


ISSUE BRIEFS

Assessing Effects of Depleted Uranium: The **IAEA** Role

In the recent past, the use of depleted uranium in conventional anti-tank munitions during conflicts in the Balkans and the Middle East resulted in the contamination of these territories with radioactive residues.

Depleted uranium is one of the by-products of uranium enrichment and, like any other uranium compound, has both chemical and radiological toxicity. Depleted uranium is only slightly radioactive, 60 per cent as radioactive as natural uranium. Depleted uranium has the same chemical and physical properties as natural uranium. The chemical toxicity of uranium is normally the dominant factor for human health. However, in special circumstances in which depleted uranium was inhaled or ingested or where fragments came into close contact with individuals, it is necessary to also assess its radiological impact.

After the above-mentioned conflicts, questions arose regarding the possible consequences of the existence of depleted uranium residues for local populations and the environment. As part of the United Nations system's effort to respond to the requests of affected States to assess the consequences of the use of depleted uranium ammunitions in conflict situations, IAEA — with its unique statutory functions, i.e., to establish standards of safety for protection against radiation exposure and to provide for the application of these standards — has been involved in coordinated evaluation exercises.

A number of evaluation of the environmental and health impact of depleted uranium munitions have been performed by national and international organizations. IAEA participated together with UNEP and WHO in several international appraisals like those in Bosnia and Herzegovina, Serbia and Montenegro, Kosovo, Kuwait, Iraq and Lebanon. The radiological framework for these studies was the International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources (Safety Series No. 115, IAEA, Vienna, 1996) and the methodology was generally based on sampling campaigns, analysis of the environmental samples in recognized international laboratories and radiological assessments performed by international experts.

The objectives of these assessments have been to draw conclusions regarding the toxic and radiological safety and to make recommendations to mitigate the hazards to the population and the environment, on the basis of comprehensive surveys at specific locations where depleted uranium ammunition residues may have been spread. These studies exclusively dealt with civilian inhabitants and environment radiological risk in areas affected by military actions after the conflicts were terminated. The results and conclusions are valid at the time of the assessments and, when possible and under certain grounds, prospectively, IAEA did not evaluate the impact of depleted uranium ammunition on the troops or the populations at the time of the conflicts.

In general, the results of these assessments indicated that the existence of depleted uranium residues dispersed in the environment does not pose a radiological hazard to the population of the affected regions. Estimated annual radiation doses that could arise from exposure to depleted uranium residues would be very low and of little radiological concern. Annual radiation doses in the areas where residues do exist would be of the order of a few microsieverts, well below the annual doses received by the population from the natural sources of radiation in the environment and far below the reference level recommended by IAEA as a radiological criterion to help establish whether remedial actions are necessary.

Complete depleted uranium ammunition or fragments can still be found at some locations where depleted uranium weapons were used during past wars. Prolonged skin contact with these depleted uranium residues is the only possible exposure pathway that could result in exposures of radiological significance. As long as access to the areas where these fragments exist remains restricted, the likelihood that members of the public could come into contact with these residues is low. The recommendations to the national authorities, in all the cases studied were to collect any depleted uranium ammunition or fragments and any war equipment which have been in direct contact with these ammunitions and isolate them from the public in appropriate locations until it can be processed as low level radioactive waste and eventually safely disposed of. Some environmental remedial actions like covering of areas with uncontaminated soils could be convenient at some particular locations, depending on the use of the land.

After the conclusion of the investigations in which IAEA participated, the national authorities in the affected regions should



have had the competence and equipment to carry out the necessary monitoring, survey and remedial activities in relation to depleted uranium. This was actually observed in all the cases studied.

IAEA together with UNEP and WHO provided coordinated response to the request of its Member States to assess the post-conflict radiological risk to the public and the environment from the contamination of territories with depleted uranium residues. IAEA generally concluded that the radiological risk was not significant and could be controlled with simple countermeasures conducted by national authorities. It was also observed that in a post-conflict environment where the social and economic disruption is high, the radiation fear linked to the presence of depleted uranium residues further increases the anxiety of the population. In many of the concerned countries the results of the radiological evaluations provided a basis for public reassurance due to the low significance of the radiological impact.

Depleted uranium

Munitions using depleted uranium (DU) were used during the Gulf War in 1991 and in the conflicts during the 1990s surrounding the break-up of Yugoslavia. The risks of harm to military personnel on a battlefield should be put in context of the other self-evident risks, but the use of depleted uranium ordnance has raised concerns about subsequent health consequences, both to service personnel and to the public after the conflict.

As has already been discussed, uranium occurs naturally in the environment. It is widely dispersed in the Earth's crust, and in fresh water and sea water. As a result, we are all exposed to uranium isotopes and their decay products, and there are wide variations in doses received depending on local circumstances. DU is a by-product of the uranium fuel cycle where natural uranium is enriched to provide suitable fuel for nuclear power. It is called depleted because it has had some of its uranium-235 isotope removed. A large fraction of decay products of the uranium isotopes is removed during the fuel enrichment process.

Depleted uranium in munitions is in a concentrated metallic form, and there are understandable concerns about elevated levels in the environment due to spent munitions. There are also worries about people handling intact depleted uranium metal. Assessments of dose to military personnel who entered a tank shortly after it was hit by a DU weapon indicate possible doses of up to a few tens of mSv from inhalation of vapours and dust. In contrast, doses to people exposed some time afterwards to resuspended dust in the same local environment are likely to be a thousand times less, typically a few tens of μSv. Contact doses when handling bare DU metal are approximately 2.5 mSv/h, primarily from beta radiation, which is not penetrating and so affects only the skin. Even so, the collection of bare DU munitions needs to be discouraged and, if possible, avoided completely.

Doses from depleted uranium are, therefore, real and, in some circumstances, they could be appreciable for military personnel. Doses to people in the post-conflict phase are likely to be much lower and should be relatively easy to avoid.

Managing contaminated areas

As we have seen (and will see from other examples in later chapters), areas in various parts of the world have become contaminated with radionuclides as a result of various human activities. In cases where the level of contamination is high, measures might be needed to ensure that the area is safe for people to live or use for other purposes. For small areas, it might be possible to do this by removing contaminated soil and other materials, but for large areas the amount of material would be too large.

The information is drawn from:

Effects of the use of armaments and ammunitions containing depleted uranium, a report of the Secretary General of the UN dated 24 July 2008.

Photos: IAEA / A. Bleise, T. Cabianca, D. Calma, P. Pavlicek.