

# RADIOACTIVE WASTE MANAGEMENT

## **Regular Budget expenditure: \$7 800 346**

### *Expenditure by subprogramme*

<i>Handling, treatment, conditioning and storage of radioactive wastes</i>	\$902 875
<i>Radioactive waste disposal</i>	\$670 299
<i>Decontamination and decommissioning of nuclear installations</i>	\$578 640
<i>Radiological and environmental aspects of waste management</i>	\$842 125 + \$2 621 300 (IAEA-MEL): 3 463 425
<i>Waste management planning and infrastructure</i>	\$2 185 107

*Extrabudgetary programme resources utilized (not included in chart): \$952 417 (including IAEA-MEL)*

The Agency's 1995 programme on radioactive waste management focused on three major areas: strengthening waste management infrastructures in developing Member States; establishing international principles and standards for the safe management of wastes; and preparing for the convention on waste safety. The increased importance placed by Member States on the decommissioning/dismantling of nuclear installations and the restoration of radioactively contaminated sites was reflected in the introduction of new initiatives in these areas.

### ***Handling, Treatment, Conditioning and Storage of Radioactive Wastes***

There are 45 WWER-type reactors in operation around the world and several more are under construction. One of the common features of many of these units is an under-designed waste management system that generates higher amounts of radioactive wastes as compared with other types of reactors. As a consequence, waste management issues were studied in a technical assistance regional project on waste minimization at WWER type reactors that was completed in 1995. Project activities included a

review of common problems and the identification of the processes and activities needed to improve existing waste management systems.

Progress was made in developing guidance material on quality assurance and quality control requirements in the production of radioactive waste packages acceptable for the transport, long term storage and disposal of wastes. A report on the characterization of radioactive waste forms and packages was completed. This report provides a comprehensive summary of waste form, container and package properties which are important in obtaining regulatory approval for the use of a waste package for transport, storage and disposal.

The Sealed Radiation Sources (SRS) Registry package, a project within the spent sealed sources programme, was completed. The SRS Registry package consists of a program diskette and documentation on the Registry, installation and operating instructions, and a guide for Registry administrators in Member States. A policy has been formulated governing the distribution of the SRS package, the financial obligations involved and issues related to implementation, such as training and updating.

The Registry is one of the primary components of Agency programmes aimed at improving the control of in-use and spent radiation sources, and will assist countries in their efforts to keep track of all sealed radiation sources from 'cradle to grave'. The first training seminar/ workshop for administrators of the SRS system was held in October 1995 in Vienna. In addition, several countries offered to implement the Registry nationally on a test basis.

### ***Radioactive Waste Disposal***

A five year CRP on the performance of engineered barrier materials in near surface disposal was concluded in 1995. The CRP provided an opportunity to share the experience of Member States in the application of engineered barrier materials and to enhance the use of such barriers by improving the techniques and methods used for selecting, planning and testing the performance of various types of materials.

### ***Decontamination and Decommissioning of Nuclear Installations***

Decommissioning is a topic of great interest to many countries because of the large number of facilities which have reached or are nearing the end of their operational lifetime. Until recently, attention was focused on the decommissioning of nuclear power and research reactors. Some countries, however, are now devoting greater attention to the decommissioning of non-reactor nuclear facilities, with implementation of these decommissioning programmes being seen as a high priority. As a consequence, the Agency has begun preparation of a technical report, which will be first of its kind dealing specifically with the decommissioning of non-reactor facilities. It will present information on installations already decommissioned and on those for which decommissioning actions are planned or under way.

A number of WWER-440 type nuclear power plants are in operation in seven countries of central and eastern Europe (Armenia, Bulgaria, the Czech Republic, Hungary, the Russian Federation, Slovakia and Ukraine). Five WWER-440 units have been shut down permanently in eastern Germany. In addition to reactors already shut down, a number of reactors will soon reach the end of their foreseen lifetime (25–30 years) and become candidates for decommissioning.

Recognizing the region's need for support in this area, a four year technical co-operation project on planning and

managing the decommissioning of WWER type nuclear power plants was initiated in 1995. The project will emphasize WWER-440 reactors, since they have received very little attention in relation to facility decommissioning. An additional complication is that documentation on design, construction and operational aspects, which inevitably have an effect on decommissioning, is scarce and not readily available. The project has been planned in such a way as to include regional workshops and technical visits to several reactor sites, and will assist countries in the development of decommissioning plans for these reactors.

Radioactive contamination of the environment has resulted from several causes: accidents involving radioactive materials; nuclear weapons production and testing activities, activities associated with nuclear power generation; the disposition of by-products from the mining and milling of radioactive ores; past waste management practices (including disposal and releases); and abandoned facilities (e.g. radium factories) where radioactive substances were used. The Agency recently initiated a programme to assist Member States in the remediation and restoration of radioactively contaminated sites. The principal efforts over the next several years will be on: gathering information and data, performing analyses and publishing technical guides, reports and documents on key aspects of environmental restoration; conducting a CRP and an interregional training course on environmental restoration.

### ***Radiological and Environmental Aspects of Waste Management***

The Agency will present a report by the end of 1996 to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the London Convention 1972) on the potential impact of the high level radioactive wastes dumped in the shallow waters of the Kara Sea, and on the feasibility of possible remedial measures. During 1995, work on acquiring basic information on waste inventories and making predictions of future releases of radionuclides from the dumped wastes was completed by a working group. The data acquired will be used in 1996 by the environmental modelling and impact assessment working groups as a basis for their calculations.

In support of the final assessment task, experimental and field work was carried out in national institutes and at IAEA-MEL to determine the distribution coefficients between sea water and sediment, and concentration factors for biological species of the Arctic. In relation to

possible remedial actions, a set of options, such as in situ capping or retrieval of certain wastes, followed by transport and storage on land, were selected for closer examination. These options will be examined for their technical feasibility, costs of implementation and radiological impacts, and will be compared with the option of leaving the wastes in the shallow Arctic waters.

A symposium to review recent developments and studies on the environmental impact of radionuclide releases was held Vienna in May. The review included the results of studies aimed at reconstructing radiation doses to exposed individuals due to releases in the early years of the nuclear industry and of projects concerned with the remediation of land contaminated as a result of past releases. The symposium also provided a forum for presenting the main results of an Agency CRP entitled 'Validation of Environmental Model Predictions' (VAMP), and to review progress in the International Arctic Seas Assessment Project (IASAP). The final session of the symposium featured a topical discussion on protection of the environment and the 'precautionary principle' (which calls for precautionary action to be taken to protect the environment from potentially harmful contaminants even if there is no concrete evidence that these contaminants have an adverse effect), a controversial concept which is being debated in many international forums.

Within the framework of the IASAP, IAEA-MEL completed radiochemical analysis of seawater and sediment samples taken during the joint 1994 Norwegian–Russian Federation expedition to the Kara Sea. The results showed that a leakage of several radionuclides had occurred from the waste containers dumped in the Abrosimov and Stepovoy Bays, but that the resulting sediment contamination is limited to the immediate vicinity of the containers. Global and regional modelling of a hypothetical large scale release of radionuclides from the dump sites has shown that only local scale radiological effects may be of importance. The analysis of seawater and sediment samples taken during the 1994 Japan–Republic of Korea–Russian Federation expedition to the far eastern seas did not show any effects from the dump sites.

Other activities related to IASAP included laboratory and field experiments to examine radionuclide accumulation by sediments and biota under Arctic conditions. These studies involved organisms typically found in the Arctic Seas. Measurements were made of their uptake response when exposed to key waste derived radionuclides at low ( $-2^{\circ}\text{C}$ ) temperatures. It was found that

brown macroalgae would be excellent bioindicator organisms for detecting radionuclide contamination in the Kara and Barents Seas.

An intercomparison exercise on biota samples collected on Mururoa Atoll was completed under the Analytical Quality Control Services (AQCS) programme. The radio-analytical performance of the participating laboratories proved to be good, although the activity of the samples analysed was very low.

The field programme carried out by IAEA-MEL on Eutrophic Limits in the Northern Adriatic (ELNA), which employed nuclear techniques to assess carbon flux and burial in the Adriatic Sea, was concluded in mid-1995. The findings were instrumental in establishing the pollution histories of important environmental contaminants, such as PCBs and mercury, in this region of the Adriatic Sea.

### ***Waste Management Planning and Infrastructure***

The costs associated with radioactive waste management and the decommissioning of nuclear facilities are of interest to Member States planning nuclear power programmes. To assist them, the Agency convened a meeting of experts in June to prepare a report on this subject. One suggestion was that the Agency should work with other interested international organizations to develop and define a comprehensive list of cost related terminologies. This can potentially facilitate greater communication and more standardized use of terms within the waste management community.

A milestone in the Radioactive Waste Safety Standards (RADWASS) programme was the publication of a Safety Fundamentals document on radioactive waste management and a Safety Standard on establishing a national system for radioactive waste management. These two documents will help to address the need for a set of internationally recognized principles and standards. They are also finding use as source material in the preparatory work for a convention on the safety of radioactive waste management.

At the request of the Norwegian Radiation Protection Authority (NRPA), the Agency assembled a five member team, under its Waste Management Assessment and Technical Review Programme (WATRP), to review Norway's work on establishing a combined storage and

disposal facility for low and intermediate level wastes. The WATRP review team found that the quality, approach and status of the Norwegian programme was satisfactory. The original WATRP review report, which includes a Norwegian translation, was published by the NRPA in December 1995.

Co-operative efforts are continuing to identify effective ways to assist the newly independent states of the former USSR and the Russian Federation with various waste management problems. One activity in this area was a seminar in Vienna on international co-operation on nuclear waste management in the Russian Federation. As a result, a Contact Expert Group (CEG) has been established to try to resolve various radioactive waste management issues.

The Agency will act as Secretariat of the CEG, which will include senior representatives from the Russian Federation and co-operating countries. Among other responsibilities, the Agency will maintain a database on high priority Russian waste management needs, and on planned or ongoing co-operative projects.

Among the activities directly assisting developing Member States was a project to create or promote regional technical centres for demonstrating pre-disposal waste management methods and procedures. In 1995, steps were taken to establish two regional centres, one at the Cekmece Nuclear and Training Centre in Istanbul, and the second at the Nuclear Research Centre in Santiago, Chile.