follow-up indicators of war on the region
			The establishment of an early warning system to spare the population the need to evacuate
			The emergency committee in the municipality and with the support of neighborhood committees evacuate the village population to Khalifa bin Zayed School in Beit Lahia
			Working to provide transportation for the population
			Establish a special committee to deal with the physically disabled and help them to transfer them to shelters

the space required for shelter, the model is important to reduce the total time of expected displacement and with constraints such as capacity in the shelter and access distance:

$$f_1 = \min \sum_{i=1}^{n} Y_i \times X_i \qquad (1)$$

$$Y_i \in (0,1,2), Y_i = \begin{cases} 1, & \text{The shelter of Hamza bin Abi Talib school} \\ 0, & \text{Shelter of Khalifa Bin Zayed school} \\ 2, & \text{Other displacement options} \end{cases} \qquad (2)$$

$$X_i \text{ Proposed shlter space} \qquad (3)$$

$$f_2 = \min \sum \frac{D_{ij}}{v_j} * \frac{P_j}{Wi_j} \qquad (4)$$

Where:

i = I = (1, 2, ... i, ... N) the proposed set of services in the shelter

j = J = (1, 2, ..., j, ..., N) A displaced group from the village

d_{ji} = j the length of the shortest path between a group of village and the proposed shelter i

V_j = Speed evacuation of a group of village population j

W_{ji} = Average width of the road from community j to shelter candidate i

P_j = Number of people needing evacuation from village j

f_1 = A function to identify shelter and reduce the total area of shelter

f_2 = Function to reduce total proposed displacement time

The characteristics of displaced IDPs are one of the main factors affecting the speed of eviction. Assuming that the speed of displacement of the village population depends on the age of the population in the community and that each child and disabled person needs the assistance of an adult during the evacuation, then the speed of evacuation can be calculated vj according to the following equation:

$$v_j = \left(2 * p_c * v_c + \left[(P_a - P_c) * (v_a + p_a) * v_0\right] * \rho\right) \qquad (5)$$

Where:

v_j = Speed of evacuation

P_c = Percentage of children and disabled in the village

v_c = Percentage of children and disabled in the village

P_a = The percentage of adults in the village without the disabled

v_a = The evacuation of adults from the village

P_0 = Percentage of elderly in the village

v_0 = The speed of the evacuation of the elderly from the village

ρ = Adjustable which is equivalent to 1.2

Considering that the speed of evacuation is >1.3 times for normal situations without taking into account the difficult situation of roads and the negative effects of the disaster

The proportion of the P_j population can be calculated in community j who needs to be evacuated according to the following equation:

$$P_j = pop_j \times R \qquad (6)$$

Where:

pop_j = The population of the community in village

j and R = The rate of evacuation of the various scenarios in the expected disasters

The possibility of evacuating IDPs before the disaster from the village of Umm El-Nasser: Figure 4 illustrates the partial displacement of residents of areas close to sewage stations in the event of fault or destruction of the ponds which may lead to a tsunami. Therefore, Hamza bin Abi Talib school was identified to displace the inhabitants of the area near the ponds.

Figure 5 it shows the overall displacement of the entire population from Umm El-Nasser village to the nearby town of Beit Lahia and is far from the danger of war. The population will move to the Khalifa bin Zayed School of UNRWA.

Set enough space for refugee families from Umm El-Nasser village: Shelter is very important for the refuges especially in the early stages of the disaster because it provision them with the survival requirements and security; there are different types of shelters that used to displace people from disasters and wars.

Fig. 4: Partial displacement to Hamza Bin Abi Talib school

Fig. 5: Overall displacement operations to Khalifa Bin Zayed school

Fig. 6(a-c): Hamza bin Abi Talib school as a partial shelter for the displaced

Umm El-Nasr is exposed to the dangers of wars that cause overall displacement of the entire population because the village is in a location for military operations. There is also another danger that causes partial displacement of people causing a flood from the destruction of the sewage station in the village center as happened in the disaster of 2007 which caused the displacement of people from their places of residence.

First: In this study, we propose Hamza bin Abi Talib school as an emergency shelter for a few days in the event of a flood, the ownership of this school for the Ministry of Education located in the north of the village is far from the danger of the flood show in Fig. 6. Table 5 shows the planning of Hamza bin Abi Talib school as a shelter for the displaced in the case of a flood based on sphere criteria.

The second, we propose that Khalifa bin Zayed School be a temporary shelter for a few weeks in the event of a war on the area. The ownership of this school is considered UNRWA's shelter in the town of Beit Lahia, show in Fig. 7. Table 6 planning the Khalifa Bin Zayed School as a shelter for displaced persons in the event of War based on sphere's standards. It was used as a shelter for 5,000 IDPs from the region during the 2014 war.

In the 2014 war, half a million people fled their homes to escape from death, many of whom were displaced to UNRWA schools. UNRWA[10] provided humanitarian assistance to <290,000 internally

Table 5: Hamza Bin Abi Talib School planning as a shelter for displaced persons in the case of a flood based on sphere standards

Sphere standards	Services required for shelter	Services available at school	Details
Power source	A permanent source general source		
Drinking water	A permanent source available for drinking		
Water for use	A permanent source available public network		
Sewage	Available sewer system and maintenance system	An internal network connected to the public network	
Equipped kitchen	All necessary needs are available	Available	
Number of rooms suitable for shelter	3.5 m per person, so that, 17.5 m^2 of unit space is enough for a family of five people as an average	The 21 rooms including 11 classrooms with an area of 60 m^2	It is enough for 700 people taking into account the total area of the school 3200 m^2 and the building area of 1500 m^2
The internal height of the so-called distance luminous	The internal height is <2 m	3 m	
Toilets	To serve the proposed number of refugees	12 WC+1 WC for people with disabilities	
The existence of a fire protection system	Fire protection equipment	Available	
Special equipment for the disabled	Taking into account the special needs	Equipped with private entrances and private toilet	
A building surrounded by a wall	Providing protection Available for refugees		
Other facilities		Available playgrounds, playgrounds and umbrellas	

Table 6: Planning the Khalifa Bin Zayed primary school as a shelter for IDPs in the event of war based on sphere's criteria

Sphere standards	Services required for shelter	Services available at school	Details
Power source	A permanent source general source		
Drinking water	A permanent source available for drinking		
Water for use	A permanent source available public network		
Sewage	Available sewer system and maintenance system	An internal network connected to the public network	
Equipped kitchen	All necessary needs are available	Available	
Number of rooms suitable for shelter	3.5 m per person, so that, 17.5 m^2 of unit space is enough for a family of five people as an average	The 32 rooms with an area of 60 m^2	Enough of 2000 people talking into account the total area of the school and boarding facilities
The internal height of the so-called distance luminous	The internal height is <2 m	3 m	
Toilets	To serve the proposed number of refugees	12 WC+1 WC for people with disabilities	
Fire protection equipment	The existence of a fire protection system	Available	
Special equipment for the disabled	Taking into account the special needs	Equipped with private entrances and private toilet	
A building surrounded by a wall	Providing protection Available for refugees		
Other facilities		Available playgrounds, playgrounds and umbrellas	

displaced persons in 90 schools that were used as emergency shelters from 156 schools of UNRWA[10].

Table 6 planning the Khalifa Bin Zayed Primary School as a shelter for IDPs in the event of war based on sphere's criteria. Procedures for the response of the emergency committee in the Municipality of Umm El-Nasr in the shelter.

The Emergency Committee in Umm El-Nasr Municipality follows the Central Emergency Committee for the North Gaza Governorate which includes all the institutions involved in emergency, relief and rescue activities such as the Office of the Director of the Interior in the North, the Office of Police Operations in Northern Gaza, civil defense, UNRWA, the mayor of Umm El-Nasr, the electricity company, the municipality of BeitHanoun and Jabalia municipality and the Water Authority. To include the tasks of the Committee that develop mechanisms and procedures for preparedness and response to the preservation of life and property, Table 7 shows the response procedures during shelter for refugees from Umm El-Nasser village.

Table 7: The response procedures during shelter for refugees from Umm El-Nasser village

Disaster	Procedures	Number of IDPs	Place of displacement
Food	Coordinate with all parties working in relief to provide for the needs of refugees Coordinate with the Ministry of Health to monitor and examine the refugees in the shelter Placement of a field officer to work within the shelter to follow up the needs of refugees Assistance in the allocation of places for each family in the shelter Coordinate with the interior to provide security within the shelter Coordination with the government in the provision of electricity and water and its sustainability Formation of an internal committee of the refugees to help shelter management	700	Hamza bin Abi Talib School in the village Umm Al -Nasr
Wars	Coordinate with all parties working in relief to provide for the needs of refugees Coordination with the Ministry of Health to follow up and examine the health status of refugees in the shelter Placement of a field officer to work within the shelter to follow up the needs of refugees Assistance in the allocation of places for each family in the shelter Coordinate with the interior to provide security within the shelter Coordination with the government in the provision of electricity and water and its sustainability Formation of an internal committee of the refugees to help shelter management Identify a special committee to deal with the disabled and help them and provide them with their needs Coordinate with the Mental Health Center to implement refugee relief programs	2000	Khalifa bin Zayed Schools in the town of Beit Lahia

(a)

(b)

Fig. 7(a, b): Khalifa bin Zayed school temporary shelter in the event of war

CONCLUSION

Identify the factors that effect on increasing risks that lead to the increase of vulnerability of the community's which includes the structural elements and social factors in the village of Umm Al-Nasser.

The risk matrix for the village of Umm Al-Nasr which requires displacement from the village was developed to determine the probability of occurrence of the hazard, the level of danger, its degree of incidence, and the consequences in case of occurrence (catastrophic, high, medium, low).

Prepare response procedures for the emergency committee in the municipality of Umm Al-Nasser village to manage the total or partial displacement of the population during or before the emergency event.

Determining the location and direction of the partial or overall displacement of the village population at risk. Designing a mathematical model for the possibility of choosing shelter for the displaced by placing a mathematical probability of displacement in the shelter within the variables of shelter type, allocated area, number of displaced persons and the speed required to reach the shelter.

Hamza Bin Abi Talib school was planned as an emergency shelter for the displaced in the event of a tsunami based on sphere's criteria Khalifa Bin Zayed Primary School was designed as a temporary shelter for displaced persons in war situations based on sphere's criteria.

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