

Nature, Size and Contaminated Areas of the Waste of War in Iraq

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Abstract

In 1991, new weapons were used for the first time by the American and British troops in Iraq. These weapons proved to have high destructive capability against armored machinery and tanks. Later, there were many signs of being a weapon to destroy the human beings, animals and plants, which raised huge controversy and sharp criticism among scientists, doctors and environmentalists.

Despite the opacity and deception, many of the secrets of depleted uranium ammunition were exposed, and confirmed the seriousness of use and serious repercussions on the environment and public health, which stepped up the international campaign against its manufacturing and use.

However, the brilliant military success and profits of the military industry tempted the Pentagon and NATO to continue production and use of these weapons. Despite the high human and environment risks DU was used in various conflicts like Iraq, Bosnia, Kosovo and Serbia, Afghanistan, Gaza, Lebanon and recently in Libya.

It is noteworthy to mention that the public and even some scientists, researchers and news media are ignorant of the effects and risks of the use of DU in military operations. This raises the point that there should be a large campaign to raise public awareness to prevent the risk of DU weapons.

Based on scientific research and updates, we would like to high light the waste of wars in Iraq: Our paper shed the light on the size of depleted uranium(DU) weapons used in the wars on Iraq and the legacy of waste (their nature, size, and the contaminated regions), as high risks on humans and the environment. This is one of the leading environmental, health and social tragic problems in Iraq. This problem should be addressed immediately, seriously and effectively.

Keywords: Depleted Uranium, Weapons of Gulf wars in Iraq, Radioactive waste, Contaminated areas, Health consequences and Environmental problems.

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1 Introduction

Iraq experienced two devastating wars in 1991 and 2003, during which massive amounts of new weapons and sophisticated manufactured nuclear weapons were used -called Depleted Uranium (DU). The wars left, apart from the terrible destruction and victims, huge waste, mostly weapons and military equipment uranium shells hit. Most of the battered remnants of war are radioactively contaminated. Despite the passage of two decades of the first war and 8 years of the second war these remains are still radioactive and residues are found in farm fields, along roads, near residential areas and even some of them within Baghdad, Basra, Nasiriyah, Maysan, Najaf, Karbala, Neynawa, Babel, D cities and other Iraqi provinces. In addition, radioactive dust resulting from the munitions explosion was transmitted by the wind to all parts of Iraq, and also to neighboring countries.

According to the Iraqi Ministry of Environment there are hundreds of sites contaminated with nuclear radiation, and The Center of Radiation Protection in 2005 reported that there are 315 polluted sites, while experts from the United Nations Environment Program UNEP estimated that contaminated sites are thousands [1]. Later the Environment Minister Nermeen Othman revealed that the Iraqi government did not embedded more than 10% of tanks and military vehicles contaminated with depleted uranium. She added that radioactive debris still contaminates Iraq because of budget shortfalls and the fragility of the security situation. She also confirmed that her ministry had located 80% of the contaminated sites, but because of the lack of security, there are still areas unable to access. She attributed this to the low budget allocated to the Ministry which is far beyond the money required to address environmental challenges in the country.

In practice, there is no strategy and/or national program, not even well thought out plans and scientific personnel and technical equipment required to clean Iraq of these wastes. The occupying forces of Iraq did not fulfill their duties imposed by international conventions. According to these conventions they are obliged to clean the pollution they caused and supply the Iraqi Government with all maps and details about polluted areas. In view of this, the Iraqi authorities concerned act randomly. Occupational forces are to leave Iraq at the end of this year and it is believed that the problem will be more severe.

2 Weapons of War in Iraq:

No one knows exactly (apart from the Pentagon and the US Ministry of Defense) the quantity of weapons that were fired at Iraq during the wars of 1991 and 2003. All the efforts made for prevention and deception and to hide the facts had failed simply because scientists, independent researchers and military experts exposed these facts and gave valuable information in this regard.

United States used in the Gulf War about 4000 tank shell, each containing 4 5 kg of depleted uranium, and more than 800 thousand rounds of caliber 30 mm, each containing 300 grams of depleted uranium were fired from the aircraft A-10 aircraft known as the "hunter tank" I [2]. Accordingly, the total amount of depleted uranium used was about 300 tons. This made some parts of the region field trials of new weapons. Dr. Isam Al-Hannawi also added that USA used DU for the first time in history in Iraq in 1991, irrespective to the health effects and environmental consequences. Furthermore, when complaints started from American soldiers of the symptoms of different diseases known

as the "symptoms of the Gulf," hastened the U.S. administration to question these symptoms, and campaigned extensive media to deny the existence of a relationship between these symptoms and exposure to dust arising from the use of depleted uranium shells [2].

According to Chemical Agent Resistant Coating (CARC), U.S. military in a war launched in 1991 used about 500 large-caliber 105 mm shells and 9000 120 mm shells, each containing a shell at 4.2 and 5.3 kg of depleted uranium, respectively. The air force also used about 800,000 of 30-mm shells, each containing 0.28 kg of depleted uranium. In addition, the Navy used 67 500 mortar, caliber 25 mm. This makes the total fired amount more than 300 tons of depleted uranium.

Dr. Mona Khammas confirmed that allied forces used about 142 tons of explosives on Iraq; this is equivalent to seven atomic bombs similar to those dropped on Hiroshima and Nagasaki. The tanks fired 5 thousand to 6 thousand bombs, and aircraft launched 10 thousand bombs. They also used napalm bombs, cluster bombs and fuel. Still there is more than 300 tons of depleted uranium in the area causing environmental pollution and threaten human health through radiation. Much of all this was used against civilians and civilian buildings and shelters far away from the battlefield [3].

The U.S. military fired 940 small shells of depleted uranium, and 14 thousand tank shells, and prepared two vehicles loaded with shells of uranium during the Gulf War. It also dropped 88 thousand tons of various types and sizes of bombs, which is equal to seven and a half times the explosive power and the burning of a nuclear bomb launched on Hiroshima. They left between 270 to 680 thousand kilograms of depleted uranium waste in the area between Iraq and Kuwait.

In the 2003 war, the United States and the United Kingdom used ammunition containing depleted uranium to hit a wide range of targets. Although we do not have sufficient information on the quantities of the real ammunition used or the contaminated sites, but it believed that between 1000 to 2000 metric tons had been used to hit the tanks and armored vehicles, buildings and sites inhabited [4].

The Institute of Nuclear Policy Research (INPR) in New York stated that the United States launched a missile containing an estimated 2000 tons of depleted uranium in Iraq, a substance linked to cancer. The institute urged the leaders of the United States and Britain to clean Iraq from depleted uranium, which causes lung cancer, bone, blood and kidneys.

Dr. Monjid Al-Naieb an expert in the Ministry of Science and Technology that the amount of munitions waste of depleted uranium, used by U.S. and British forces in the Gulf War in 1991, amounted to between 350 to 800 tons, and that most of these munitions were used in the southern regions from Iraq. During 1991 war, Coalition Forces used depleted uranium shells against tanks and wheels located on the battlefield, deployed in open areas and desert between the borders of Iraq - Kuwait - Saudi Arabia. In 2003 war they used same type of shells on populated places such as the capital, Baghdad [5].

British Defence Secretary Liam Fox admitted in a letter written to the House of Commons, in mid-2010 that in Basra alone, that U.S. and British forces used depleted uranium in Iraq in 2003. Quoted "the Kuwait News Agency" for Fox as saying that "British forces have used 1.9 metric tons of depleted uranium ammunition in the war on Iraq in 2003 "(Alssabah, 2010, July 25). Others had reported that 100 tons were used in Basrah area [6].

The U.S. military in Basra confirmed that in mid-2010 used more than 13 tons of radioactive waste on military targets .As a result, more than 10 thousand tons of scrap iron and the remains of military vehicles were destroyed by missiles containing depleted

uranium. In addition there are plans to collect hundreds of thousands more tons of iron scrap containing unknown proportions of depleted uranium (Alqabas, 2010, June 27) The U.S. reconstruction team in Basra had started in 6/6/2010 that they had removed 10 thousand tons of scrap iron from the area of Abu Alkhasib, 4 thousand tons of the regions of Hayaniya and Abbas, and 6 thousand tons of hotel Hamdan area (Aswat Aliraq, 2010, June 6).

3 Depleted Uranium as Radioactive waste

Depleted Uranium (DU) is considered as radioactive waste. It is usually the product of a nuclear process such as nuclear fission, which is used in nuclear reactors, nuclear weapons and other nuclear fuel-cycles (The Encyclopedia of Environment, 2011). The full radiation effect of DU occurs six months after its production, when together with two chief decay products DU gives off its maximum amount of alpha, beta and some gamma radiation – although Uranium 238 (of which DU is mainly composed) – gives off most of the alpha radiation. **One milligram of U-238 can give off more than one million alpha particles in one day. Each alpha particle releases over 4 MeV** (million electron volts) of energy, in a spherical direction, which will hit cells randomly up to 6 or so cells away in an organ or tissue. **Just 6-10 eV** (electron volts) are needed to *cleave the nuclear DNA strand in a cell* [7]. This radioactive source will last for thousands of years.

DU waste poses substantial or potential threats to public health or the environment and generally exhibits one or more of these characteristics: ignitability, corrosivity, reactivity or toxicity.

The process of uranium enrichment will produce large quantities of depleted uranium. For nuclear weapons and nuclear fuel create about 7 metric tons of depleted uranium for each metric ton of enriched uranium produced. **Production of 1 kg of low-enriched uranium yields about 5 to 10 kg of DU.** Production of **1 kg of highly enriched uranium yields about 200 kg of DU.** However, the enrichment process produces a disproportionately large amount of byproduct depleted uranium [8]. The result is that very large quantities of depleted uranium are produced as waste streams. In 1996, worldwide production of DU was estimated by the European Parliament's Science and Technology Options Assessment (STOA) panel at about 35,000 metric tons [9]. As a result, it is estimated that over 1.2 million metric tons of DU are currently stockpiled worldwide, mostly in the United States [10]. Over the past-half century, 732,000 metric tons of DU- more than half of all the uranium ever mined in the world - was produced at three uranium enrichment plants in Oak Ridge, Tennessee, Paducah, Kentucky, and Portsmouth, Ohio [8].

DU had been used *in weapons* so that it can penetrate armored vehicles, tanks and bunkers. On explosion it creates poisonous radioactive cloud of fine dust which can spread tens of kilometers [11]. Anybody who breathes these particles will have a permanent dose, and it's not going to decrease very much over time, and will suffer major problems [12, 13].

DU weapons had been used for the *first time in Iraq* in 1991. More than 1,820 tons (3-million, 640 thousand pounds) of radioactive nuclear waste uranium were exploded into Iraq alone in the form of armour piercing rounds and bunker busters, representing the world's worst man made ecological disaster ever. 64 kg of uranium were used in the Hiroshima bomb. The very broad human and ecological disaster of the Iraq War has been drowned out by America's sound-bite driven media organizations, that are owned by the

same fascist clique which presides over the Iraq War [14]. The U.S. Iraq Nuclear Holocaust represents far more than fourteen thousand Hiroshima's [15].

4 Waste war radioactive measurements:

Number of researchers(Figure 1) stated that military waste in Iraq as a result of the use of DU ammunition is radioactive [16, 17], Team of Uranium Medical Research Centre (September -October 2003).



Figure 1: Some researchers inspecting military waste in Iraq

The investigations performed by Prof. Seigwart Horst- Günther, a physician and expert radiation and nuclear medicine, following the cease fire in 1991 showed that the radiation dose on the surface of DU shells used in the war, was $11 \mu\text{Sv}$ (Microsievert) per hour, while the radiation dose allowed in Germany is $300 \mu\text{Sv}$ per year. This suggests that the annual dose allowed in Germany is given in one day in Iraq [18]. Prof. Chris Busby (Figure 2) found in 2000 the readings very high, declaring: " highest reading I've seen in my life[18]. In May 2003, Scott Peterson (Figure 3) reported that the Geiger counter readings at several sites in Baghdad, where US troops stood guard and over 1,000 employees walked in and out of the building, their radiation readings were at nearly 1,900

times background radiation levels [19]. A few months later, the Seattle Post Intelligencer reported elevated radiation levels at six sites from Basra to Baghdad. One destroyed tank near Baghdad had 1,500 times the normal background radiation (Flounders and Catalinotto, 2004). Scientific team of Uranium Medical Research Centre (UMRC) (Figure 4) found in September-October 2003 elevated radiation levels about 10 – 30 thousand times at many sites in Iraq [20].



Figure 2: Scientists inspecting military waste in Basra-Iraq



Figure 3: Mr. Scott Peterson (2003) measuring radioactive pollution in Baghdad [17]



Figure 4: Prof. Tedd Weyman and Prof. Mohammad Al-Shekli (2003) inspecting military waste in Iraq [21, 22]

Following the survey conducted by UMRC team for the bombed sites (battlefields and communities) they found in 2003 that the radiation was in many areas (Table 1) ranging between 1000 and 10 000 times the limit of what is permissible internationally [21]:

Table 1: Bomb sites, battlefields and communities surveyed and investigated by UMRC team, Sept. 30 to Oct 13, 2003

Order of Investigations Areas surveyed and sites investigated	“Overwhelming Force” Order of Battle Operations Iraqi Freedom, Telic and Falconer
<p>Baghdad area, heavy-weight bombsites: Baghdad Central Market Baghdad Central Telephone Exchange Al Rashid Air Force Base Baath Party Headquarters Ministry of Information Mansour District – April 7/03 leadership decapitation strike (Sector 613) Jammah Suburb # 512, Baghdad</p> <p>Baghdad combat battlefields, US led: Haiyyal Mavalemeen–Teachers District Auweirj Coalition/SRG HQ Tank-graveyard Baghdad Gate</p> <p>Central Iraqi, U.S. led combat: Suweirah and Suweirah Air Force Base Salman Pak Road Battlefield</p>	<p>Air campaign: U.S. and British “Shock and Awe” Strategic Military and Civilian Demoralization bombing Joint Air-delivered and Ship-launched Bombing Campaign by: U.S. & UK Royal Airforces U.S. and British Royal Navies 15,500 strike sorties 27,000 bombs</p> <p>Ground force battles Advance and Battle for Baghdad: “Rapid Dominance” Comprised of two main divisions, western and eastern, main columns advancing from Kuwait to Baghdad. U.S. 1st Marine Expeditionary Force – East U.S. 5 Corps – West U.S. 3rd Mechanised Infantry Division Close-in air support: 101st Air Assault Division 82nd Airborne Divisions</p> <p>UK Operation Telic & Operation James Combat Joint Special Operations Task Force; including Australia - Operation Falconer 3rd Commando Division (Desert Rats) 1st UK Armoured Division</p>

An Najaf and Diiwaniyah Karabla and Al Husseinayah Al Kut Al Hillah An Nasiriyah British led combat: Battle for Al Basra Az Zubayr (Kuwaiti/Iraq DMZ) Al Ashar and Abu Khasib Basra Canal and Shaat al Arabi corridor Al Faw peninsula Umm Qasr	7 th Armoured Brigade 2 nd Close Support Division (Royal Logistics) 16 Air Assault Brigade & SAS Sabre Squadron
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In 2005, Khajak Vartanian [23] performed wide survey and he had measured the radio-activity of depleted uranium in different areas of the Basra governorate and indicated that more than 100 sites and scrap exposed to pollution in the Gulf wars of 1991 and 2003 with high level radiation. The results showed also high contamination for soil samples close to the targets destroyed by DU shells :17.4 - 1964.6 Bq / kg in Alzubayr, 4.8 -1847.6 Bq / kg in Basra, 84.7 - 4632.2 Bq / kg in Abu Alkhasib, 397.2 -1723.2 Bq / kg in Qurna [23].

Later, Vartanian after conducting a survey covering the Basrah Governorate revealed that there is high level of DU radiation from military wastes in several locations in Basra.

Other survey, performed in 2009 by expert physicist Mohamed Abdulhalim, from the Radiation Protection Centre-Ministry of Environment, confirmed that an increase in the background radiation in Haferalbaten area was 10 folds more than it is in Baghdad [24].

Even today, there are hundreds of tons of depleted uranium in the form of munitions, wrecked tanks, vehicles, containers, alloys, and other military scrap litter in Iraq's countryside. Many of the refurbished buildings dominate towns and cities, in Basra, Nasiriyah ,Samawa, Omarra , Najaf, Babylon, Diwaniyah, Diyala, Kerbala and others were blown to pieces by shells tipped with depleted uranium. Their scrap was dumped in open sites (Figures 5 and 6). Some of that scrap disappeared.

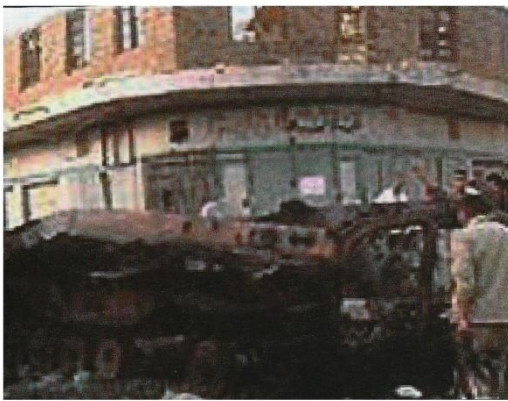


Figure 5: Remains of DU polluted military weapons in Iraq.



Figure 6: Remains of DU polluted military weapons in Iraq.

5 Samples of Contaminated Sites

There is no exact statistical analysis of the number of polluted sites with DU weapons in Iraq, but there are more than 200 sites considered as highly polluted sites. Sixty three of these sites were used by Military Manufacturing Department during Saddam regime.

After 19 years of war in 1991 and 7 years of war in 2003, the Iraqi Ministry of Environment revealed that more sites of radioactive contamination in Iraq are located in Baghdad, Basra, Maysan, and Muthanna. Deputy director of Radiation Protection Centre, Ministry of Environment, Maha Hamid, stated that areas at Tuwaitha, and Haferalbaten had been allocated to dump the radioactive wastes from Baghdad and Basra.

More than 40 sites (figure 7) across Iraq are contaminated with high levels of radiation and dioxins, with three decades of war and neglect having left environmental ruin in large parts of the country, an official Iraqi study has found. Greater rates of cancer and birth defects near site [25].



Figure 7: Map of DU polluted sites in Iraq.

Depleted uranium among poisons revealed in report. Areas in and near Iraq's largest towns and cities, including Najaf, Basra and Falluja, account for around 25% of the contaminated sites, which appear to coincide with communities that have seen increased rates of cancer and birth defects over the past five years.

The joint study by the environment, health and science ministries found that scrap metal yards in and around Baghdad and Basra contain high levels of ionising radiation, which is thought to be a legacy of depleted uranium used in munitions during the first Gulf war and since the 2003 invasion. Government study groups have recently studied 500 sites for chemicals and depleted uranium. Until now they have found 42 places that have been declared as [high risk] both from uranium and toxins. Ten of those areas have been classified by Iraq's nuclear decommissioning body as having high levels of radiation. They include the sites of 3 former nuclear reactors at the Tuwaitha facility – once the

pride of Saddam Hussein's regime on the south-eastern outskirts of Baghdad – as well as former research centres around the capital that were either bombed or dismantled between the two Gulf wars [25].

The head of the decommissioning body, Adnan Jarjies, said that when inspectors from the International Atomic Energy Agency arrived to "visit these sites, I tell them that even if we have all the best science in the world to help us, none of them could be considered to be clean before 2020".

Bushra Ali Ahmed, director of the Radiation Protection Centre said only 80% of Iraq had so far been surveyed. "We have focused so far on the sites that have been contaminated by the wars," he said. "We have further plans to swab sites that have been destroyed by war." A big problem for us is when say a tank has been destroyed and then moved, we are finding a clear radiation trail. It takes a while to decontaminate these sites". Scrap sites remain a prime concern. Wastelands of rusting cars and war damage dot Baghdad and other cities between the capital and Basra, offering unchecked access to both children and scavengers [25].

Joint work of the Ministries of Health, Environment and Higher Education, considered that there are number of sites polluted with radioactive military waste. A recent study, considered that more than 40 sites in Basra, Najaf and Fallujah, suffers from high pollution levels.

Dhiya Al-Sarai disclosed the results of air survey performed by Dr Edward Eyslon and his team, stating that 143 sites are polluted by DU wastes in 7 Iraqi governorates: 16 in Diyala, 20 in Babylon, 11 in Waset, 14 in Maysan, 22 in Basrah, 20 in Nasiriyah and 40 in Baghdad [26].

UNEP estimated that pollutes sites are more than 1000 in Iraq. While Basrah University estimated the polluted sites in Basra to be 100 (NINA, 2011). Spokesman from the Ministry of Science and technology claimed that there are 36 sites polluted by DU (of which 3 in Baghdad and 23 in Basrah). However, large number of sites (more than 3) in Baghdad had been reported by other sources.

Now the remnants of war destroyed and scattered on the main roads (Figures 5 and 6) and private entrance to the city of Basra from Nasireyah, the entrance to the desert road between Samawah and the Saudi border and the Fadhliyah near Nasireyah, and other areas, distributed between the cities of Omarrah and Basra [27].

Reports from the University of Basra confirmed that the number of contaminated sites in Basra alone amounted to about 100 sites through 2004. This number is increasing with time due to the decision of Iraqi government in 2004, allowing the sale of waste iron left in the battlefield.

Others studies, performed by Vartanian, Mastar Ali and other researchers in Basrah disclosed many new contaminated sites with DU. Many reports illustrated dozens polluted sites in Basrah and surrounding areas [5]. The city of Nasiriyah (Figure 7), is considered one of the most southern regions polluted with radiation due to the large military vehicles destroyed and its proximity to stores Khamiyssiyah huge which was bombed by coalition forces in 1991 and left a devastating strewn around, hundreds of tons of depleted uranium in the form of munitions and containers, and alloys [27]. Others reported polluted sites and cancer cases. More than 300 cases of abnormal birth were reported in 2010. In April, 2011, a report was issued stating that there are 33 polluted sites in the city of which 15 were cleaned.

In Neynawa (Figure 7) , the Iraqi army discovered later 10 polluted sites with DU weapons. Some people died or poisoned due to inhalation of toxic gas emitted from these

weapons. The possibility of a radioactive leak from a former nuclear plant (Edayah) was reported. This facility was bombed in 1991 and there are more than 10000 people threatened by this radioactive leakage [6].

Hawija (a village in Kirkuk governorate) turned into a backyard contaminated with radioactivity and waste of the field used by U.S. military for training. This may cause human tragedy where number of cancer cases had been reported.

The Directorate of Civil Defense revealed that they had destructed more than 70 thousand bombs in different areas of Diwaniyah since 2003, indicating that it had completed cleaning 13 out of 17 areas contaminated with the remains of weapons and ammunition. The number of bombs in the area reaches 70068.

In Kerbala (Figure 7), the Iraqi Red Crescent Society reported that large quantities of waste the U.S. military were discovered west of Kerbala. Furthermore, according to the Environment Department there are atleast 200 sites considered highly polluted by radioactive military wastes [28]. Number of reports had been published stating that other cities (Babylon, Najaf, Almothana) have polluted radioactive sites [29, 30].

Communication facilities and some of the sites used by the Ministry of Oil were also bombed by DU ammunition, and for this reason the facilities are abandoned now due to the radiation effect [31, 32]. Reports from WHO, Ministry of Health and Prime Minister Office confirmed the pollution in several sites in Iraq [33].

Confirmation of the warnings launched by scientists and researchers, including Dr. K. Al-Muqdadadi, who warned in the Arab media repeatedly the Iraqi Government and the public about the dangerous effects of these DU waste and its health consequences [37-41] Ministry of Science and Technology had revealed earlier that the scrap metals of the wars were used in construction by some people. Neighboring countries abandoned the import of Iraqi scrap due to its radiation effect. Iraq now is considered one of the leading in cases of congenital deformities among newborns. All these are due to the consequences of the Gulf Wars especially the one which took place in 2003. Cases of cancer were reported due to the effect of the remnants of uranium weapons. So, the children in Iraq are still playing above and around the radioactively contaminated waste (See the pictures), and are exposed to their danger, where many of them have cancer and died of cancer who were in contact with them (Figure 8).



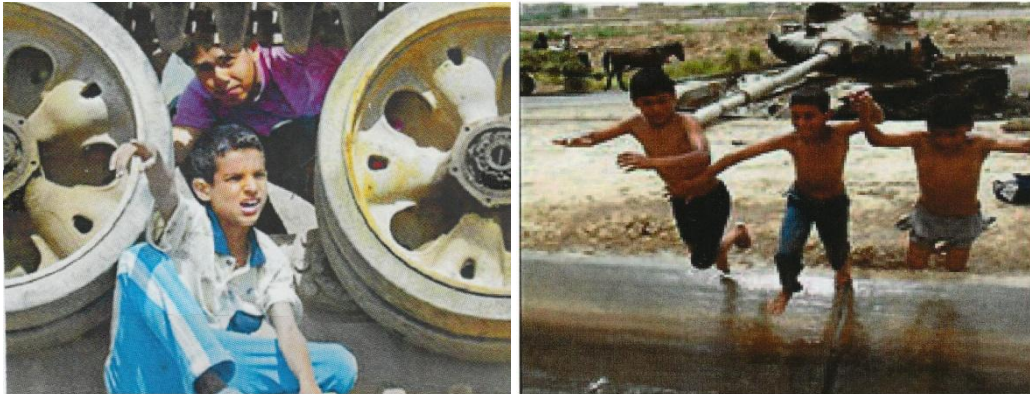


Figure 8: Iraqi Children playing with DU polluted military weapons

6 Conclusions

-Remnants of DU weapons used in 1991 and 2003 wars constitute a major threat to the environment and including humans, animals and plants.

-After 8 years, there are still enormous amount of DU weapons deployed in the farms and fields, along the roads and in near populated centers.

-Some of the military scrap is used as iron scrap.

-Remnants of war radioactive in Iraq, constitutes a major challenge to the environment and the population, especially as it was tampered with and been dismantled, transported and some stored in populated centers. This is causing cancer and birth defects.

-User of DU weapons did not abide the international law and agreements that they should clean the polluted sites. They also did not officially report the position of the polluted sites. HE the Iraqi Minster of Environment Mr. Sargon Lazar stated that there are number of military wastes in different cities [5].

-The Iraqi Government had not put any budget to clean up these polluted sites.

7 Recommendations

-The slowdown in addressing the DU polluted sites will cause more serious problems and losses in all aspects of life in Iraq.

-The Iraqi Government must speed up the cleaning operations of the DU polluted site in a scientific way.

-National Organization should be established to take the correct scientific measures to clean the polluted sites.

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