

PAPER • OPEN ACCESS

Effect of Climate on The Burial and Stripping of Remnants of War in Al-Muthanna Desert and Its Health Effects

To cite this article: Muhammad Jaber Al-Aajibi and Karar Majid Al-Jiashi 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **923** 012079

View the [article online](#) for updates and enhancements.

You may also like

- [Response of some Bread Wheat Cultivars to Foliar Feeding Stages with Nano-Microelements](#)
Amir M. H. Al-Shammari and Ali H. Noaema
- [Optimal Use of Natural Resources in Al-Muthanna Desert \(Soil as A model\)](#)
Muhammad Jaber Al-Aajibi and Jassim Wehwah Al-Jiashi
- [Investigation on the behavior of the modified AA 7075 alloy using differential scanning calorimetry technique](#)
Firas Fouad Abdullah and Haider Tawfiq Naeem



ECS
The
Electrochemical
Society
Advancing solid state &
electrochemical science & technology

DISCOVER
how sustainability
intersects with
electrochemistry & solid
state science research

Effect of Climate on The Burial and Stripping of Remnants of War in Al-Muthanna Desert and Its Health Effects

Muhammad Jaber Al-Aajibi¹ and Karar Majid Al-Jiashi²

¹The Desert and Sawa Lake Studies Center, Al-Muthanna University, Iraq.

²Al-Muthanna Governorate Traffic Directorate, Iraq.

¹Email: mohammed.jaber@mu.edu.iq

²Email: kararmagid4@gmail.com

Abstract

Military remnants in the Al-Muthanna desert are one of the most important risks facing the local population in the desert, due to its presence in large quantities and in large areas and in many types. Climate factors interacted integrated with each other, which led to the burial of many of these wastes. Sometimes wind erosion shows it, and there is a big role for dust storms and air precipitation to hide the war remnants in Al-Muthanna desert, due to the nature of the dry climate in it, which helped in the disintegration of its soil, which makes up most of the surface of the study area. It was also found that there is a large role of rain in burying many wastes, led to its concealment and the difficulty of seeing it with the naked eye, which required the use of explosive detection devices or dogs trained in that to investigate it. As for the casualties caused by the remnants of war, it has been continuous throughout the years (2004-2020), which claimed the lives of many local residents in the Desert, led by the year 2013, when the number of victims was. When studying the distribution of these remnants in the Desert region, it appeared that there are many areas in which war remnants are scattered in large areas, all of which are explosive and dangerous, such as mines, cluster bombs of different types, mortars and artillery. The Busayeh desert took the largest share of the area and the largest amount of war remnants. The research found that there are areas in which there are war remnants that are not registered with the Civil Defense Department in Al-Muthanna Governorate, such as Al-Juyou, Faydat Al-Faris, and Kilo.

Keywords: Climate, Desert, Health.

1.Introduction

Military remnants were a source of closure and a threat to the lives of the population even after the war ends, especially explosive waste, which annually kills many innocent people, among the areas that have taken their share of war remnants was Al-Muthanna desert. After the Iraqi army entered Kuwait and the United States of America and its allies declared war on Iraq to liberate Kuwait, as well as the US occupation war on Iraq in 2003 AD and the entry of US forces and allied forces from the side of the Iraqi-Kuwaiti and Saudi borders. Those lands became a battlefield between the Iraqi army and the allied forces, and a corridor for the occupying armies, as a result, the desert area became an arena for planting landmines and other remnants of war, as these wastes claim the lives of dozens of Bedouin residents in that area. It also leads to great losses in livestock, especially the sheep and camels that graze in those lands, especially after it rains, which requires identifying the areas that contain these explosives, counting their quantities, and setting instructions for the purpose of avoiding their dangers.

2.Research problem

What is the impact of the climate on the burial and erosion of war remnants in Al-Muthanna desert? What are the health effects of it? The main problem can be divided into secondary problems:

- What is the role of climate factors in burying and eroding military remnants?
- What are the health effects of the explosion of these wastes?



Content from this work may be used under the terms of the [Creative Commons Attribution 3.0 licence](https://creativecommons.org/licenses/by/3.0/). Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

3.Hypothesis

Climate plays a major role in burying and eroding war remnants in Al-Muthanna desert, and there are health effects resulting from it. Secondary hypotheses can be formulated:

- Integrated climate factors, especially wind, rain and dust storms, play a major role in burying and eroding military remnants.
- There are health effects resulting from the remnants of war in Al-Muthanna desert, which have claimed the lives of many local residents and workers.

4.Purpose of the study

Studying the impact of climatic factors in concealing and sometimes showing many remnants of war, as well as revealing the health effects of war remnants in the desert to know the real danger these remnants pose to the lives of the population as well as animals, and identifying the locations of these remnants for the purpose of avoiding them and avoiding the dangers arising from them.

5.The site

The astronomical location of the study area is between latitudes 29° 03' 45" - 31° 03' 30" north and longitudes 46° 59' 59" 33" - 44° 52' 30" east. Dhi-Qar As for the east and southeast, it is bordered by Basra Governorate, and from the west is the desert of Najaf, which belongs to the Shabchah district. As for its southern borders, it is the international border of Iraq with the Kingdom of Saudi Arabia. The desert constitutes most of the area of Al-Muthanna Governorate, as it occupies an area of (46254.5 km²), with a percentage of (89.38%) out of the governorate's area of (51,750 km²) [1], (Figure 1).

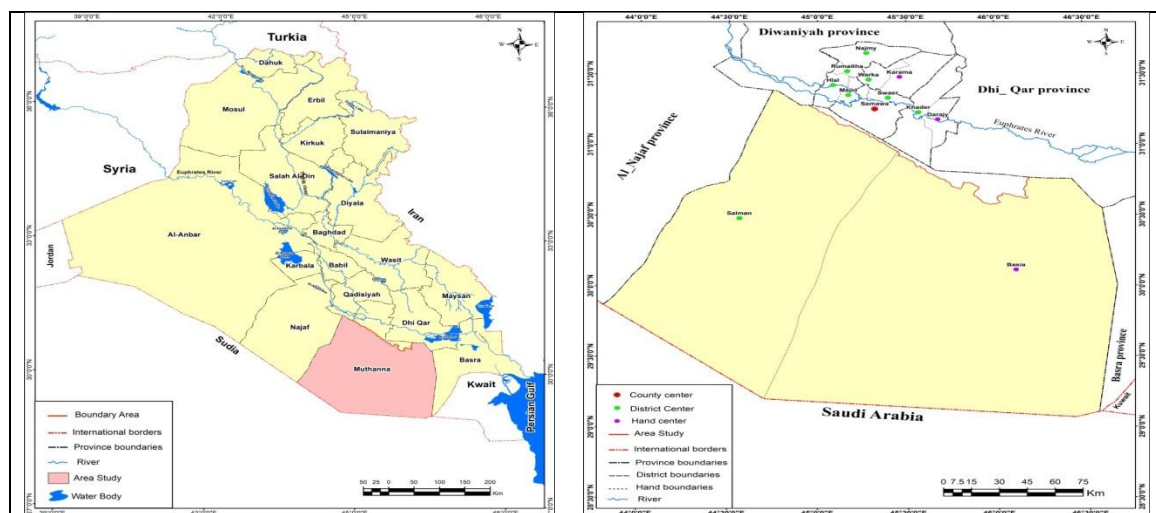


Figure 1. the geographical location of the Desert of Iraq and Al-Muthanna Governorate.

Source: From the researcher's work based on the Figure of the Republic of Iraq, the Ministry of Water Resources and the General Authority for Surveying, Figure Production Department, Muthanna Administrative Figure, at a scale of 1: 500000, Baghdad 2018.

6.The surface

The surface of Al-Muthanna desert is characterized by its different topography and is characterized by its gradual slope from the southwest towards the north and northeast, and its height in the southwest reaches (455 m) above sea level [2]. The surface is divided into several areas:

6.1 Al-Dibdaba

The composition of Al-Dibbeh consists of course, multi-colored clastic rocks, and some limestone may overlap in it, as it appears flat. It consists of gravel and sand. The gravel consists of quartz crumbs[3].

6.2 Al-Hajjara

They consist of rocky areas with sharp edges consisting of limestone, flint and basalt. The most important depressions in it are the depression of Al-Salman, Hadania, Al-Sa'a and Shawiya. Its surface consists of exposed, bare rocks due to wind erosion and the lack of vegetation cover [4].

6.3 Al-Wedian area

It is located in the north of the study area and is characterized by its simplicity, as it is located between the sedimentary plain in the north, the dunes and stones area in the south, and the borders with Najaf governorate in the west and Al-Dibbeh area in the east. To the sedimentary plain area, the height of this area ranges between (60-180 m) above sea level, covering the surface of calcareous formations and some clays[5].

6.4 Al-Hammad area

This area is located in the southwestern part of the study area. It is surrounded from the south by the international borders with Saudi Arabia, from the north by the Al-Hajjara region, and from the west by Desert Al-Najaf and the Al-Dabdaba region to the east. This region is located above the rocks of dolomitic limestone[6].

7. Military remnants

Since the outbreak of the Industrial Revolution in Europe, human beings have been harnessing their scientific and material energies to produce lethal weapons in order to kill each other. Among these weapons are landmines planted on the battlefield and other explosive remnants such as artillery rockets and others. Death does not end at the end of the battle, but rather continues for subsequent generations, because of the explosive remnants left by the war. Therefore, war remnants are large groups of explosive and non-explosive or abandoned objects that remain on the battlefield after the end of the armed conflict, these remnants include landmines, cluster bombs, grenades, artillery bombs, mortar shells and other small explosive remnants. As thousands remain, and may reach millions of explosive parts, for many years to come, many children, women and men alike are killed or injured every year. Al-Muthanna desert is one of the areas affected by the effects of war because of these wastes, which annually kill tens or sometimes hundreds of people, as well as the death of many grazing animals and other animals, which affects its biological diversity, in addition to the radioactive effects that these wastes may cause.

8. Types of military remnants

8.1 Landmines

They are explosive devices designed for the purpose of destroying vehicles, detonating them, causing damage to them, killing people or impeding their activities. These mines may be activated by the movement of the target. When he tramples on and collides with it or detonates it by direct pressure on it or when the wires attached to it move or detonates it through remote control and mines are used as defensive weapons, provides protection for important military sites and hinders the movement of forces by causing losses to the enemy and destroying its equipment, and it divides landmines into two types [7].

8.1.1 Anti-personnel landmines

It is designed to explode when there is a person near it or when a person touches it, and its purpose is to disable the person, paralyze him, or kill him. They are usually detonated when a person steps on them or touches the wires attached to them, and mines can explode with the passage of time, through remote control, anti-personnel mines can be found buried in the ground or lying on it, and they are small devices and in different shapes, and usually he camouflages them to blend in with the surroundings in which they are located. As in the Figure (2), anti-personnel mines are divided according to the method of detonating them into several types as well, explosive anti-personnel mines and anti-personnel fragmentation mines, were divided into one-way fragmentation mines; There are anti-personnel mines that rise when they are fragmented and are in the form of a 360-degree radius. There are anti-personnel mines. The formed device (AP) is buried and has a cylindrical shape and a conical tip for the purpose of inserting it into the soil. They are yellow and earthy, green or yellow in color, and walking over this type will activate the detonator and detonate it. This type does not lead to killing the person, but rather to disable him, because of the small amount of explosives that this type is designed from.



Figure 2. Anti-personnel mines in Al-Muthanna desert.

Source: Field study of the Muthanna desert on 9/9/2021.

8.1.2 Anti-vehicle landmines

They are often designed to attack tanks to disable or destroy vehicles, this type explodes by pressing it, and you need a heavy weight for the purpose of detonating it, can explode by magnetic influence, remote control, or by moving a wire rod. A fiberglass cable laid on the road can be used to detonate road mines (AV). These are directed to fire anti-tank finned missiles and can be placed on both sides of the road at a distance of between (2-4) meters above a small tripod, anti-vehicle mines are much larger than anti-personnel mines, and the explosive and destructive power is more intense. Whether it is anti-personnel or anti-vehicle mines, Al-Muthanna desert contains tons of these explosives, which pose a threat to the population in the present and the future.

8.2 Unexploded Ordnance (UXO)

They are explosive munitions that have been prepared, fuzed, weaponized, or otherwise prepared for use or use. It may have been launched or shot down but still not detonated whether by fault, design or any other reason[8]. These include mortars, rockets, grenades, cluster munitions, and bombs dropped from aircraft. They do not include landmines, but rather unexploded ordnance and abandoned munitions [9]. Among the unexploded remnants of war in the Muthanna Desert are artillery rockets, mortar shells, hand grenades, Al-Arbaji shells, and unexploded rockets dropped from enemy aircraft. It is unfortunate that residents often deal with these remnants as non-explosive and carry them or some children play with, which has killed many of them or disabled them. Figure (3) and (4).



Figure 3. A type of unexploded ordnance.

Source: UNSMA, ERW Safety Awareness, Project funded by the Kingdom of The Netherlands and the Emergency Response Fund, Page 4.



Figure 4. A type of unexploded ordnance.

Source: Field study of the Muthanna desert on 9/9/2021.

The problem of explosive remnants of war suffers from all regions that have witnessed wars in the modern era, and some of them have faced this problem for decades. Poland, for example, removes hundreds of thousands of these remnants every year after World War II [10]. Many areas of Iraq suffer from the tragedies of these munitions because of the various wars that those areas witnessed, such as the war with Iran that lasted eight years and the first and second Gulf Wars, in which Al-Muthanna desert had the largest share of these munitions.

9.The effect of climate factors on the burial or erosion of war remnants

Al-Muthanna desert is located within the dry desert climate that characterizes the southern part of Iraq, (Figure 5).

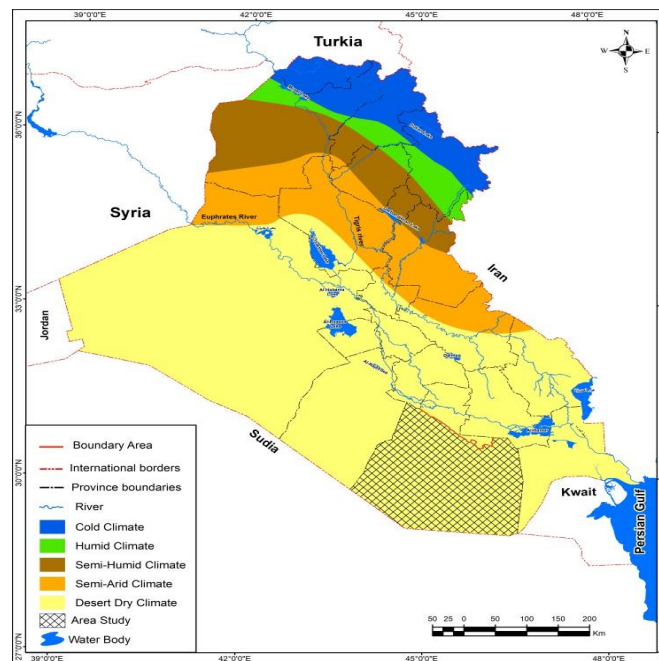


Figure 5. The location of the Muthanna deasrt within the climatic regions of Iraq.

Source: From the researcher's work, depending on the Ministry of Water Resources, General Authority for Survey, Figure Production Department, Baghdad, Iraq's administrative Figure with a scale of 1: 1000000, 2011.

Therefore, climatic factors in the desert play an important role in concealing or stripping the various forms of war remnants. The correlation between pressure distribution and general wind movement does not need evidence, as the winds It is the result of pressure differences, and because the atmospheric pressure is the product of the difference in the distribution of heat on the surface of the earth, so the atmospheric pressure and the resulting general winds are the product of the uneven distribution of solar radiation on the surface of the earth [11].

Table (1) show that it can be realized the importance of the influence of climatic factors on the surface of the study area, which is characterized by the variation of the slope and elevation factor, as well as the different components of the soil that make up the surface. The study area is characterized by the long hours of solar brightness, especially in the summer, as the hours of radiation reach (13.5, 13.4 and 13.1 hours) in June, July and August, respectively. These long hours are sufficient to form geothermal storage.

As the nature of the rocky and sandy surface that characterizes the Desert helps the high temperatures as well as the dryness of the area in the summer and the lack of humidity, as the highest average temperatures are recorded (35, 36.5 and 36.5 degrees) in June, July and August, respectively. As for the maximum temperatures recorded (43.1, 44.8 and 45.1 degrees).

Therefore, the study area becomes of low pressure for wind gusts that dry the soil particles and transport them through wind erosion. Which helps in burying the war remnants when the wind calms down and the sedimentation process takes place or stripped when the wind blows quickly. The wind speed reaches its highest level in June and July (4 m/s). These winds are characterized by being hot, which increases evaporation and dryness of the soil, as evaporation amounts reach their highest levels in July and August (14.4 and 14.7) respectively. The region is also characterized by the season of dust storms in the months of March, April and May, which were recorded (1.07, 1.4 and 1.6 days).

As for the fall of dust, it continues in most months of the year, and the highest value was recorded in March (6.4). Therefore, the elements of the climate work together, each element is affected by the other, which leads to an increase in the mechanics of the soil particles and their movement continuously, especially the sandy ones. The higher the wind speed, the greater the movement of these particles. This is due to high temperatures, air expansion and the region's being under the influence of the Indian seasonal depression [12]. Therefore, winds and dust storms play an important role in burying those remnants of war scattered in Al-Muthanna desert. As for rain, it has an important role in concealing and showing the remnants of the war, despite its fluctuation and lack of rainfall. The highest amount was recorded in winter in the months of January and February (17.1, 11.9). Figure (6) and (7).



Figure 6. The effect of climate factors on covering and eroding military remnants in Al-Muthanna desert.

Source: Republic of Iraq, Ministry of Interior, Directorate of Civil Defense in Muthanna Governorate

The effect of rain is shown through the formation of torrential torrents of silt. The nature of the surface of the area, which varies between height and depression, helps in the formation of torrents that have the ability to sweep the soil and carry it to distant areas. This causes the war remnants to be hidden when silt is deposited, especially in the depressions (floods), as in Umm Kharj, where the remnants of war were covered and it became difficult to distinguish them. The torrents also concealed these wastes in most valleys and flood areas. The torrents sometimes show the residues that were covered by the sand during strong rain showers, therefore, the remnants of war became a source of danger threatening the lives of the Bedouin population and their animals. The danger is not limited to the residents of the area only, but it is more dangerous to the tourists who come to the area during the spring and the rains, as they are unaware of its location, as it is covered with sand and weeds, and even the marks placed by the civil defense teams have been covered with dust, and some of them were uprooted by the local population due to their ignorance of their importance.



Figure 7. The effect of the wind on displaying war remnants in Al-Muthanna desert.

Source: Field study of the Muthanna desert on 9/9/2021.

Table 1. Elements of climate in Al-Muthanna desert for the period (1990-2020).

Months	Theoretical solar brightness hours	Max temperature	minimum temperature	General average temperature	rain	relative humidity	evaporation	wind	dusty phenomena	stuck dust	falling dust
1	10:03	16.9	6.1	11.5	17.1	63.8	9.1	2.7	0.1	3.3	2
2	11	20.5	8.1	14.3	11.9	55.2	9.5	3.1	0.7	5.7	3.5
3	11:04	25.9	12.3	19.1	11.6	45.1	10.3	3.5	1.07	8.7	6.4
4	12:03	32.0	17.9	25	12.6	36.7	12.8	3.6	1.4	9.5	6.1
5	13:04	38.9	23.8	31.3	5.5	27.2	14.1	3.7	1.6	11.6	6.2
6	13:05	43.1	26.8	35	0	22.2	13.4	4.0	0.5	9.3	6.2
7	13:04	44.8	28.3	36.5	0	22.1	14.4	4.0	0.4	7.5	6.2
8	13:01	45.1	27.9	36.5	0	23.4	14.7	3.5	0	4.4	3.8
9	12:02	41.4	24.0	32.7	0	27	13.8	3.1	0.1	4.8	3.2
10	11:03	35.0	19.4	27.2	2.9	36.4	13.7	2.8	0.2	6.8	3.5
11	10:03	25.8	12.6	19.2	10.3	51.7	11.3	2.5	0.0	3.1	1.8
12	10:02	19.5	7.7	13.6	10.9	60	9.8	2.6	0.0	2.1	0.8
Mean	11:08	32.4	17.9	25.1		39.2		3.3	0.5	6.4	4.1
Total					82.8		147.4				

Source: Republic of Iraq, Ministry of Transport and Communications and the General Authority for Meteorology, Climate Department, Baghdad, unpublished data for the year 2020.

10. The health effects of war remnants in the of Al-Muthanna desert

The health effects caused by the remnants of war are a nightmare that hardly leaves the peoples who witnessed the scourge of war. Whenever the citizens heard the terrifying explosion, their notes returned to that bloody war, because of which they left many of their dear ones. In 1994, at the height of the landmine crisis, the ICRC estimated that, on the basis of its field information and that of other humanitarian organizations, that 2,000 people per month are killed or injured by anti-personnel mines[13]. The effects of those wars remain represented by their explosive remnants, which claimed the lives of many local citizens, and despite the attention of international organizations to the victims of the remnants of war, many peoples still suffer from the dangers of these remnants, with the convening of many conferences and agreements, such as the Nairobi Summit in 2004, the first conference of the 1997 Convention on the destruction of anti-personnel mines, their use, stockpiling, production or transfer and destruction were attended, and the Ottawa Convention has a fundamental role to include directly to the families and community of the victims. In 2009, the Convention on Cluster Munitions (CCM) amended the meaning of victims to include all persons who were killed, physically injured, or sustained long-term harm due to the use of cluster munitions [14]. However, the Muthanna desert continues to witness many accidents annually, causing the death of many victims and the disability of many residents, as well as leading to economic losses represented in the death of many animals (sheep and camels). The families of the victims of the war remnants were not included in any compensation, nor were the disabled who lost their limbs completely or partially or who lost their animals, and the research will be exposed to

the number of victims who die annually since 2004-2020 according to the available data as in Table (2). In 2004 the number of victims was (7) Distribute between Badiyat Al-Salman (4) and Busayeh (3). In 2005, the death toll decreased to only (2) in Busayeh, then increased to (8) in 2006, and the highest death rate was in 2013, as the explosion of the remnants of war caused the death of 23 people in that year, causing a horrific bloody massacre, and the cause of the death of that number is The spread of people in the Desert, as that year coincided with the early growth of weeds and the appearance of truffles due to the large number of rains in that season, which extended to the year (2014), when the number of victims was (10) between the Desert of Salman and Busayeh. and remnants of war, by examining those numbers in the table, we find that there is an increase in the number of victims in the Busayeh desert than the number of victims in Al-Salman, although the area of the Salman desert is the largest. as well as United Nations organizations, not to mention the explosives that were covered in sand due to sandstorms, which led to a temporary danger that could explode at any moment. The number of victims in Al-Muthanna desert until the year (2020) reached 94, and these are the only ones who lost their lives and are registered with the health departments in Busayeh and Salman, there is missing data on the number of casualties before the US occupation of Iraq in (2003), as the war remnants are not only those left by the war of entry of US forces into Iraq, but there are many of them are remnants of the war to liberate Kuwait in 1991, and these remnants have caused death and disability a lot From citizens, so these wastes require a great effort by civil defense teams with the help of international organizations and citizens to investigate and dismantle them by specialists.

Table 2. The human casualties as a result of the explosion of war remnants in Al-Muthanna desert (Al-Salman and Busayeh) for the period (2004-2020).

No.	Year	Victims No.	accident scene	
			Salman	Busayeh
1	2004	7	4	3
2	2005	2	0	2
3	2006	8	3	5
4	2007	4	1	3
5	2008	2	0	2
6	2009	3	0	3
7	2010	9	4	5
8	2011	2	2	0
9	2012	4	1	3
10	2013	23	11	12
11	2014	10	4	6
12	2015	4	0	4
13	2016	3	1	2
14	2017	5	1	4
15	2018	1	0	1
16	2019	3	0	3
17	2020	4	0	4
Total		94	32	62

Source: Republic of Iraq, Ministry of Health, Muthanna Health Department, unpublished data for 2020.

11. Geographical distribution of war remnants in Al-Muthanna desert

Through Table (3), it is clear that the war remnants are spread in large areas and scattered areas in the Desert, and this increases its danger. Military remnants in (5) areas of varying size, they were concentrated in Al-Daraji - Al-Buhaira area between Block (5) and Block (2), with areas of (260,000, 70,000, 210,000, 23,950, 744000 m²).

As for the Busayeh desert, a mine field spread in Abu Khuwaimah with an area of (27000,000 m²). As for the center of Desert - Desert (3), cluster bombs with two M42 strips covered an area of (7000000 m²). The same type is also found in the areas affiliated with the Busayeh sub-district. Busayeh, which is Al-Azami, Aden 2, Leh, and covered areas of (8000,300, 3225,000, 5900000 square meters), respectively, and anti-tank missiles (heat) of 106 mm caliber were deployed in Aden (2). As for the type of cluster bombs (M42 and BLU), they were distributed in Abu Khuwaimah (1), Busayeh (5), Busayeh (6) and Busayeh (2), with areas of (5900000, 3910855, 197555 m²), respectively, while the cluster bombs (type) were spread BLU 63 in Busayeh (2) with an estimated area of (5460000 m²), aAs for 120 mm mortar shells, they spread in Busayeh (Abu al-Jed area), and there were also quantities of cluster bombs (M42 and Blu spread in Busayeh (1), with an area of 370,000 m²). The large spread did not end at this point, but the bombs also spread Cluster type (M42 and BLU in each of

Busayeh (1), Busayeh (4), Jadaa, Al-Reem, Baswa, Abu Ghar Road, and the administrative borders of Muthanna Governorate with Al-Qadisiyah Governorate (Oil Pipeline Road) with areas (370000, 13100000, 457000, 128000, 357000, 230000, 250000 square meters) Straight. What increased the danger of the remnants of war in the desert is the random distribution of these remnants in the desert areas, as shown in the Figure (8). It is noted that there are other areas for which the researcher did not find data registered in the concerned departments, especially in the Al-Salman Desert region. Among the local population, the area of Al-Juyou, [16], south of Salman, as well as Faydat Umm Kharj, as these areas could not be recorded, due to the difficulty and danger of access to them, as dust storms covered many of the remnants of war in them.

Table 3. Geographical distribution of war debris in Al-Muthanna desert.

*Objectid	Shape	Area name	y	x	Area (m ²)	remnants of war type
1	Point	Bsaia 4	30° 4' 38.887" N	46° 3' 43.359" E	13100000	Cluster bombs M42
2	Point	jadaa	30° 5' 56.454" N	46° 6' 14.001" E	457000	Cluster bombs M42
3	Point	Rim	30° 8' 38.619" N	46° 6' 44.847" E	128000	Cluster bombs M42
4	Point	Baswa	31° 2' 47.340" N	45° 4' 9.764" E	357000	Cluster bombs M42
5	Point	oil pipeline	31° 17' 12.056" N	44° 46' 31.300" E	230000	Cluster bombs M42
6	Point	Abu-Khwema 2	29° 15' 45.056" N	46° 15' 37.010" E	27000000	mine field
7	Point	Bsaia 3	30° 7' 47.871" N	46° 7' 31.328" E	7000000	Cluster bombs M42
8	Point	Al-Adami	29° 31' 49.717" N	46° 18' 27.430" E	8000300	Cluster bombs M42
9	Point	Aden 2	29° 42' 52.107" N	45° 50' 20.521" E	325000	Cluster bombs M42
10	Point	Lia	29° 52' 47.337" N	44° 55' 56.704" E	5900000	Cluster bombs M42
11	Point	Aden 1	29° 43' 29.103" N	45° 51' 7.505" E	-	Anti-tank missiles 106ML
12	Point	Abu-Khwema 1	29° 22' 57.740" N	46° 14' 12.603" E	5900000	Cluster bombs M42 and Blu
13	Point	Bsaia 5	30° 6' 37.615" N	46° 6' 44.537" E	3910855	Cluster bombs M42 and Blu
14	Point	Bsaia 6	30° 6' 22.697" N	46° 4' 36.777" E	197555	Cluster bombs M42 and Blu
15	Point	Bsaia 2	30° 8' 17.354" N	46° 4' 14.886" E	5460000	Cluster bombs M42 and Blu
16	Point	Abu-Aljad	29° 50' 18.703" N	45° 23' 34.491" E	-	Mortar shells 120ML
17	Point	Bsaia 1	30° 7' 19.641" N	46° 6' 3.305" E	3700000	Cluster bombs M42 and Blu
18	Point	Blok5 .ALdraji-Bhairh	30° 34' 29.278" N	45° 39' 12.422" E	260000	Cluster bombs M42
19	Point	Blok5.ALdraji-Buhairh	30° 34' 49.411" N	45° 39' 26.712" E		Cluster bombs M42
20	Point	Blok5.ALdraji-Buhairh	30° 34' 39.905" N	45° 39' 37.235" E		Cluster bombs M42
21	Point	Blok5.ALdraji-Buhairh	30° 34' 26.218" N	45° 39' 32.863" E		Cluster bombs M42
22	Point	Blok5.ALdraji-Buhairh	30° 35' 30.817" N	45° 36' 14.850" E		Cluster bombs M42
23	Point	Blok5.ALdraji-Buhairh	30° 35' 26.557" N	45° 36' 22.671" E	70000	Cluster bombs M42
24	Point	Blok5.ALdraji-Buhairh	30° 35' 18.032" N	45° 36' 18.826" E		Cluster bombs M42
25	Point	Blok5.ALdraji-Buhairh	30° 35' 22.875" N	45° 36' 11.158" E		Cluster bombs M42

*Objectid	Shape	Area name	y	x	Area (m ²)	remnants of war type
26	Point	Blok5.ALdraji-Buhairh	30° 40' 54.397" N	45° 50' 37.391" E	210000	Cluster bombs M42
27	Point	Blok5.ALdraji-Buhairh	30° 35' 40.816" N	45° 36' 9.166" E		Cluster bombs M42
28	Point	Blok5.ALdraji-Buhairh	30° 35' 28.824" N	45° 35' 56.213" E		Cluster bombs M42
29	Point	Blok5.ALdraji-Buhairh	30° 35' 37.231" N	45° 35' 43.422" E		Cluster bombs M42
30	Point	Blok2 ALdraji-Buhairh	30° 39' 28.872" N	46° 16' 13.081" E		Cluster bombs M42
31	Point	Blok2ALdraji-Buhairh	30° 39' 30.541" N	46° 16' 21.782" E	23950	Cluster bombs M42
32	Point	Blok2ALdraji-Buhairh	30° 39' 27.350" N	46° 16' 22.567" E		Cluster bombs M42
33	Point	Blok2ALdraji-Buhairh	30° 39' 25.647" N	46° 16' 14.053" E		Cluster bombs M42
34	Point	Blok2ALdraji-Buhairh	30° 41' 9.210" N	46° 19' 21.517" E		Cluster bombs M42
35	Point	Blok2ALdraji-Buhairh	30° 40' 38.044" N	46° 19' 0.838" E	744000	Cluster bombs M42
36	Point	Blok2ALdraji-Buhairh	30° 40' 28.662" N	46° 19' 25.887" E		Cluster bombs M42
37	Point	Blok2ALdraji-Buhairh	30° 41' 2.008" N	46° 19' 42.953" E		Cluster bombs M42

Source: Republic of Iraq, Ministry of Interior, Civil Defense Directorate, Muthanna Civil Defense Directorate and Technical Affairs Department.

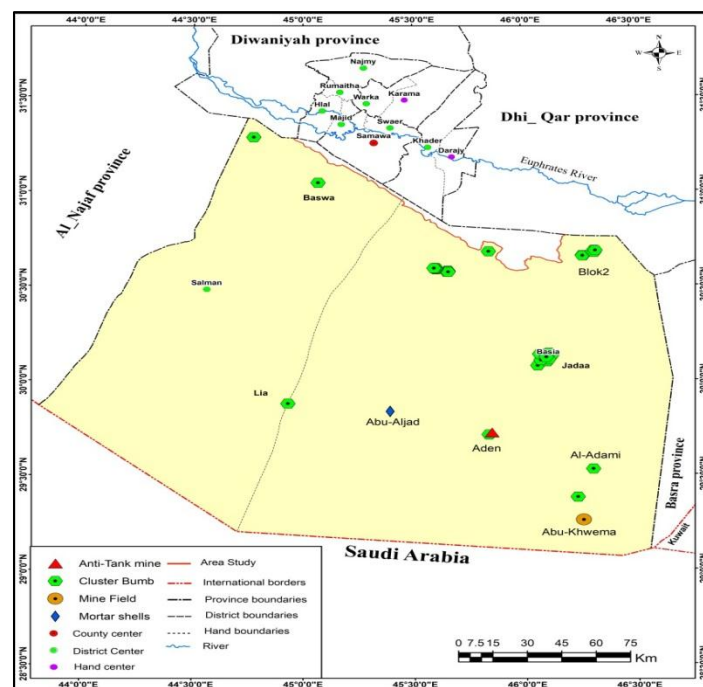


Figure 8. The geographical distribution of war remnants in Al-Muthanna desert.

The source is from the researcher's work based on Table (3).

12. Management of war remnants and how to control them and reduce their danger

Disposing of military remnants requires a highly experienced and professional management to put in place the necessary plan to control the remnants of war and reduce its dangers, which caused the loss of many lives. The Muthanna desert has a vast area, as well as the different nature of its surface between sand dunes, barren deserts, valleys, plateaus, depressions and sandy lands. follow

- Forming a team specialized in dealing with types of war remnants, and this team will be from the civil defense teams, the Health and Environment Department, and the Mine Affairs Department in the governorate. It is advisable to cooperate with an organization specializing in removing mines and explosives.
- Conducting a comprehensive survey of the study area and determining the coordinates and areas of all the sites where the war remnants are located, especially that there are areas containing war remnants of different types that are not registered with the Civil Defense Department.
- Putting signs that refer to military remnants, such as danger signs, flags or stones, and marking them.
- Bring high-precision devices to detect explosives, and dogs trained to detect explosives can be brought, especially that most of the war remnants, if not all of them, have disappeared due to climatic factors affecting the varying nature of the surface.
- The team includes a first aid cadre in anticipation of any emergency that may occur, and the presence of an ambulance equipped with all the necessary medical tools for first aid

13. Battle Ground Cleaning (BAC)

BAC operations are the sites of explosives and the disposal of remnants of war, including explosive ordnance and abandoned ordnance (ERW). It must be treated by dismantling or detonating it, and the area is cleaned as follows

- Cleaning the area: It is carried out through technical survey, information and reliable evidence collected during the technical survey.
- The quality of removal, and there are two types of removal [15].

A- Surface removal: It is carried out through visual research and a device may sometimes be used to detect explosives, especially when plants or earth mounds are present, especially since most of the explosives in the Muthanna desert have been buried due to climatic factors. In this process, all types of war remnants are inspected, including small arms.

B - Subsurface removal: techniques are used, including digging and detection, as all war remnants are removed, and dogs can be used to detect explosives. Dangerous components are identified and the explosive devices are dismantled or detonated with caution to eliminate their danger. Unexploded ordnance and ammunition are also disposed of. Abandoned. This is done to a specific depth through the approved clearance organization with the approved operational capabilities, such as manual removal by experienced and qualified personnel to get rid of explosive ordnance. Also, the demining organization and its sub-unit work on monitoring, and it is necessary to work on conducting a qualitative control process after clearance. BAC should specify the area to be removed and specify the type of target as well as the depth of removal. In desert areas, especially sandy areas, as in the study area in Busayyah district, it needs to be removed to a depth of (1-3 m) to determine and destroy unexploded ordnance, as well as the depth of demining can be adjusted as required, and any change to mine removal can be agreed and formally written down. The depth of war remnants and their disappearance in the soil, for example, is affected by rain and soft soil, as well as by the frequency and speed of winds and dust storms in desert areas. Therefore, cleaning operations work to limit the dangers to which the local population is exposed, and it is possible to move through the lands safely and in the longer term

Conclusions

- Military remnants are affected by all climatic factors through the interrelationship of these factors among themselves.
- There are climatic factors that have a clear impact on the burial and erosion of military remnants, the most important of which is the wind.
- Role for dust storms in hiding the remnants of war, as well as air precipitation over time, which leads to the burial and concealment of the remnants of war.
- The rain, despite its scarcity and fluctuation from one season to another, has a direct impact on burying the war remnants sometimes and showing up when the soil is swept over it at other times.

- The research concluded that there are victims whose numbers are not insignificant annually, who lose their lives due to war remnants in the Muthanna desert.
- The number of victims varied from year to year, and the share of Desert Busayah was the largest in numbers from the Desert of Salman, due to the increase in the amount of waste in the Busayeh desert and the sandy nature of its surface, which leads to its hiding in the sand and not being seen by the residents.
- The research concluded that there are large quantities and different types of war remnants spread in Al-Muthanna desert and occupy large areas
- The research found that there are unregistered military remnants in the desert of Al-Salman, which requires marking them and recording their coordinates by the competent authorities.

Recommendations

- Take care and caution when working in the Badia areas, due to the presence of war remnants such as land mines of various types or abandoned, which have the potential to be explosive, which necessitates staying away from them in any way.
- Putting signs in areas that contain remnants of war, which are special signs for that purpose, to be known as a danger area and should be avoided.
- Spreading awareness among the local population by the competent departments such as the Civil Defense Directorate in the governorate and the Environment Department and urging citizens not to approach these wastes, carry them, or attempt to dismantle them or raise the signs set by the competent authorities.
- Benefiting from the local population (the Bedouins) in knowing the areas that are not registered with the competent departments, as these Bedouins are familiar with and familiar with all the areas of the Badia, that is, they know the stray and contained therein.
- The competent authorities should make intensive efforts and invite the United Nations to conduct a comprehensive survey of the Badia areas, identify unknown or unregistered areas with the presence of remnants of war, and work to remove or detonate those remnants.

References

- [1] Directorate of Statistics in Muthanna Governorate, Planning and Follow-up Department, unpublished data, 2020.
- [2] By analyzing the topographic Figure
- [3] Falah Jamal, Bashir Ibrahim Salam Fadel Ali.(2016).Iraq's natural demographic and economic geography.Amman-Jordan,. Dar Tigris. Arabic Edition, p. 62.
- [4] Walaa Kamel Sabri Al-Asadi, the effect of climate on surface features and plant environment in the Muthanna desert(2016). PhD thesis. College of Arts. University of Baghdad , p. 41.
- [5] Jassem Wawah Shati Al-Jiashi,(2017). Spatial Analysis of Water Resources and Sediments in the Badia of Al-Muthanna Governorate and Its Investments. Master Thesis. College of Education for Human Sciences. Al-Muthanna University , p. 35.
- [6] Walaa Kamel Sabri al-Asadi, previous source, p. 44.
- [7] United Nations Landmines, Explosive Remnants of War and IEDs. Safety Guide, p. 12.
- [8] UNSMA, Explosive Remnants of War (ERW Definitions, page 8.
- [9] UNSMA, ERW Safety Awareness. Project funded by the Kingdom of the Netherlands and the Emergency Response Fund, Page 4.
- [10] International Committee of the Red Cross, Explosive Remnants of War The Deadly Legacy of Armed Conflict Website (<https://www.icrc.org/ar/doc/resources/documents/legal-fact-sheet/erw-factsheet-150807.htm>)
- [11] Qusai Abdul Majeed Al-Samarrai,(2008) Climate and Climatic Regions.Amman. Arabic Edition , pg. 99.
- [12] Jassim Wawah Shati Al-Jiashi,(2017) Spatial Analysis of Water Resources and Sediments in the Badia of Al-Muthanna Governorate and Its Investments.Master Thesis. College of Education for Human Sciences. Al-Muthanna University , p. 50.
- [13] Internet (https://www.icrc.org/ar/doc/resources/documents/misc/focus_mines_assist_041118).
- [14] United Nations,(2010) Mine Action. Guiding Principles for Gender Considerations. Mine Action Programs, p. 29.
- [15] Mine Action Department. Za-Baghdad.(2010) Clean the Battlefield. Iraqi National Standards for Mine Action 9.11., edition, p 7.