Technological Infrastructure and Its Effects: A Case Study on Nuclear Weapon

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Abstract-Nuclear weapons have an effect on everyone in the world and even on the future generations. They affect everything from soil to peoples' genes. This research will attempt to make readers more aware about this topic that is rarely talked about. America promotes non-proliferation but they have more than 10,000 nuclear warheads in its arsenal. Furthermore, America is the only country that has ever used nuclear weapons that was during World War 2 on Japan. This has caused more than hundreds of thousands lives be taken and the effect also can be seen until today. There are also many nuclear weapons that are produced by other main power countries such as Russia and United Kingdom. Besides, there are other new weapons that cause radiation sickness and skin burn and these have more powerful explosion than Little Boy that was dropped on Hiroshima and Fat Man that was dropped on Nagasaki. This paper will explain about type of nuclear, their process and the effect to the Earth and human.

Keyword: nuclear weapons, fission and fusion weapon, World War 2

I. INTRODUCTION

During twentieth century, nuclear weapons have the most important role in international security especially in communications, transportation and weapons technology. However, nuclear weapons are the most powerful destructive weapon once they explode and they make a stabilizing effect on superpower relations by making conflict unacceptably costly for a long time ago. This paper will explain the supporting infrastructure of nuclear weapon and the effects of the nuclear weapons [6].

A. Definition

Nuclear weapon is a destructive instrument that makes an explosion force from the reaction. There are two types of nuclear weapons which is fission (fission bomb) and a combination of fission and fusion (thermonuclear weapon). Both of them release a big quantity of energy from small amount of bomb [11].

II. BACKGROUND

Nuclear weapons make many destructive through nuclear fission or combined fission and fusion reactions. Starting with scientific breakthroughs made during the 1930s, the United

States, United Kingdom and Canada collaborated during World War 2 in Manhattan Project to counter the suspected Nazi German atomic bomb project. On August 6, 1945, a uranium-based weapon named Little Boy was detonated above the Japanese city of Hiroshima and three days later, a plutonium-based weapon called Fat Man was detonated above the Japanese city of Nagasaki. Hiroshima and Nagasaki remain the only two instances of nuclear weapons being used in combat. There are many nuclear bombs other than Fat Man and Little Boy that have more powerful reaction. The first fusion bomb was tested by United States in Operation Ivy on November1, 1952, in Elugelab Island code-named Mike. Mike was a prototype design standing over 20ft (6m) high and weighing at least 10000lb (64t). The explosion produced energy equivalent to 10.4 megatons of TNT which is 450 times the power of bomb that was dropped onto Nagasaki. So, that was a big reason why this bomb could not be dropped even from the largest planes [7].

III. **R**ESULTS

From this research, nuclear bombs are the weapons that have huge mass of destruction. The bombs contain nucleus of an atom and the energy released when the particles of nucleus which is neutrons and protons are either split or merged. There are two types of nuclear weapons which is fission and fusion [11].

- Fission weapons nuclear fission reaction is the basic reaction for all existing nuclear weapons and is called as atomic bombs or atom bombs (A bombs). The mass of fissile material such as uranium and plutonium is compressed into a supercritical mass.
- 2) Fusion weapons also called as thermonuclear weapons or hydrogen bombs (H bombs) that could produce large amount of energy in nuclear fission reactions. This type of weapon consists of two light elements which is tritium and deuterium that fuse together and form helium and neutron.



Fig 1. Fission and fusion reaction [11]

Nuclear fission is the neutron that split the nucleus of atom into small fragments and usually this method involves isotopes such as uranium-235, uranium-233 or plutonium-239.

Nuclear fusion are two small atoms that are fused together to form helium isotopes. The two atoms are hydrogen isotopes, which is deuterium and tritium. The differences between uranium-235 and uranium-238 is when the nucleus of uranium-235 absorbs neutron, it can undergo nuclear fission by releasing energy on average 2.5 neutrons. Uranium-235 is described as fissile because the reaction can support a chain reaction, which could release more neutrons than it absorbs while uranium-238 is not fissile and not undergo fission when absorb neutron unlike uranium-235.



Fig 2. Example Abomb [11]

Atomic bomb (A bomb) is produced by nuclear fission that make power releases by splitting atomic nuclei. The chain reaction spreads almost instantaneously, which is when a single free neutron strikes the nucleus of an atom from radioactive material such as uranium or plutonium, it will produce two or more neutrons free. This reaction will produce energy and the new neutrons will strike another uranium or plutonium nuclei through the same way that make more energy and more neutrons produced. The reaction occurs repeatedly.



Fig 3. Example Hbomb [11]

Hydrogen bomb (H bomb) is produced through nuclear fusion reaction. Nuclear fusion reaction is a reaction that releases atomic energy by numerous light nuclei at high temperatures to produce heavier atoms that have greater destructive power and more efficient than atomic bombs. The process is also referred to as thermonuclear explosion because of the nuclear fusion reaction is at high temperatures from the initial process. Deuterium and tritium which are two hydrogen isotopes fuse together and form Helium atoms and make the term hydrogen bomb to describe deuterium-tritium fusion bomb.



Hiroshima bomb also called Little Boy is long and thin shape arsenals by using material uranium-235. The effect for less than one kilogram of uranium-235 is equal to approximately 15,000 tons of TNT.

Nagasaki bomb also called Fat Man is rounder and fatter arsenals compared to Hiroshima bomb by using material plutonium-239. The effect for more than one kilogram of plutonium-239 is equal to 21,000 tons of TNT.

A. Effect after using nuclear weapons

Atomic raids can produce huge impact such as damage, death and injury. It killed at least 100,000 of Japanese civilians and military personnel with the heat, radiation and blast effects. There are also many death cases from radiation sickness and related cancers that followed the stages after the impact [8].

 Initial stage (1 - 9 weeks) - this is the chronic stage in which there are greatest number of deaths with 90% from thermal injury and 10% from super lethal radiation exposure.

- Intermediate stage (10 12 weeks) the deaths' number in this stage is stabilizing compared to first stage.
- Late period (13 20 weeks) there is some improvement in survivors' condition at this stage.
- Delayed period (20 weeks and above) there are many complications and mostly related to healing of thermal and mechanical injuries. If an individual is exposed during this stage to the radiation, he or she will suffer from infertility, sub-fertility or blood disorders.

IV. CONCLUSION

A rather large fraction of survivors, less than 2 kilometers survivors may have experienced early effects in the form of signs and symptoms of acute radiation injury. The fractions of survivors experiencing late effects appear smaller with the number of estimated radiation-associated deaths to date being on the order of 1,000 or 3% of proximal survivors. A full picture of the impact of cancer on the survivors must include the elevated risk of incidence as well as mortality. Furthermore, there are other late effects with a clear impact on health and quality of life such as cataract. For survivors who were in utero at the times of the bombings, exposure to doses of a fraction of a gray or more during critical periods of gestation may have led to severe developmental consequences in a rather large proportion of those so exposed. In addition, survivors were subject to a psychosocial impact as well although this was related to the general experience of being in the cities at the times of the bombings rather than to radiation. The effects of using nuclear weapons to people such as on World War 2 caused death and other chronic cancer. This shows that if one of the nuclear arsenal is leaked, the whole world is in danger. In addition, there are more types of nuclear weapons which have bigger explosion and stronger effect than that on Hiroshima and Nagasaki. Therefore, extreme carefulness must be placed to avoid the misuse of nuclear weapons.

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