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ENVIRONMENTAL POLLUTIONS RELATED TO CONFLICTS IN IRAQ AND PEOPLE'S HEALTH OUTCOMES

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ABSTRACT

The prolonging war actions in Iraq have given rise to cumulative increase in environmental pollutions across country. Areas which have been extensively polluted include air, land, water and the health infrastructure to a greater extend. War has been ongoing for over two decades and the environmental damage couldn't be avoided. War in Iraq contaminated the sand through the military actions that reconfigured the desert sands raising dust and causing air and land pollution simultaneously. The dust storms generated by military actions would reach the cities such as Erbil and Baghdad contaminating environmental surfaces and infrastructure. Evidence from experiments conducted by measuring the amount uranium levels in animal organs show that there is the presence of depleted uranium the Iraqi food chains and webs. Results further shows that the highest depleted uranium concentration is found in the Southern part of Iraq. Places like the Al-Twaitha nuclear research site are considered to be extensively polluted because of the destruction of nuclear reactors in the Gulf war of 1991. Furthermore, more barrels which had radioactive materials were stolen from the site in 2001. Soil samples around the site exhibited a high amount of CS-137 and Co-60 which are damaging to human beings and biodiversity. Health complications which have been observed include birth defects and cancer due to the radioactive chemicals emitted during war. As noted above, environmental damage in form of infrastructural damage remains an outcome of Iraq's long war, and rapid industrialization in oil extraction and urbanization. The most affected cities in Iraq are Erbil, Basrah, Faluja, Baghdad, Mosul, and Thi-qar. This analysis concludes that the presence of an extensively contaminated environment due to the past and current wars, rapid industrialization is directly connected to the health complications being sustained.

KEY WORDS

Pollution, land, water, healthcare, cancer, birth defects, industrialization, war.

Iraq's land, atmosphere, water and the health infrastructure has been extensively polluted by war for the past 2 decades [13]. The environmental impacts sustained by Iraq have a huge blow on the nation taking into consideration the effects of the land, water and air pollution Investigations which have been conducted show that there is a direct correlation between the incidence of war and cancer morbidities and mortalities in Iraq [15]. In addition to that, there is a prediction that cancer cases (morbidities and mortalities) shall exponentially increase due to the continuous rise of the hazardous chemicals emitted [22]. Recorded also, is the exponential increase in birth defects due to the negative effects of war. Cities were bombarded leading to injuring of children in the cities of Iraqi [5]. Bombardment of cities polluted the air, water and the land also generating both air-borne and water-borne diseases. Some of these diseases are still epidemic in the land [16]. The direct effect of war comprises of the emission of potential toxic gases and chemicals whilst the indirect effect is associated with the destruction of infrastructure [20]. Places like Erbil are extensively affected by water and air pollution caused by, industrialization-vehicle emissions, infrastructure development, sewer reticulation and farming.

For over twenty years, Iraq has been embroiled in both domestic and foreign armed confrontations. This, along with international sanctions, robbed inhabitants of necessities like food, medicine, and internet". Water, air, and soil contamination caused mainly by emissions from cars and generators in crowded areas, unplanned use of chemical fertilizers, war



remnants, and bombing with depleted uranium" [40] is one of the challenges to citizens' well-being that Minister Narmin Othman, the former Minister for Environment in Baghdad, listed. Her ministry had discovered abandoned tanks and military vehicles from the 1991 and 2003 conflicts that were tainted with radioactive elements, but nothing had been done to get rid of them.

As a byproduct of uranium enrichment, depleted uranium (DU) is a radioactive heavy metal that is created by humans and comes from uranium ore. Its nature and effects were summarized by Hindin. Due to its pyrophoric qualities and density, this metal can spontaneously fire at ambient temperature in air, oxygen, and water. It also reacts with the majority of non-metallic elements. It can be found in many applications, such as hospital X-ray radiation shielding, strong projectiles like missile nose cones and bullets, and tank armor. A DU penetrator explodes on impact when employed as a projectile because of the tremendous temperatures it produces. This property causes the bullet to become sharper as it melts, which facilitates the penetration of thick armor. The missile leaves its DU behind after it penetrates armor.

This was determined to be a significant health risk to a large portion of the populace, together with hospital and heavy industry waste and raw sewage dumped into the Tigris and Euphrates rivers (IRIN, 2009). It is debatable if depleted uranium (DU) causes health problems, namely "birth defects." Nonetheless, a significant body of study keeps looking into this problem. Research on the possible health implications of dual use has produced data that challenges assertions that there is no connection between dual use and a variety of health issues, including effects on the developing fetus.

It is said that the majority of the dust particles are tiny enough for humans to breathe in or consume, and that they float in the wind for a considerable amount of time. It may contaminate ground water when it settles on the ground as partially oxidized DU dust. Toxicological effects can be caused by chemicals or radiation. While insoluble forms of uranium are linked to radioactive effects, soluble forms are linked to poisonous effects. Research has shown that DU used orally can build up in the kidney, brain, reproductive system, lung, and bone. It also may have carcinogenic, mutagenic, and toxic consequences. Therefore, the existence of such a material close to residential neighborhoods is concerning, especially with regard to the health of the young and unborn.

The emergence of war in Iraq led to the contamination of sand particles due to the production of intoxicants which polluted the sand. In addition to that, military action damaged soil structures, creating dust storms in different places in Iraq. As noted above, these dust storms contaminated infrastructure in cities creating an eye soar to the people [18]. One of the toxic substances which were detected in these dust storms is Uranium. Uranium is known, scientifically, to be a contributor of many health care complications [8]. In addition to that, noted also is the contamination of water by metal particles in cities such as Fallujah and Basrah. This contamination has led to the development of birth defects in the above-mentioned cities. The common metals which have been detected are lead and mercury.

In contrast, low contamination of land, water and the air has been observed in cities where war was minimal or never occurred in Northern Iraq. The USA-Iraq war of 2003 used over 150 tons of depleted Uranium and scientifically, Uranium is a radioactive metal whose radiation has the potential to destroy the human immune system [19]. DU is the waste product of Uranium and it becomes the major contaminant Northern Iraq, in addition, the substance is used to manufacture bullets which further has the capacity to cause pollution [14].

When projectiles are launched or released, they leave into the atmosphere DU dust which contains uranium oxides which affects the pulmonary system. Air pollution is the greatest after effect of the wars which took place in Iraq [24]. In the most parts of Iraq, DU has been detected and there is need to eliminate it from that environment to contain negative implications which come as a result of the dangerous substance [15]. Another critical aspect is that the accumulation of DU in the soil can potentially lead to the entrance of the substance in food chains and webs as shown in Figure 1.

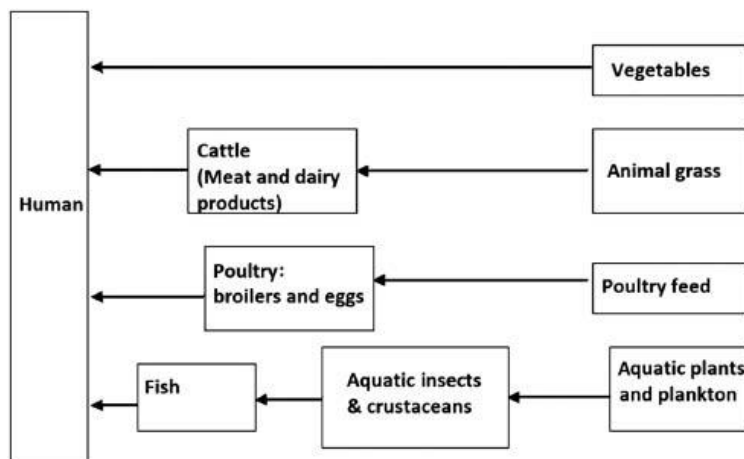


Figure 1 – Accumulation of Pollutants in the soil and how they are passed into the food chain [6]

DU presence in Iraq food chains has been measured using in vitro experiments, that is, sheep organs. The experiments were conducted in various Iraq cities where the highest concentration of DU was recorded.

The common polluted site in Iraq is the Al-Tuwaitha. This is a Nuclear Reactor Research site, shown in Figure 2 below, located 20Km in the Southeastern side of Baghdad within the Tigris Valley [9]. These reactors were destroyed in 1991 during the Gulf war. In the 2003 war, barrels which contain radioactive materials were stolen from that site leading to the contamination of the area in the process [6]. The tested samples showed to be carrying the Cs-137 and the Co-60 radioactive compounds [1]. The results demonstrated that the values which were obtained were quite above the set points meaning to say that the radioactive quantities were toxic to the environment. The dose rate exceeded the minimum requirement with a factor of 9500 [2].

Further experimental tests revealed that the Fuel Fabrication Facility in one of the nuclear facilities which was destroyed contained U-238 and U-235 [25]. Another important part of this analysis is the risk of exposure the locals have to the radioactive material hence AL-Tameen conducted a multi-step risk assessment of local inhabitants' exposure towards radioactive compounds. The significance of this assessment was mainly to measure the safety of people as well as the means to protect the citizens against the pollutants. By the way, radioactive material has the capacity of affecting the immune system as well as the reproductive system. In addition to that, an evaluation on the possibility of people developing cancer in the near future was evaluated. Making use of 0.14 latent fatalities per million individuals who are exposed to the radioactive latency. The results which were obtained demonstrate that radiation injury in form of gene damage can possibly happen at a rate of 1850 people per million exposed individuals [12].

A recent investigation which has been focusing on checking the level of genotoxicity on the people who have been exposed to the radiation within the working-class population. This exposure and contamination is known to have occurred in January 2010 to December during the decommissioning of the site. Results which have been obtained show that damage has occurred in the peripheral blood lymphocytes of workers who were exposed to radiation material at AL-Tuwaitha nuclear site. Another experiment which was conducted on the same site focused on sheep fertility. Critical elements of study were semen characteristics, and chromosomal alterations within the lymphocyte cells [11]. The results obtained showed the occurrence of chromosomal alterations. There was also a reduction of fertility in the population which lived around that place.

Scientific investigations which have been carried confirm on the negative impact of pollutants on ecology. Gaseous pollutants such as carbon, Sulphur and their compounds affect biodiversity. Some of the toxicants are bacteriostatic whilst others are bactericidal. The former inhibits the growth whilst the latter kills bacteria. Effect of these pollutants is not restricted to bacteria only but rather affects other micro and macro-organisms. Investigations were carried



in the vinegar fly, *Drosophila melanogaster* Meigen, to check the lethality of the radiation, indeed the frequency of dominant lethality. Parameters which were measured were hatchability rate of the eggs as well as the fecundity. These were indicators of the presence or the absence of mutation within the vinegar fly population. The results which were obtained showed a high degree of the reduction of fecundity. In addition to that, there was a decrease in egg hatchability in the Tuwaitha area in comparison to other parts of Baghdad which showed minimum side effects [12].



Figure 2 – The destroyed Nuclear Reactor at Al-Tuwaitha nuclear research site [25]

The emergence of congenital birth defects increased, exponentially, by a factor of 17 in Al Basrah Maternity hospital comparing years 1994 to 1995 to 2003. Lead content was found to be higher in the enamel part of the deciduous tooth of children born with birth defects in Basrah in comparison to non-impacted communities. Data which was collected in 2010 from 10000 children across the 10 governorates indicates that there is a correlation between the presence of contamination and the emergence of birth defects. Sources of the toxicants include war waste, domestic waste, and human waste. The results further showed that children from Basra were extensively affected [7].

Researchers from Iraqi found out depleted Uranium in bones, blood and tissues of cancer patients. Specimens which were collected from the southern and middle part of Iraq showed a higher contamination with depleted Uranium due to war. The samples from cancerous patients had a higher concentration of Uranium than the non-cancerous patients who were tested. Another investigation which was carried to check the uranium crystals (UC) in the urine of breast cancer patients showed that cancer patients had a general higher level of UC of around 1.6ug/L whilst healthy individuals of the same sex had 1.03ug/L. In addition to that, there was a higher incidence rate Diyala city in comparison to the statistics before the war [7]. In addition to that, there was an exponential increase in cancer incidence rate in the city of Karablaa and this was linked to the presence of some DU toxicants.

Basrah is the most affected and polluted city in Iraqi since it was heavily bombarded during the Iran-Iraq war as well as the Gulf war in the year 1991. Researchers who conducted investigations in this city show that the concentration of Uranium was 16ppm. In addition to that, results also show that the city was extensively polluted with DU. Populations living in this city or other nearby cities showed weak immune systems [16]. Experiments which were conducted to test hair samples exhibited very higher levels of metals in comparison to the standard [1].

An investigation which was conducted showed the presence of Uranium in the city of Mosul. The concentration of Uranium in the damaged three cities, on average, was 1.176ppm, in comparison, nearby cities had half of this concentration. The incidence rate of cancer in Mosul is currently higher than the Gulf war time.

An investigation which was carried out in Thi-qar to determine the presence of DU in the war zone city showed the presence of high concentration of Uranium concentrations. The



concentration of uranium was 1900 times higher than the standard [25]. The highest concentration of DU was found in the soil and metal pieces near the war zones [21]. Levels revealed by one investigation showed that the DU concentration was close to 16.38ppm.

Air pollution is the greatest challenge in Erbil and that has been leading to various pathologies which comprises of respiratory, cancer and heart disease [14]. In Erbil, the main sources of air pollution are industrial emissions, vehicle emissions and construction activities. In addition, water pollution in Erbil is a great challenge and the main drivers of water pollution include sewage, industrial waste, and agricultural runoff. The sewer system in Erbil is currently overloaded and waste lands are not being recycled properly. To address these challenges, there is need for all key stakeholders to address aspects such as: air quality improvement, water pollution reduction, waste management improvement.



Figure 2 – Sewage processing in Erbil (Moveit Magazine, June 2020)



Figure 3 – Construction activities in Erbil (Moveit Magazine, June 2020)

Disability is no longer seen as a fixed attribute of an individual, but rather as an "evolving concept." It results from the interplay of "environmental and behavioral barriers that hinder their full and effective participation in society on an equal basis with others" and an individual's disabilities (UN, 2006). It includes those who have chronic disabilities of the body, mind, intellect, or senses. The UN Convention definition of "impairment," which includes both "mental illness" and "functional impairments," was used by the study. Difficulties with movement, vision, hearing, self-care, communication, cognitive abilities, or long-term health issues were considered "functional impairments." Instead of using the word "impairment," which is frequently linked to stigma and may be interpreted to exclusively refer to the most serious challenges, the term "difficulty" was chosen.

Although diagnostic "labels" are necessary to gain access to support, parents can be reluctant to stigmatize their kid by calling them "impaired." This was seen as a special



problem in Iraq, where the Arabic translation was criticized for being too similar to the English word "defective." The chosen strategy gave the researchers the opportunity to concentrate on child "difficulties" as it related to the study topics. The statement recognized that the term "disability" is a dynamic concept that is defined both personally and in a given context, making it challenging to gather reliable evidence from independent sources. Nevertheless, no discernible substitute terminology for the term "birth defect" was found or deduced.

A child may have a wide range of possible consequences as a result of insufficient or abnormal physical development in the womb; these outcomes are generally referred to as "birth defects." An individual does not necessarily have to struggle with their functional or mental health just because they were born with a "birth defect." As a result, while it was improper to refer to children with functional challenges as "defective," the word "difficulty" was appropriate in this instance. By sticking with the word "birth defect," the phenomena was able to be distinguished from "functional difficulty." It also provided a clear description of a gestational developmental consequence and, due to its widespread understanding, may have made it feasible for clear messages to be understood by the largest number of people.

Iraqi villages from the far north to the southern coast were represented by the four governorates that were surveyed: Erbil, Baghdad, Basra, and Najaf. They included both urban and rural areas, wealth and poverty, and a variety of physical features. The autonomous Kurdish region includes Erbil, and Baghdad serves as the national capital for the remaining governorates. UNICEF chose three governorates—Baghdad, Basra, and Erbil — based on anecdotal information that they had a large population of disabled individuals. Otherwise, it was believed that the governorates reflected the variety of lifestyles and cultural backgrounds found throughout the country [25]. As part of the sample process, local authorities were consulted to determine which geographic areas were thought to be representative of each governorate overall.

The areas were separated into localities consisting of 50 to 100 homes, and to prevent bias in location selection by fieldworkers, up to 50% of the localities were then randomly removed. Data collection started at a randomly selected location, and 20 families with children who would agree to an interview were found by methodically approaching homes. In order to control for the impact of local population homogeneity on data integrity, the location was abandoned once 20 interviews had been completed [26]. In cases when a locality chosen at random resulted in a conflict or other concerns for participants or researchers, it was substituted with a similar site that was safer.

The ethical concerns of researcher risk and informed consent were crucial. Therefore, under the supervision of their team leader, fieldworkers received comprehensive instructions on the former. They also worked in pairs and included a female team member to ensure that data collection from female participants was carried out in compliance with local conventions around interaction with non-family members. To ease concerns about the purpose and validity of the survey, teams were also matched to localities based on sectarian traits. Field personnel received identification badges, letters of authorization from local authorities, and apparel designating them as UNICEF employees.

The fully structured survey questionnaire was modified to meet the objectives of the current investigation based on a tool utilized in an epidemiological survey of adults in the UK with learning disabilities and challenging behavior [27]. The survey instrument was used in that study to investigate the experiences of families. In order to provide global standardization of disability metrics, the Washington Group on Disability Statistics (WGDS, undated) includes questions about "difficulties" in six areas of functioning. In acknowledgment of its influence on people and their access to education, a question about chronic health issues was included [28]. 6032 homes provided data, of which 10,714 children and young people (55.6% male) between the ages of 0 and 18 were included.

Descriptive information on school attendance, developmental skills (for children under the age of eight), and perceived physical, sensory, cognitive, and health issues was gathered for each child in addition to demographic data. Children between the ages of 4 and 18 years old had a mental health indicator completed as well (Strengths and Difficulties Questionnaire,



Goodman 1997). More data on the effects was gathered for kids who were thought to be struggling.

A mixed methodology was used in the study [29]. Quantitative data addressed concerns of prevalence and supplied descriptive contextual information. Through qualitative interviews, stakeholders were able to consider the effects of "disability" on the opportunity for disabled children to receive an education alongside their peers as well as contribute individually or in groups to the creation of instruments [30].

Seven groups of ten fieldworkers, each headed by a team leader, gathered the data. All fieldwork in Erbil was conducted by two teams speaking Kurdish. The fieldwork was done by the five Arabic-speaking teams in the three governorates located in the south. Field workers received introductory instruction in qualitative interviewing and household surveys. They helped the governorate of Erbil test research instruments. Facilitated by CARA, team leaders served as the primary points of contact for questions and discussions between research groups in the UK and Iraq. They oversaw the group and individual qualitative interviews. The survey data was entered into an SPSS database created in the UK by Iraqi Masters students who were trained during the piloting phase. Teams in the UK received the data in batches for consolidation, cleaning, and analysis.

Based on the report of a key informant, typically a parent, the prevalence of functional problems among the children examined was determined. In addition, parents were asked if any of their children had birth defects and, if so, what kind of defects they had. The validity of parent self-report in the context of birth abnormalities has been questioned in the literature because of recollection biases [31]. On the other hand, it can be argued that the birth of a child with a birth defect, or its identification later on, is an unanticipated and terrible occurrence that parents are unlikely to forget or erroneously recall. This is due in part to the availability of accompanying consultations with medical professionals. As a result, the birth defect report from the parents was recognized as true.

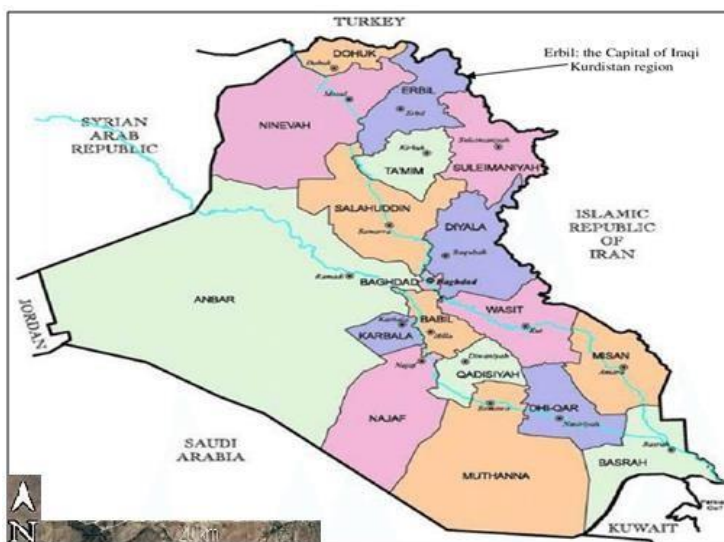


Figure 4 – Location of Iraq (Iraqi map) [41-44]

The respondents' assessments of the children's abilities in relation to others of similar chronological age served as the basis for the functional difficulty questions. Researchers also gathered data regarding the features of the areas they surveyed. They categorized each locality according to its geography (urban/rural); exposure to recent conflict; natural sources of contamination (e.g., ingress of sea waters into rivers in the south of the country); industrial contamination (e.g., discharge of hazardous waste); contamination from remnants of warfare (e.g., potential sources of DU); and/or other sources of contamination (e.g., hazardous disposal of human or domestic waste). They did this after



consulting with local officials and residents and making observations of environmental features.

These environmental measurements are imprecise because they are unable to accurately depict the level of danger that identified sources pose to locals or, in the event that a risk is there, the level of exposure that specific children or their parents face. Nonetheless, the metrics serve as a valuable tool for investigating correlations with congenital abnormalities or everyday challenges encountered by kids in the four governorates that were studied in 2010.

When considering the objectives of healthcare professionals and compared to current studies on the frequency of specific birth disorders, the total prevalence of birth defects is a "blunt tool" (see, for example, [32]). However, it serves as a helpful predictor of the possible support requirements for children with disabilities in educational settings. In national samples, the general prevalence of birth abnormalities has been reported to be 3–5% (Robinson and Linden, 1993). Although the prevalence rate in Basra (8.2%) is higher than that of a prospective study of infants and young children (7%) in a peri-urban slum neighborhood in Lahore, Pakistan, it is comparable to that research's overall prevalence rate of 3.7% [33].

That article contained no recommendations addressing potential reasons for a higher incidence. There has been constant conjecture on the connection between the local population's health and environmental factors, specifically industrial and military toxins. Perceived associations between armament materials (e.g., lead and DU) and cancer or birth problems in offspring of individuals possibly exposed to this pollution are especially concerning [34]. According to this study, there is a connection between the frequency of birth abnormalities and the existence of "other," natural, and armed sources of contamination.

Nonetheless, examination of the governorate most impacted by these environmental issues revealed that a particularly significant contributing factor to the development of birth defects and functional difficulties was unhygienic conditions brought on by harm to, or inadequate arrangements for, the disposal of human and domestic waste. Many substances have the potential to negatively affect the developing fetus or kid, according to literature on the causes of birth abnormalities and disability in young children [34]. Mercury (Hg), arsenic (As), and lead (Pb) have all been linked to large increases in birth defects, long-term health problems, and disabilities.

For instance, long-term consumption of water with high arsenic concentrations has been linked to bladder, kidney, liver, and skin malignancies as well as miscarriages [35]. Exposure to methylmercury (MeHg) during pregnancy or after delivery may also cause a variety of physical, mental, and sensory problems.

It's uncertain how much of these kinds of pollutants are present in Basra. Nonetheless, a study conducted in marshland areas to the north by Canadian and Iraqi researchers discovered moderate to severe pollution from heavy metals, including lead and arsenic, in numerous examined locations [36]. The authors mention that a sampling region had previously been used for military purposes and cultivation while the marshland was dry, even though they do not speculate on the causes of this pollution. Due to its ability to kill insects and function as a potent fungicide, arsenic has historically been utilized in large quantities in pesticides [37]. This could illustrate the effects of the ongoing use of dangerous pesticides in agriculture, which the UNDAF study (2010) noted.

Because it is coincidentally difficult to find clean water supplies, the relationship between the predominance of children in Basra with birth abnormalities and functional issues and possible pollutants from human and domestic waste is concerning [36]. Contaminants have the potential to affect human health when they seep into home water sources in areas where armed conflict has devastated infrastructure. One serious concern from feces contamination from domestic or feral cats is *Toxoplasma gondii*. The oocysts found in feces can live for over a year and become infectious one to five days after excretion. They are dispersed by surface water [38].

Therefore, contact with dirt or water spreads infection rather than direct contact with cats. In addition to working with animals or coming into touch with dirt, discovered that



"drinking untreated water, or having no piped water, but not with living on a farm" was a significant infection pathway. Seizures, significant sensory issues, and cognitive impairments can result from exposure [39]. National data analyses found links between birth abnormalities and functional challenges and three possible contaminants: natural, military, and "other" domestic/human sources. When the research was limited to Basra, the governorate most severely impacted by an extraordinary set of conditions, only the correlation with "other" sources of household or human waste was shown to be statistically significant.

Of the three possible sources of pollution linked to an influence on the well-being of children, the Basra findings alone arguably showed that "other" human/domestic sources were substantially more likely to be implicated. This conclusion is more nuanced than it first appears to be. It is important to remember that the three possible sources of contamination are significantly correlated. That is, in addition to residues of conflict and/or naturally occurring contamination, in this case salinization of rivers, the presence of "other" human/domestic waste sources of contamination is likely to exist. As previously mentioned, combat may leave behind trash, such as lead or DU from decommissioned or used weaponry.

However, the harm done to drainage systems, sewers, and water supplies—which serve as a conduit for the poisoning of nearby populations—may be the most pervasive and long-lasting legacy of armed warfare. The situation in Basra was made worse by obstacles to the availability of drinkable water. To determine the probable role that each of these forms of pollution plays in the challenges that kids face, more research is required.

As mentioned prior, Iraq has experienced decades of war and unrest and this has claimed lives as well as destroying the country's environment creating a toxic legacy that affects the health of the people. The sources of this pollution are quite diverse but the significant one being the destruction of critical infrastructure during periods of conflicts. Example include the 1991 Gulf War which extensively damaged refineries, water treatment plants and oil fields. The United States of America was responsible for these military attacks with its allies. Apart of the military goals, damage was caused on the environment as we realized that the damaged water treatment plants contaminated the clean drinking water and thick smokes of carbon from the burning oil wells.

In addition to that, the weaponry which was used during these conflicts destroyed the environment continuously. One notable compound is the Depleted Uranium, DU, which is used in ammunition. Research shows that DU has the potential of causing neurological and cardiovascular illnesses and other long term health term effects. Despite these health concerns, there is no resolution on banning of this compound by the International Law. Organizations like the International Atomic Energy Agency have proposed that there is limited data on the effects of Depleted Uranium on human beings and the environment. The International Law emphasizes the protection of human beings and the environment especially in periods of armed conflicts. This is quite imperative!

Environmental contaminants like Depleted Uranium have got a significant negative effect on human health. In addition, burning oilfields causes air pollution as well as dust storms which have got the potential of inducing respiratory disorders whilst simultaneously contaminated water sources can cause gastrointestinal sicknesses such as cholera and typhoid. Research has connected the exposure to DU with an exponential development of cancers and birth defects. The potential health effects of Depleted Uranium on human beings are quite alarming.

When it comes to environmental impact, unexploded ordnance known as UXOs reduce land use and threaten the lives of people especially children. There is also reduced land function which reduces agricultural productivity putting food security and lives at great risk. These insecurities reduce investment hence thwarting economic development in the region. Organizations which have been vocal in cleaning up of Depleted Uranium in Iraq include the United Nations Environment Program (UNEP) upon conducting assessments in affected areas. Awareness has been continuously offered by non-governmental organization to people to be cautious as well as providing medical care to affected communities. These efforts have been considered to be imperative but more is still needed.



There are several countries which have been involved in trying to restore the environmental damage which have been caused by conflicts in Iraq. The United Kingdom, the United States of America and their allies initiated many cleanup initiatives. These countries together with the United Nations Environment program have run environmental assessments to stage the level of risk. They have been advocating for total decontamination in the affected areas as well as restoring the damaged ecosystem. The Iraq Marshlands Restoration Program which was initiated by the Italian government and the United Nations is considered to be one of the best environment restoration programs. This program has been focusing on Mesopotamian Marshes rehabilitation. These marshes were damaged and drained during the Saddam Hussein regime. The program includes the reflooding of the marshes, native species of biodiversity reintroduction and the provision of sustainable livelihood to the inhabitants. Results have been showing improvement of people's lives as well as the environment.

However, remaining risks and unsolved environmental, ecological and safety issues, and new emerging threats (uncontrolled biological experiments, pathogens spread risks, radioactive and contagious materials illegal trafficking) still poses great danger to communities and require supreme efforts on all levels to restore damaged areas and ecosystems. The military actions in the country have created conditions for the uncontrolled use of military biology. The active use of toxic substances along with the use of weapons containing uranium cause no less damage to the environmental situation. The risks associated with the operation of closed military biological laboratories remain high. Given the lack of control over their activities in Iraq, the threat of outbreaks of epizootics and the spread of life-threatening materials among people remains.

In *conclusion*, the presence of a heavily contaminated environment due to factors such as war, extensive industrialization is directly connected to high prevalence of diseases in cities such as Basrah, Mosul and Thi-Qar. There is need to de-contaminate these regions as well as relocating people who live in these communities. The correlation between cancer prevalence and DU made munitions have been found by researchers and international collaborators. There are cities which should be labeled high risk and, in these cities, caution is required. Plans should also involve a more scientific and holistic approach in investing from North to South of Iraq. War zones (cities) should be investigated and the toxic pollutants should be analyzed and be eliminated. In addition to that, government should channel more resources into de-contaminating the environment especially the land, water and the air. Effective investigation, treatment and elimination of the contaminants require collaboration of specialists from departments such as veterinary industry, Agriculture and Public Health sectors. Toxicated and radiated species should be isolated and get treatment. Finally, awareness to all men should be given.

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