Hazards of Uranium Weapons to Human Health and the Environment: Report to the UN Workshop Towards a Ban of DU

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Banning the world's uranium weapons and providing medical help and compensation for their victims is now a critical and urgent issue, if we wish to stop the destruction and pollution of our planet and build a peaceful world for the future.

The UN Secretary-General, Mr. Kofi Annan, stated in a message delivered on 6th November 2002 marking the first observance of ***The International Day for Preventing the Exploitation of the Environment in War and Armed Conflict*** (resolution 56/4), that: "International conventions govern nuclear, chemical and biological weapons, but new technologies – such as ***depleted uranium ammunition*** – pose as yet unknown threats to the environment. Damage to the environment in war is also an impediment to the restoration of peace and rebuilding of society."

We completely agree with his message and request that the UN take immediate concrete action to ban uranium weapons. They should also conduct health surveys of the victims of uranium weapons; undertake environmental surveys in all affected areas, and seek ways to provide medical treatment and compensation for the victims.

This report discusses the grounds for our requests and considers both the environmental and public health hazards of uranium weapons.

I. The hazardous properties of uranium weapons: the grounds for demanding a ban

The following four points illustrate the hazardous properties of uranium weapons; each in itself is a justification for a ban.

1 A novel weapon of great penetrative and destructive power

Uranium shells are more powerful than those made of conventional metals such as tungsten. Uranium's high density – 19.05 g/cm^3, (2.4 times higher than iron and 1.7 times that of lead) gives DU shells increased range and penetrative power. This density, combined with uranium's pyrophoric nature, results in a high-energy kinetic weapon that can punch and burn through armour plating.

When the DU penetrator strikes a hard target, a huge amount of kinetic energy is converted into thermal energy. This creates extremely high temperatures of between 3000-6000°C, much higher than the melting point (1132 °C) and sometimes beyond the boiling point (3818 °C) of uranium. The uranium immediately burns, melts and vaporizes into an aerosol, while the shell is penetrating into the target.

Uranium's main rival in kinetic penetrators is tungsten, which has a similar density. However, as a waste product of the nuclear industry, depleted uranium (DU) is far cheaper.

Globally, at least 16 countries have already armed themselves with uranium weapons to increase their military power. A ban on uranium weapons is also critical to reduce the build-up of arms in an effort to proceed towards worldwide disarmament.

2. Weapons composed of radioactive materials

Uranium weapons are manufactured from radioactive waste materials produced during the production of nuclear weapons and as part of the civilian nuclear fuel chain. The transit of such wastes is legally restricted, as is their dispersal into the environment within the countries that use uranium weapons, such as the US and UK, as well as in countries of their military coalition allies, such as Japan.

However, these countries have not stopped dispersing radioactive materials overseas. The use of uranium weapons causes widespread and long-lasting radioactive contamination of the environment and civilians alike. The radioactive half-life of U238, of which 99.8% of DU is composed, is 4.5billion years - equivalent to the present age of the earth.

Uranium weapons are the weapons composed of radioactive materials. They are different from nuclear weapons, which use the destructive power of a nuclear explosion. However, both of them cause radioactive contamination and radiation exposure. The use and testing of uranium weapons is, in that sense, opposed to the intention of the *Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water* (PTBT, 1963), a treaty signed in order to: 'Put an end to the contamination of man's environment by radioactive substances,' and also by the nuclear free zone treaties as the *South Pacific Nuclear Free Zone Treaty* (1985), the *Treaty on the Southeast Asia Nuclear Weapon-Free Zone* (1995) and *The African Nuclear-Weapon-Free Zone Treaty* (1996), which "determined to keep the region free of environmental pollution by radioactive wastes and other radioactive matter."

The use of uranium weapons is a serious violation of these international agreements, which have been reached by the world's anti-nuclear movement. Their use is also in direct opposition to the world's desire for peace, and for nuclear disarmament, and ignores the bitter experience and suffering of the world's radiation victims.

3. Uranium weapons as ecological pollutants

Uranium is radiologically and chemically hazardous. From mine to battlefield, pollution results from every stage of production and use of uranium weapons. The use of uranium weapons produces fine particles of uranium oxide, the diameter of which vary from 10 micrometers to the sub-nanometer level. Such uranium oxide aerosols can easily spread for tens of kilometres from battlefields and testing sites

In Kuwait, after the 1991-Gulf War, it was reported that the signs of DU (higher uranium concentration and a lower isotopic ratio between U235 and U238) was detected in the sample of the solid fall-out and suspended air particulate matter. Even in the cities and beaches of the Arabian Gulf, tens of kilometres from battlefields in the desert. [1)] Similarly, DU was detected in vegetation samples and small mammals in the study areas around a US military testing range.[2)]

Civilian contamination from DU has also been found. Autopsy samples of organs including the lungs, liver and kidneys of civilians residing in Basra, southern Iraq, at least during the 1991-1994 period showed signs of DU pollution.[3)] Large numbers of DU weapons were used in and around Basra during the Gulf Wars in 1991 and 2003.

Fine particles of uranium oxide have never existed before in the natural world. The future impact on the environment and ecosystem from contamination by manmade forms of such radioactive materials is not yet fully understood.

In the preamble of the *Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques* (1976), it states that: *"Recalling the Declaration of the United Nations Conference on the Human Environment adapted at Stockholm (1972),"* which stated that "*Man and his environment must be spared the effects of nuclear weapons and all other means of mass destruction (principle 26).*" In article one of the convention, it is also stated that: *"Each State party to this Convention undertakes not to engage in military or any hostile use of environmental modification techniques having wide spread, long lasting or severe effects as*

the means of destruction, damage or injury to any other State Party." This convention was originally inspired by learning from the bitter experience of the environmental destruction caused by the US's use of Agent Orange in the Vietnam War. DU weapons are also contrary to the intention of this international disarmament treaty, which prohibit weapons from an environmental protection viewpoint.

Banning uranium weapons is also critical from an environmental protection viewpoint; we must oppose the contamination of the environment and ecosystem by hazardous materials.

4. Weapons of mass destruction or indiscriminate effect
Uranium weapons not only affect military personnel but also innocent civilians, especially children, even after hostilities have ended. Uranium dust can easily cross the borders of countries in conflict.

Their use is contrary to existing international humanitarian law. Including: *The Hague Regulations concerning the Laws and Customs of war on land* (1907), *Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare* (1925), and the *Geneva Convention and its Additional Protocol I* (1977), the *Convention on Prohibition or Restrictions on the Use of Certain Conventional Weapons Which May Be Deemed to Be Excessively Injurious or to Have In discriminate Effects* (CCW, 1980).

Uranium weapons were condemned as weapons of mass or indiscriminate destruction in the resolutions of the Sub-Commission to the UN Commission on Human Rights (1996, 1997 and 2001), along with nuclear weapons, chemical weapons, fuel-air bombs, napalm, cluster bombs and biological weaponry.

Demanding a ban on the use of uranium weapons is morally correct and legally inevitable given the volume of existing international humanitarian law.

II. The damage to human health and environment by uranium weapons and the "precautionary principle"

1. Scientific evidence indicates that uranium weapons are hazardous to the ecosystem and human health.
We do not as yet understand the full impact that fine particles of DU oxide may have on the human body. We do not have accurate internal dose assessment; we have little information on the precise distribution and dynamics of internalised particles, and we are still lacking a complete understanding of the mechanisms by which damage to cells and organs occurs.
Despite this, there is mounting scientific evidence from both animal, and in vitro studies that suggest deleterious effects on human health from inhaled DU particles through both radiological action and chemical toxicity:

a) Results of animal and cellular studies
Animal and cellular studies have shown clear evidence of the carcinogenic, neurotoxic and immuno-toxic effects of DU; as well as its ability to damage the reproductive system and foetus. Some data also suggests that uranium can directly damage the DNA and enzyme proteins in living cells. Many scientific and medical papers on the chemical and radiological toxicities of uranium have been published. [4-10)]

Of course, in order to scientifically assess the results of animal and **cellular** experiments, we must take into account the different pathways and exposure levels, and also the differences between in vitro and in vivo effects. Equally, we must consider the different sensitivities between experimental animals and humans. However, even these basic data are fundamentally important when considering the threat to human health posed by these weapons.

The data suggests that DU exposure may not only cause cancer and leukaemia, but also wider damage to all the systems and organs of the human body.

By only considering damage to the lungs and kidneys, the governments and military agencies in US, UK and other countries have been guilty of underestimating the risks, and ignoring many of the hazardous health effects caused by DU exposure.

b) Increased incidence of chromosomal aberrations
Dicentric and ring chromosome aberrations are one of the specific signs of radiation damage, these were found in studies of UK Gulf War veterans (1991) and service personnel who had been deployed in the Balkans War (1995-1999).[11)]

This study suggests that veterans may have been exposed to internal radiation from DU particulates. In January 2004, evidence of chromosomal damage was fundamental in securing health compensation for a Scottish Gulf War veteran in a court battle against the UK MoD.

c) Increased morbidity of Gulf War veterans
Many medical journals have reported an increased incidence of various diseases of the circulatory, blood, urinary, neuro-muscular, reproductive and immune systems, compared to other veterans who did not serve in the Gulf War.

An increased incidence of some cancers in Gulf War veterans and congenital disorders in veterans' children has also been reported.[12-20)]

Most of these reports did not focus on the link between health damage and the veterans' DU exposure, yet veteran's exposure to DU is thought to be a key factor in Gulf War Syndrome.

As in the independent UK Lloyd Inquiry (Nov. 2004), Gulf War Syndrome has begun to be recognized as a distinct set of symptoms suffered by veterans sent to the Gulf in 1991, and it is likely to be a result of several factors, including DU exposure. Most recently, a war pensions tribunal in London ruled that "the term Gulf War Syndrome is the appropriate medical label to be attached in the legal case of a UK veteran suffering from the syndrome.

d) The hazardous health effects of micro-particles
Micro-particles - particles smaller than 10¼m and 2.5¼m - are similar in size to the DU aerosols produced by uranium weapons. Such particles have been implicated as a health threat by large-scale epidemiological studies into air pollution in the US, UK and other European countries.

Exposure to these fine particles has been linked to increasing levels of respiratory and cardiovascular diseases.[21-23)] It has also been found that such fine particles tend to remain in the body for a longer period because of their small size.

Smaller than micro-particles, 'nano-particles' have also recently been found to be hazardous to health in studies of experimental animals.[24)] Exactly how these particles damage health is poorly

understood at the moment, but air pollution regulation levels have been revised more strictly in many countries following their discovery.

The high impact temperatures generated by uranium weapons are more than sufficient to generate micro-particles and nano-particles. Air pollution health studies would suggest that uranium fine particles are also harmful to human health. In the case of uranium, the hazard is enhanced by the radiological and chemical properties of uranium oxides.

2. Genuinely independent health and environmental research is needed, and urgent medical support and compensation for victims is necessary

There have been no epidemiological and environmental studies up to now, which sufficiently studied and analyzed scientifically the link between the DU exposure and the health damage of civilians and veterans in contaminated areas. The direct causal relation between their health damage and DU exposure is not always clear.

The governments and military agencies of the US, the UK and others have been underestimating the toxicity of uranium, denying the causal relationship to health damage and concealing the information about the use of uranium weapons and the damage caused by them.

This situation has made it extremely difficult to undertake scientific research into the effects of these weapons. Yet governments and the military have placed the onus on the victims to prove the link between exposure and health. They have continued to use uranium weapons without giving any compensation to the victims.

In Iraq, where large numbers of uranium weapons were used during the Gulf Wars, it is still too difficult to carry out large-scale environmental and epidemiological research and to provide the basic and urgent medical treatment of sick civilians. Iraqi civilians have been affected by a multitude of environmental health factors, social factors such as poverty, dynamic changes of population in the cities and so on, caused by the repeated wars, economic sanctions and political confusion. This situation makes it extremely difficult to isolate the effects of DU exposure from other environmental and social factors.

The International Atomic Energy Agency (IAEA), the International Committee of Radiation Protection (ICRP) and other international parties, whose remit is the promotion of nuclear energy, have been underestimating the effects of contamination and the risks associated with DU exposure. ICRP has been underestimating the risk of radiation exposure only assessing fatal cancers, leukemia and severe genetic defects. They have been ignoring other health problems from which victims are actually suffering.

Genuine scientific research into the environmental and health conditions in affected areas is urgently needed. The research should be carried out for the victims and should provide the necessary medical support for them. Iraqi doctors, who have been caring for the patients in affected areas, have been reporting that cases of leukemia and birth defects are increasing, especially among children. Infants, babies and unborn fetuses are particularly at risk from radiation and environmental pollutants as their cells are dividing rapidly and it is imperative that more research is done in this area.

Cooperating with the German branch of the International Physicians for the Prevention of Nuclear War (IPPNW-Germany), other NGOs and specialists in this field, ICBUW intends to support an epidemiological study proposed by Iraqi doctors working in affected areas of the country.

3. Banning uranium weapons is also critical under the 'precautionary principle'.
Animal and cellular studies, the ill health of the veterans and the hazardous effects of fine particles are all compelling evidence of the dangers to human health and the environment from DU.

They are a warning to us that we should take concrete measures, even without fully understanding every process and causal relationship between use of uranium weapons and damage to human health and the ecosystem, before it is too late.

Continuing to pretend that there is no danger from uranium weapons is morally, ethically and scientifically wrong. Governments must listen to the victims and end the use of uranium weapons immediately. The history of environmental pollution has repeatedly taught us that when the alarm bells begin to ring we must take action.

The 'precautionary principle' has been established as one of the basic principles of ecosystem and public health protection. In the *Rio Declaration on Environment and Development*, which was adapted at the 1992 UN Conference on Environment and Development (Earth Summit) in Rio de Janeiro, they stated: 'In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation; Principle 15.'

This 'precautionary principle' was also confirmed in the Agenda 21 action plan at the Earth Summit, in the *Wingspread Statement on the Precautionary Principle* by scientists in 1998, and also in the *Stockholm Convention on Persistent Organic Pollutants* (POPs), which came into effect in 2004. According to the 'precautionary principle' uranium weapons should be banned immediately.

III. No more 'Hibakusha' - no more DU victims.

Earlier this year, we commemorated the 60th anniversary of the atomic bombings of Hiroshima and Nagasaki, not only in Japan, but also all over the world.

"No more Hiroshima and Nagasaki," has been the message to the world from the atomic bomb victims for the past 60 years. Despite this, we already have tens of millions of radiation victims - 'Hibakusha' in Japanese - throughout the world from both military and civilian use of nuclear. And now, victims of uranium weapons are being added to that enormous total of 'Hibakusha'.

We have to learn to take the lessons from the past century of nuclear age more seriously. We must listen to the voices of the radiation victims.

We call on international community***: "No more Hibakusha and no more DU victims in the world! Ban uranium weapons immediately!"*** We call for the support of all people in the world, who have been acting for peace, anti-nuclear-weapons as well as anti-nuclear-fuel-chain, environmental protection, human right protection and so on. We have a responsibility for our future generations and for the future of this planet.

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Note:

1) Katsumi Furitsu, Contact person of CARE, is responsible for the entire content of this report.

2) The word “Hibakusha” in this report means not only the atomic bomb victims in Hiroshima and Nagasaki but also all of the radiation victims in the world, who have suffered from both the civilian and military use of nuclear technology.

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