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Nuclear Weapons: Spoiling for Man's Annihilation

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ABSTRACT

Nuclear weapons are weapons of mass destruction that spoil for man's annihilation. Their use and control constitute a major concern of international relations. Yet, the existing literature contains materials that are fragmented and often dated. This review is aimed at harmonising and updating existing literature on various important aspects of nuclear weapons, including types, delivery methods, strategy, governance/control/law, disarmament, controversy and non-military uses. It recommends that world leaders should make sincere efforts to demilitarise the applications of nuclear weapons, if it is practically impossible to eliminate them.

Key words: Defense and security, nuclear bombs, demilitarisation of nuclear weapon applications

INTRODUCTION

Nuclear reactions can result in a destructive force that constitutes a nuclear weapon. This reaction can be fission or fusion, both of which release vast quantities of energy from relatively small amounts of reactants. Several tons of energy (usually measured in comparison with the amount of energy released by a unit of trinitrotoluene, TNT) are released by both atomic (fission) and hydrogen (thermonuclear) bombs, as tested nuclear weapons. A thermonuclear weapon of about 1,100 kg can produce an explosive force comparable to the detonation of about 1.2 million tons of TNT. No wonder, a little explosive device can devastate a city by blast, fire and radiation. Hence, nuclear weapons are weapons of mass destruction, spoiling for man's annihilation. Their use and control constitute a major concern of international relations (FAS, 2007).

The United States of America (USA) has released the two nuclear weapons ever used in the course of warfare. The one was detonated near the end of World War II (WW II) on August 6, 1945 over the city of Hiroshima, Japan. The other was exploded three days later on August 9, 1945 over Nagasaki, Japan. About 200,000 Japanese people (mostly civilians) died from acute injuries sustained from the nuclear weapons. Although, the ethical status of the bombings remain a subject of debate, the delivery of the warheads led to Japan's surrender in the war (FAS, 2000).

Subsequently, over two thousand nuclear weapons have been detonated for testing and demonstration purposes. The literature lists (chronologically by date of first test) the countries that have detonated and acknowledged possessing nuclear weapons (FAS, 2007). They are the USA, the Soviet Union (succeeded as a nuclear power by Rusia), the United Kingdom, France, the People's Republic of China, Pakistan and North Korea. Israel is widely believed to possess nuclear weapons, though it does not so acknowledge. Other States suspected of having a nuclear weapons programme are Iran and Syria. South Africa admitted to having previously fabricated nuclear weapons, which it denounced after it has disassembled the arsenal and submitted to international safeguards. A number of former Soviet republics-Belarus, Kazakhstan and Ukraine-formerly possessed nuclear weapons, returned soviet nuclear arms stationed in their countries to Russia after the collapse of the USSR.

The havoc worked on human life and environment by use of nuclear weapons is inestimable (Eneh, 2011a-d; Eneh and Agunwamba, 2011; Eneh and Agbazue, 2011). Since, the existing literature on nuclear weapons contains materials that are fragmented and often dated, this review is aimed at harmonising and updating existing literature on various important aspects of nuclear weapons.

TYPES OF NUCLEAR WEAPON

Two types of nuclear weapon are identified on the basis of the chemical reaction from which the energy is derived. Majority of the energy may come from nuclear fission reactions alone, or use fission reactions to begin nuclear fussion reactions to produce a large amount of the total energy output. Weapons whose explosive output is exclusively from fission reactions are commonly referred to as atomic or atom bombs (A-bombs). This is actually a misnomer because their energy comes specifically from the nucleus of the atom. In fission weapons, a mass of fissile material (enriched uranium or plutonium) is assembled into a supercritical mass-the amount of material needed to start an exponentially growing nuclear chain reaction-either by shooting one piece of sub-critical material into another (the "gun" method) or by compressing a sub-critical sphere of material using chemical explosives to many times its original density (the "implosion" method). The latter approach is considered more sophisticated than the former and only the latter approach can be used if the fissile material is plutonium. The amount of energy released by fission bombs ranges from the equivalent of less than a ton to upwards of 500,000 tons (500 kilotons) of TNT. A major challenge in all nuclear weapon designs is ensuring that a significant fraction of the fuel is consumed before the weapon destroys itself.

The most commonly used fissile materials for nuclear weapons applications are uranium-235 and plutonium-239, while uranium-233 has been less commonly used. Also, Neptunium-237 can be used (Albright and Kramer, 2005). The fusion weapons are generally referred to as thermonuclear weapons or hydrogen bombs (H-bombs) because they rely on fusion reactions between isotopes of hydrogen (deuterium and tritium). However, all such weapons derive a significant or a majority portion of their energy from fission to "trigger" the fusion reactions, which can themselves trigger additional fission reactions.

Thermonuclear weapons are much more difficult to successfully design and execute than primitive fission weapons. Thermonuclear bombs work by using the energy of a fission bomb to compress and heat fusion fuel. A fission bomb and fusion fuel may be placed in proximity within a special, radiation-reflecting container. When the fission bomb is detonated, gamma radiation and X-rays emitted first compress the fusion fuel, then heat it to thermonuclear temperatures. The ensuing fusion reaction creates enormous numbers of high-speed neutrons, which can then induce fission in materials not normally prone to it, such as depleted uranium. Each of these components is known as a "stage", with the fission bomb as the "primary" and the fusion capsule as the "secondary". In large hydrogen bombs, about half of the yield and much of the resulting nuclear fallout, comes from the final fissioning of depleted uranium (Albright and Kramer, 2005). By chaining together numerous stages with increasing amounts of fusion fuel, thermonuclear weapons can be made to release an energy equivalent to over 50 million tons (50 megatons) of TNT.

Other types of nuclear weapon include boosted fission weapon-a fission bomb which increases its explosive yield through a small amount of fusion reactions, but it is not a fusion bomb. In the boosted bomb, the neutrons produced by the fusion reactions serve primarily to increase the efficiency of the fission bomb. A neutron bomb is a thermonuclear weapon that yields a relatively small explosion, but a relatively large amount of neutron radiation to cause massive casualties,

while leaving infrastructure mostly intact and creating a minimal amount of fallout. A salted bomb is created by surrounding a nuclear weapon with suitable materials (such as cobalt or gold), to produce exceptionally large quantities of radioactive contamination. Most variation in nuclear weapon design is for the purpose of achieving different yields for different situations and in manipulating design elements to attempt to minimize weapon size.

NUCLEAR WEAPON DELIVERY

The technology and systems used to bring a nuclear weapon to its target is called nuclear weapons delivery. It relates to both nuclear weapon design and nuclear strategy. Deployment may cost as high as 57% of the total financial resources spent in relation to nuclear weapons (Albright and Kramer, 2005).

The actual delivery method used in warfare is dropping the gravity bomb from bomber aircraft. The method does not place many restrictions on the size of the weapon and weapon miniaturization requires considerable knowledge of weapons design. But, it limits the range of attack, the response time to an impending attack and the number of weapons which can be fielded at any given time. With miniaturization, nuclear bombs can be delivered by both strategic bombers and tactical fighter-bombers, allowing an airforce to use its current fleet with little or no modification (Albright and Kramer, 2005).

A nuclear weapon mounted onto a missile, which can use a ballistic trajectory to deliver the warhead over the horizon is preferable, from a strategic point of view. Short-range missiles allow for a faster and less vulnerable attack, while the development of long-range intercontinental ballistic missiles (ICBMs) and Submarine-Launched Ballistic Missiles (SLBMs) has given some nations the ability to plausibly deliver missiles anywhere on the globe with a high likelihood of success. Multiple Independently Targetable Reentry Vehicles (MIRVs) allow multiple warheads to be launched at different targets from one missile, reducing the chance of a successful missile defence (Albright and Kramer, 2005).

Tactical weapons involve a variety of delivery types, including not only gravity bombs and missiles, but also artillery shells, land mines and nuclear depth charges and torpedoes for anti-submarine warfare. Atomic motar was also tested at one time by the USA. Small, two-man portable tactical weapons (somewhat misleadingly referred to as suitcase bombs), such as the Special Atomic Demolition Munition (SADM), have been developed, although the difficulty of combining sufficient yield with portability limits their military utility (Albright and Kramer, 2005).

NUCLEAR WARFARE STRATEGY

A set of policies that deal with preventing or fighting a nuclear war is known as nuclear warfare strategy. The policy of trying to prevent an attack by a nuclear weapon from another country by threatening nuclear retaliation is called the strategy of nuclear deterrence. The goal in deterrence is to always maintain the ability of a country to respond to a nuclear attack with one of its own (a second strike capability) and potentially to strive for the ability to completely destroy an enemy's nuclear forces before they could retaliate (first strike status). During the Cold War, policy and military theorists in nuclear-enabled countries worked out models of what sorts of policies could prevent one from ever being attacked by a nuclear weapon (Creveld, 2000).

Different forms of nuclear weapons delivery allow for different types of nuclear strategies. The goals of any strategy are generally to make it difficult for an enemy to launch a preemptive strike against the weapon system and difficult to defend against the delivery of the weapon during a

potential conflict. Sometimes, this has meant keeping the weapon locations hidden, such as deploying them on submarines or rail cars whose locations are very hard for an enemy to track and other times this means protecting them by burying them in hardened bunkers.

Other components of nuclear strategies have included using missile defense (to destroy the missiles before they land) or implementation of civil defense measures (using early-warning systems to evacuate citizens to safe areas before an attack) (Creveld, 2000).

Weapons designed to threaten large populations or to generally deter attacks are known as strategic weapons. Those designed for a battlefield in military situations are known as tactical weapons (Creveld, 2000).

Since, a nuclear war between two nuclear powers would result in mutual annihilation, the significance of nuclear weapons is purely to deter war because any nuclear war would escalate out of mutual distrust and fear, resulting in mutually assured destruction. This threat of national, if not global, destruction has been a strong motivation for anti-nuclear weapons activism, which question the usefulness of such weapons in the current military climate. The use of (or threat to use) such weapons would generally be contrary to the rules of international law applicable in armed conflict. But, there is the need to reach an opinion as to whether or not the threat or use would be lawful in specific extreme circumstances, such as if the survival of the state were at stake (Creveld, 2000).

Perhaps, the most controversial idea in nuclear strategy is that nuclear proliferation would be desirable. This view argues that, unlike conventional weapons, nuclear weapons successfully deter all-out war between states and they are said to have done this during the Cold War between the USA and the Soviet Union (Creveld, 2000).

The threat of potentially suicidal terrorists possessing nuclear weapons (a form of nuclear terrorism) is of enormous international concern, since the prospect of mutually assured destruction may not deter an enemy who expects to die in the confrontation. If the initial act is from a rogue group instead of a sovereign nation, there is no fixed nation or fixed military targets to retaliate against. Following the September 11, 2001 attacks, this complication is seen as the sign of the next age of nuclear strategy, distinct from the relative stability of the Cold War (Creveld, 2000).

NUCLEAR WEAPONS: GOVERNANCE, CONTROL AND LAW

In 1957, seven years after WW II, the International Atomic Energy Agency (IAEA) was created under the mandate of the United Nations in order to encourage the peaceful development and applications of nuclear technology, while providing international safeguards against nuclear proliferation and misuse and facilitating the application of safety measures in its use. The political control of nuclear weapons in most countries dictates that the use of nuclear force can only be authorized by the head of government. The Partial Test Ban Treaty of 1963 restricted all nuclear testing to underground nuclear testing, to prevent contamination from nuclear fallout, while the Nuclear Non-Proliferation Treaty of 1968 attempted to place restrictions on the types of activities which signatories could participate in, with the goal of allowing the transference of non-military nuclear technology to member countries without fear of proliferation. In 1996, many nations signed the Comprehensive Test Ban Treaty, which prohibits all testing of nuclear weapons that would impose a significant hindrance to their development by any complying country. However, till now, it had not entered into force (Richelson, 2006).

Additional treaties and agreements have governed nuclear weapons stockpiles between the two countries with the largest stockpiles, the United States and the Soviet Union and later between the

United States and Russia. These include treaties such as SALT II (never ratified), START I (expired), INF, START II (never ratified), SORT and New START, as well as non-binding agreements, such as SALT I and the Presidential Nuclear Initiatives of 1991. Even when they did not enter into force, these agreements helped limit and later reduce the numbers and types of nuclear weapons between the United States and the Soviet Union/Russia (Richelson, 2006).

Beside, agreements between countries oppose nuclear weapons. Through the use of treaties, many nations have been declared Nuclear-Weapon-Free Zones-areas where nuclear weapons production and deployment are prohibited. The Treaty of Tlatelolco of 1967 prohibited any production or deployment of nuclear weapons in Latin America and the Caribbean. The Treaty of Pelindaba of 1964 prohibits nuclear weapons in many African countries. Recently, a Central Asian Nuclear Weapon Free Zone of 2006 prohibits nuclear weapons among the former Soviet republics of Central Asia (DeVolpi *et al*., 2004).

The highest court of the United Nations, the International Court of Justice, ruled in mid-1996 that the use or threat of use of nuclear weapons would violate various articles of international law, including the Geneva Conventions, the Hague Conventions, the UN Charter and the Universal Declaration of human rights. The International Committee of the Red Cross calls on states to ensure that nuclear weapons are never used, irrespective of whether they consider them to be lawful or not. Other specific actions meant to discourage countries from developing nuclear arms include economic sanctions (temporarily) levied against India and Pakistan for nuclear weapons tests in 1998. One of the stated casus belli for the initiation of the 2003 Iraq War was an accusation by the United States that Iraq was actively pursuing nuclear arms (though this was soon discovered to be false, as the programme had been discontinued). In 1981, Israel had bombed a nuclear reactor being constructed in Orisak, Iraq in what it called an attempt to halt Iraq's previous nuclear arms ambitions. In 2007, Israel bombed another reactor being constructed in Syria (DeVolpi *et al*., 2004).

NUCLEAR DISARMAMENT

Nuclear disarmament refers to the act of both reducing or eliminating nuclear weapons and to the end state of a nuclear-free world, in which nuclear weapons are completely eliminated. Beginning with the 1963 partial test ban treaty and continuing through the 1996 comprehensive Test Ban Treaty, there have been many treaties to limit or reduce nuclear weapons testing and stockpiles. The 1968 Nuclear Non-Proliferation Treaty has, as one of its explicit conditions, that all signatories must "pursue negotiations in good faith" towards the long-term goal of "complete disarmament" (Richelson, 2006).

There have been numerous campaigns to urge the abolition of nuclear weapons, such as that organized by the Global Zero movement. The goal of a "world without nuclear weapons" was advocated by the USA President Barack Obama in an April 2009 speech in Prague. A CNN poll from April 2010 indicated that the American public was nearly evenly split on the issue. Proponents of nuclear disarmament say that it would lessen the probability of nuclear war occurring, especially accidentally. Critics of nuclear disarmament say that it would undermine deterrence and could lead to increased global instability (DeVolpi *et al*., 2004).

NUCLEAR CONTROVERSY

Scientists involved with the manhattan project were divided in their opinions over the use of that first nuclear weapon, even before it was successfully developed. The two atomic bombings of two Japan's cities played a role in the country's surrender in the World War II. The USA's ethical

justification for them have been subjects of scholarly and popular debate for decades. The question of whether nations should have nuclear weapons, or test them, has been continually and nearly universally controversial (FAS, 2007).

Following the castle bravo hydrogen bomb test at the pacific proving grounds, which contaminated the crew and catch of the Japanese fishing boat, lucky dragon, radioactive fallout from nuclear weapons testing was first drawn to public attention in 1954. One of the fishermen died in Japan seven months later and the fear of contaminated tuna led to a temporary boycotting of the popular staple in Japan. The incident caused widespread concern around the world, especially regarding the effects of nuclear fallout and atmospheric nuclear testing. It "provided a decisive impetus for the emergence of the anti-nuclear weapons movement in many countries" (FAS, 2007).

In 1954, emerging peace movements in Japan converged to form a unified "Japanese Council Against Atomic and Hydrogen Bombs". Japanese opposition to nuclear weapons tests in the Pacific Ocean was widespread and "an estimated 35 million signatures were collected on petitions calling for bans on nuclear weapons". In the United Kingdom, the first Aldermaston March organised by the Campaign for Nuclear Disarmament took place at Easter 1958. Several thousand people marched for four days from Trafalgar Square, London, to the Atomic Weapons Research Establishment close to Aldermaston in Berkshire, England, to demonstrate their opposition to nuclear weapons. The Aldermaston marches continued into the late 1960s when tens of thousands of people took part in the four-day marches (FAS, 2007).

A successful campaign to stop the Atomic Energy dumping radioactive waste in the sea 19 km from Boston started in 1959. In 1962, Linus Pauling won the Nobel peace prize for his work to stop the atmospheric testing of nuclear weapons and the "Ban the bomb" movement spread. In 1963, many countries ratified the Partial test ban treaty prohibiting atmospheric nuclear testing. Radioactive fallout became less of an issue and the anti-nuclear weapons movement went into decline for some years. A resurgence of interest occurred amid European and American fears of nuclear war in the 1980s (FAS, 2007).

Between 1940 and 1996, the U.S. spent at least $8.15 trillion in present day terms on nuclear weapons development. Over half was spent on building delivery mechanisms for the weapon. The sum of $511 billion in present-day terms was spent on nuclear waste management and environmental remediation (FAS, 2007).

NON-MILITARY USES OF NUCLEAR EXPLOSIVES

Aside their military uses, nuclear explosives have been tested and used for large-scale earth moving purposes. Considering the long term health and clean-up costs, there is no economic advantage over conventional explosives. In the aftermath of the first thermonuclear bomb test, synthetic elements, such as einsteinium and fermium, were created by neutron bombardment of uranium and plutonium during thermonuclear explosions. In 2008, the worldwide presence of new isotopes from atmospheric testing beginning in the 1950s was developed into a reliable way of detecting art forgeries, as all paintings created after that period may contain traces of cesium-137 and strontium-90-isotopes that did not exist in nature before 1945. Nuclear explosives have also been seriously studied as potential propulsion mechanisms for space travel (FAS, 2007).

CONCLUSION AND RECOMMENDATION

Nuclear weapons seem to have protected mankind since two generations, are ultimate hindrance to any enemy and the best way to ensure peace. Bids to do away with them are sluggish and

unsuccessful. Checking the number of nuclear bombs in the world is probably impossible. It would not be a wise decision to scrap all nuclear weapons when hostile states like Iran are about to acquire a nuclear bomb. Nobody can predict how much dangerous the world will become when there would be no nuclear bombs.

On the other hand, the military use of nuclear weapons is immoral and should not be allowed to grow. The more the number of nuclear weapons made, the more are the risks of annihilation of human life. Maintaining a nuclear bomb is very expensive and takes a large share of the country's defense budget. Countries are more likely to have a civil war in which they can use nuclear bombs against each other and the nuclear radiation could prove disastrous to the entire globe. Possession of nuclear weapons does not earn the status and pride of a advanced economy.

If nuclear weapons are practically impossible to eliminate and have non-military uses, world leaders could still make sincere efforts to demilitarise their applications.

REFERENCES

Albright, D. and K. Kramer, 2005. Neptunium-237 and americium: World inventories and proliferation concerns. Institute for Science and International Security. http://isis-online.org/uploads/isis-reports/documents/np_237_and_americium.pdf

Creveld, M.V., 2000. Technology and War II: Postmodern War?. In: The Oxford History of Modern War, Townshend, C., (Ed.). Oxford University Press, New York, USA.

DeVolpi, A., V.E. Minkov, V.A. Simonenko and G.S. Stanford, 2004. Nuclear Shadowboxing: Contemporary Threats from Cold War Weaponry. Fidlar Doubleday, New York.

Eneh, O.C. and J.C. Agunwamba, 2011. Managing hazardous wastes in Africa: Recyclability of lead from e-waste materials. J. Applied Sci., 11: 3215-3220.

Eneh, O.C. and V.C. Agbazue, 2011. Protection of Nigeria's environment: A critical policy review. J. Environ. Sci. Technol., 4: 490-497.

Eneh, O.C., 2011a. Recyclability potentials of beryllium oxide from E-waste items in Nigeria. J. Applied Sci., 11: 397-400.

Eneh, O.C., 2011b. A review on petroleum: Source, uses, processing, products and the environment. J. Applied Sci., 11: 2084-2091.

Eneh, O.C., 2011c. Enhancing Africa's environmental management: Integrated pest management for minimization of agricultural pesticides pollution. Res. J. Environ. Sci., 5: 521-529.

Eneh, O.C., 2011d. Environmental significance of the combustion of liquid petroleum fuels: A review. J. Appl. Sci., 11: 2680-2685.

FAS, 2000. Nuclear weapons South Africa. http://www.fas.org/nuke/guide/rsa/nuke/index.html

FAS, 2007. Nuclear weapons Israel. http://www.fas.org/nuke/guide/israel/nuke/index.html

Richelson, J., 2006. Spying on the bomb: American nuclear intelligence from Nazi Germany to Iran and North Korea. Norton, New York.