

Management of radioactive wastes in developing countries: Growing needs

A greater awareness of problems is leading to more requests for technical assistance and waste management advisory services

by K.T.Thomas

Wide variations in the development and use of nuclear energy are evident in developing countries. A few have or are pursuing partial or complete nuclear fuel cycle activities. Eleven developing countries have nuclear power plants with a total installed capacity of 8600 megawatts-electric (MWe). Because of the increasing demand for electrical energy, more developing countries would like to have nuclear power. But most of them are constrained by lack of finances and technical expertise. Some have research reactors, and a few have uranium mining and milling operations. Most developing countries are using nuclear energy for applications in fields of medicine, agriculture, industry, and research.

From all these uses, radioactive waste is produced that must be managed safely and efficiently. Increasingly in recent years, countries have turned to the IAEA for technical assistance and waste management services to address serious problems they are facing.

Special needs and problems

In many countries, the priority attached to radioactive waste management during the early years of nuclear development was not as high as it should have been.

In the developing world, this situation generally continues to exist for various reasons. In a majority of the cases, there is a lack of awareness of the importance of safe radioactive waste management. Consequently, it tends to receive low priority, inadequate financing, and insufficient staffing and training support. This

collectively leads to little appreciation of the safety implications.

In some cases, a sense of false security had set in. The erroneous perception arose that waste disposal problems are easy to solve, can be delayed, and will solve themselves. Problems tended to be ignored, or wastes were stored, sometimes improperly, in some remote place.

Many particular problems today are rooted in these conditions, and tied to the acute financial difficulties facing most developing countries. The allocation of funds for waste management thus is often disproportionately low in comparison with the real needs.

To cap the situation, the most important aspects, namely adequate legislation, organization, policy, and understanding of safety issues, are absent in many developing countries.

In those countries dealing with management of waste emanating from nuclear applications, one of the major problems concerns spent radiation sources. In many instances, information is lacking as to the extent and magnitude of this problem. The sources frequently are negligently stored, in some cases with non-radioactive materials, and serious accidents have happened.

In countries with nuclear research centres equipped with one or two reactors, or with isotope production facilities, the problems of waste management are greater. Proper minimization, segregation, collection, treatment, and conditioning methods are not practiced in a large number of countries.

In many instances, waste management work is entrusted to scientists without adequate background on the subject, or organizations to back them. Unfortunately in a majority of cases, the staff have many other responsibilities as well.

In response to such conditions, the IAEA has put in place a number of mechanisms in support of efforts that countries are making to develop the necessary infrastructure and expertise for the safe management of radioactive waste.

Mr Thomas is a former staff member in the IAEA Division of Nuclear Fuel Cycle and Waste Management.

Technical co-operation projects. Through technical co-operation projects, the IAEA supports and arranges training courses and fellowships, and provides expert advice as well as equipment and instruments. Currently 20 countries receive different types of technical assistance in areas of radioactive waste management through 33 projects. In assessing project requests, the Agency takes into consideration both specific and broad aspects of the country's programmes and priorities.

Co-ordinated research programmes (CRPs). CRPs serve as an important channel through which developing countries receive advice on specific research and development topics. Participation is open to all countries. Through their participation, developing countries receive state-of-the-art knowledge in the field from the research projects themselves and during periodic meetings at which results are discussed. Currently, there are seven ongoing CRPs in areas of radioactive waste management.

Among them is one on safety assessment of waste disposal, an especially important topic. Near-surface disposal is the preferred option for the comparatively large volumes of low- and intermediate-level radioactive wastes which arise from the nuclear fuel cycle and radionuclide applications. National regulatory authorities require that safety assessments are performed in order to show that the prescribed radiological performance criteria can be met. The Agency's CRP (entitled "The Safety Assessment of Near-Surface Radioactive Waste Disposal Facilities") involves the intercomparison and validation of analytical models that are used for safety assessments, with the aim of raising the level of confidence in their results. To date, participants from 17 Member States, including seven developing countries, are formally associated with this programme.

Training courses and study tours. National, regional, and inter-regional training courses are among activities providing opportunities for scientists and managers from developing countries to acquire the expertise demanded in the waste management field. Between 1976 and 1989, a total of 206 participants from 60 countries attended such courses. Additionally, 59 scientists attended regional and inter-regional training courses in 1990 and 1991 arranged for countries in the Middle East, Europe, and Africa.

Specialized activities. A number of other activities are under way to address aspects of waste management from nuclear applications. Applications of radioactive materials in industry, medicine, and other fields are growing in developing countries at a fast pace. The problem of managing spent radiation sources, particularly

more hazardous ones like radium-226, is acute, especially in countries lacking a regulatory framework to handle them. As part of its support, the IAEA has reviewed the nature and magnitude of this problem, and is now developing a database in support of efforts to improve the identification, monitoring, and control of radiation sources. (*See the following article.*)

Concerning the general area of nuclear applications, a number of technical manuals have been or are being prepared. They address topics including minimization and segregation of wastes; handling, conditioning and disposal of spent sealed sources and other solid wastes; interim storage of waste; treatment and conditioning of radioactive effluents, organic wastes, and resin wastes; and design of a centralized waste processing and storage facility. Videos on various technical aspects of waste management also are supplied, often through expert missions, as is a standardized design to assist countries interested in setting up a waste processing facility.

WAMAP: An inter-regional approach

Overall, the IAEA's variety of services aim at enabling developing countries to become more self-sufficient and reliant in the management of their radioactive waste. An effective avenue for helping them to achieve these objectives is known as the Waste Management Advisory Programme (WAMAP), which was set up in 1987.

WAMAP's scope is inter-regional, and its operation bridges the expertise of specialists in the IAEA's technical divisions with the experience of the Agency's technical co-operation programme. Teams of experts in various waste management disciplines visit a Member State on request for a comprehensive overview of waste management needs, practices, procedures, and institutions, or in certain cases to address specific areas needing assistance.

The emphasis is on the practical development and implementation of the various components of an integrated waste management system. These include infrastructure, waste handling and processing technology, waste storage and disposal, uranium mining and milling, waste management, decommissioning, spent radiation sources management, safety assessment, and public acceptance aspects. The level of assistance depends upon each country's stage of nuclear development.

To date, 35 WAMAP missions (one of which was carried out jointly with the IAEA's Radiation Protection Advisory Team programme)



WAMAP missions through 1991

have been undertaken to 34 countries. (See map.) Eleven of these countries have nuclear power plants and/or nuclear fuel cycle facilities, nine have uranium and/or monazite processing programmes, and 11 predominantly have isotope applications. Altogether 41 experts from nine countries and the IAEA participated in these missions.

WAMAP missions have identified a number of areas demanding greater national awareness and attention. Each mission reports its findings and recommendations to national authorities, with special emphasis placed on practical approaches that can be taken to address or remedy specific problems. Additionally, during the course of missions, the experts provide on-the-spot assistance and advice to the country's waste management staff.

As part of each mission's follow-up actions, Agency technical officers monitor the steps taken by national authorities to implement WAMAP recommendations. They also send supporting technical reports and technical video films that demonstrate safe waste management practices, especially of spent radiation sources. In some cases, experts are dispatched to provide further assistance in the field.

Meeting the challenge

From the foregoing, it can be seen that developing countries are facing certain major problems in the safe management of radioactive wastes. Lack of awareness, and the absence of a regulatory framework, infrastructure, finances, and expertise, add to problems created by the low priority that many countries attach to waste management.

There is therefore a continuing need for greater appreciation of both the challenges and the responsibilities. While outside assistance can stimulate national activities, the main efforts have to come from the countries themselves.

For developing countries to reap the benefits of nuclear energy, it is essential that they have safe radioactive waste management systems. In assisting countries to achieve this difficult task, the IAEA's available mechanisms and programmes, in particular WAMAP, are fundamentally designed to promote this understanding and to augment national capabilities. □