

THE RADIOACTIVE WASTE MANAGEMENT CONCEPT: PROBLEM DEFINITION AND SOLVING IN LATVIA

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ABSTRACT

Development of the radioactive waste (RW) management Concept is treated as a key component of a general process – elaboration of the overall RW management strategy for a certain country/region. We present an indication of possible solutions for crucial RW management problems for Latvia being at the same time rather generic for other countries. The importance of the Concept for Latvia arises from the planned decommissioning of Salaspils research reactor (SRR) and from the recommended further upgrading of the RW management organization in conditions of limited resources.

The aim of this Concept is to stimulate the development of advanced, environmentally sound and population friendly system of RW management, in accordance with the fair social system for the protection of human health and the environment, in line of international recommendations. The Concept foresees solutions for the safe management of RW for the period 2003-2010.

The main problems to be analysed and solved in the Concept:

The increase of RW quantity and a lack of sufficient storage space. In addition to the traditional producers of RW such as medicine, industry, and science, there are two major operators in Latvia who have significantly increased the yearly amount of RW for disposal in the recent years and will do so also in the nearest future – mostly, due to disposal of SRR decommissioning waste in the existing near-surface LILW-SL RW repository (in Baldone), which dictates the need for its enlargement.

The safety of the existent repository. To ensure protection of population and environment (also the Baltic sea) from exposure and radioactive contamination, proper measures shall be taken. The safety of the RW repository should be upgraded by building of a long-term cover, according to recommendations of the safety assessment (SA) accomplished by the international consortium CASSIOPEE.

Construction of a long term storage and the geological disposal site. Safe isolation of long-lived RW can be achieved by storage in the geological disposal site only, thereby:

- a) supports the interests of future generations by using the standards ensuring a minimal risk in the far future, simultaneously minimising the transferred responsibility for safe management of RW;
- b) ensures fair satisfaction of the current interests of population by implementation of the newest solutions in construction of the repository;
- c) does not prescribe the necessity to allow the removal of waste packages from the repository.

The foreseen solutions - Strategic aims:

- a) to build a long-term storage for disused sealed sources that can't be stored in near-surface depositories;
- b) to investigate the possibilities for construction of a geological repository;
- c) to build two new vaults (for SRR D&D waste disposal and for spare space) in the existing repository.

The risks that RW management poses to population. The need to find a compromise between different parts of society may cause a necessity to implement a compensation mechanism for hypothetical risks and mitigation of negative perception by public of any activities with RW seriously hinders the projecting of new storage spaces. Introduction of efficient compensation mechanism would favourably effect the opinion poll to be conducted before planning new facilities. As an actual factor there is regarded stakeholder involvement. Among the three proposed compensation mechanisms there has been chosen to realize direct payments from the State budget to Baldone municipality

The competence level of the employees involved in RW management. There is foreseen to proceed a system of information supply to decision makers and to public. Due to an insufficient level of skills in conducting expertises (SAs, etc.) Latvia should actively participate in international projects.

INTRODUCTION

According to international documents (IAEA recommendations, European Union directives, etc.), each relevant Member State shall develop and implement comprehensive, definite and a clearly expressed radioactive waste (RW) management program including all possible waste types as well as waste management stages; in particular, national policies and implementation strategies for the safe management of radioactive waste shall be developed” [1].

In fulfilling its international obligations, in particular, those of the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of RW Management, as well as other relevant documents, in Latvia recently has been elaborated the Concept of RW Management, with the aim to stimulate the development of environmentally sound and population friendly system of RW management, thereby ensuring sustainable economic development in accordance with the fair social system for the protection of human health and the environment,. This Concept has been elaborated following the assignment given by the Cabinet of Ministers from 2002-03-19, was accepted by the Cabinet in 2003-06-26 and foresees the solutions for the safe management of RW in the nearest 5 – 10 years (the time period from 2003 till 2010).

LEGAL BASIS of the CONCEPT and ORGANIZATION of RW MANAGEMENT

The Concept is based on:

- a. Nine IAEA generic principles for RW management.
- b. Site-specific conclusions and recommendations of the CASSIOPEE¹ study on Safety Assessment of Baldone near-surface RW repository.
- c. National legislation:
 1. The Law “On Radiation Safety and Nuclear Safety”;
 2. The regulations of the Cabinet of Ministers No.129 from March 19, 2002 “Requirements for the Practices with Radioactive Waste and Related Materials”, containing basic radiation safety principles and setting up
 - waste classification
 - the clearance system
 - all waste acceptance criteria (related to RW packages, vaults and all relevant facilities) as well as criteria for disposal in near-surface and deep geological facilities, based on the concept of 300 years long State supervision period)
 - requirements for long-term safety assessment
 - requirements for site selection
 - requirements for quality assurance system, and others;

3. The regulations of the Cabinet of Ministers No.157 from April 16, 2002 “The Principles of Determination of the Equivalence of Various Radioactive Waste”.
- d. Other site-specific items (conditions, government documents, problem definitions, planned tasks).

According to the principle cited in the Preamble of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of RW Management (1997), namely, “The timely creation of an effective national legal and associated organizational structure provides the basis for appropriate management of RW”, being currently implemented in Latvia, a proper development of the Concept is based on the recently established national legal and organizational policy and infrastructure of RW management.

The governmental policy for RW management is conducted by the Ministry of Environment (ME). The Radiation Safety Centre – the State Regulatory Body under the supervision of ME – is responsible for:

- supervision and control of practices with the sources of ionising radiation, that forms RW
- preparation of draft policies for the state policy of supervision and control of RW management
- issuance of the licenses for the practices involving ionising radiation sources.

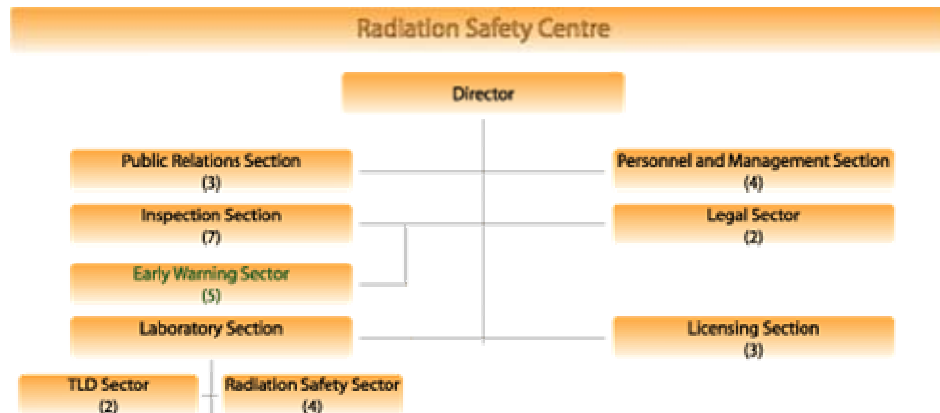


Fig. 1. The structure of the Radiation Safety Centre

One of the main principles of general RW management policy foresees that the users of ionising radiation sources who gain profit from the use of such sources and produce RW, are fully responsible for the RW management and are obliged to solve the potential problems in the very moment they arise, without delaying the dealing with the problem to a later time.

The urgency and importance of the Concept for Latvia arises from the planned decommissioning of Salaspils research reactor (SRR) – according to decision of the Cabinet of Ministers from 1996 - which shall be completed till 2010 - as well as from the recommended further development and extension of the RW management organizational structure in conditions of relatively limited resources.

The Agency “**RAPA**” is the sole organisation in Latvia dealing with RW management, is fully financed by the **State**, receives supplementary funding from the import tax on radioactive substances and as the main task has to implement state procurements to collect all RW from their site of origin, processing and disposal.

The main features of RW management:

- a) In compliance with IAEA recommendations, currently in the repository there is accomplished only storage of treated RW, but has been stopped its disposal.
- b) The oldest part is licensed as permanent disposal, but the last vault (No. 7) – as a long term storage site, where since the earlies 90-thies the RW is stored in removable waste containers. After transporting of RW to the Baldone site, containers are sorted according their characteristics in compliance with existing waste acceptance criteria and are dislocated into the vault (No.7) compartments.
- c) A license for disposal will be issued after additional safety assessments and some safety enhancements (based on EU - CASSIOPEE recommendations).
- d) Latvia is at early stages of dismantling and decommissioning of SRR, and waste management optimization is one keystone of decommissioning strategy [2].

Latvia has a sole national RW near-surface repository of RADON-type, built in accordance with the former USSR standard requirements. Total capacity of the repository – 2060 m³, currently the total amount of deposited and stored RW reaches ~1400 m³. Its six vaults, used in the period 1962-92, have been closed, being a permanent disposal site, but the last vault (No. 7) is operating as a long term storage site, before the next decision for disposal of the waste portion suitable for its near surface disposal; the rest of that waste shall be stored until deep geological disposal option will be available - either within the country - or outside - if a regional approach would be approved. The repository is foreseen for low- and intermediate level activity short-lived (LILW-SL) waste, and is managed by the State enterprise “RAPA” having been in January 2004 rearranged into the State agency for RW management.

THE MAIN PROBLEMS SOLVED IN THE COCEPTION

The increase of the RW quantity and a lack of sufficient storage space

Increased amounts of RW stream

Since 1962, all RW in Latvia has been buried or stored in a single place – the RADON-type RW repository (called as “Radons”) that is placed in the Riga district, about 5 km from the centre of Baldone village and about 27 km from the centre of the capital of Latvia - Riga.

The use of radioactive materials and nuclear materials in Latvia is relatively minor. During a calendar year (in partularly, in the period 1995-1999, approximately 3–5 cubic meters of unconditioned RW were supplied for long term storage or disposal (by conditioning and preparation for disposal, the gross volume of RW increases by a factor of two), along with some 500 – 5000 different sealed sources of ionising radiation. The total activity of such RW reaches around 10 TBq.

In addition to the traditional institutional RW producers in medicine, industry, research and other areas – (a principal summary of forthcoming institutional RW (icluding existing valid agreements to re-export the radiotherapy and blood irradiation sources to their manufacturers) is illustrated in Table I).

Table I. The most significant sealed sources as the foreseen institutional RW for disposal

No.	Activities	Main nuclides	Total activity (GBq)
1.	Irradiation (research)	Co-60	250 000
2.	Research	Pu-Be	1 200
3.	Medicine	Cs-137	40
		Co-60	35
		Ra-226	2,87
4.	Well logging	Am-Be	115
5.	Nuclear gauges	Cs-137	70
		Kr-85	12
		Am-Be	6,7
		Sr-90	3,4
		Sr-90-Y	21
		H-3	100
6.	Sample testing	Ni-63	4.4 GBq
7.	Calibration	Cs-137	840
8.	Smoke detectors	Am-241	3,1
		Pu-239	2,2
9.	Sources in survey meters	Sr-90	0,15 (amount – 2200 items)

There are two major operators in Latvia that have significantly increased the yearly amount of RW for disposal of in this repository in recent years and will do so in the foreseeable future:

1. The Salaspils research reactor (SRR) - has been in operation until 1998, with a Critical Assembly (the zero power reactor) operated until 1993. According to SRR Decommissioning concept [3], accepted by the Cabinet, there are in progress the preparatory works for SRR decommissioning – switching off the systems and experimental equipment being non-applicable for further maintenance of SRR as well as their dismantling - which will generate much larger amount of RW than during its operational period; also the waste streams produced by other institutions significantly increased during the years 2000-2002 (see Table II).

Table II. Summary of the amount of RW delivered for its predisposal management during 1999-2002

Year	2000	2001	2002
Activity (TBq)	30	45	60
Number of disused sealed sources	2640	730	4871
RW volume (m ³)	12,4	16	30

In particular, only in 2002 from the RR territory there have been transported to the “Radons” disposal site above 30 m³ of RW with total activity 60 TBq, including disused sealed sources (collected also from other users).

2. One privatised joint stock company having a large stock of the sources of ionising radiation. According to the decree of the Cabinet of Ministers No. 92 from 21st of February 2002 “On the convey of the inventory of to-be-liquidated state joint stock company “RNIIRP””, the sources that can be exploited further are conveyed to the Ministry of Education and Science, and the other sources are to be deposited. At the same time, decontamination of this object is carried out. Decommissioning of this object started in 1994, when the majority of the sources were transferred to Baldone RW repository in accordance with the decree of the Cabinet of Ministers

No. 377 from 1994. So, during 2002 this object has sent for disposal disused sealed sources, contaminated scrap metal and equipment with the total activity of 1,3 TBq and volume above 10 m³.

Additionally, in Latvia since 1999 a considerable amount of RW is a contaminated scrap. In addition to the planned scrap amounts from the aforementioned „RAPA” and „RNIIRP” activities, additional amounts come from scrap collection and transit companies: in 2001 the disposed amounts of such (the last-type) scrap ~ 3.5 cbm, ~13 GBq. Besides, the planned seeking for and exploitation of natural oil beds in Latvia will increase the amount of such a waste. The naturally occurring RW might form in some technological processes in the industry using large quantities of natural material as well as, e.g., in the melting processes of metal ores or in production of non-combustible materials.

The lack of sufficient storage space

The total number of the ionising radiation sources deposited in Baldone RW repository and those having their guaranteed life time to be expired in nearest few years, has reached several tens thousands. Hence, this RW repository urgently needs an upgrade that has to be finished in the nearest five years, in order to meet the increasing demand for storage space.

In more detail, the enlargement of this repository is unavoidable as the free space available in the vault No. 7 (the only vault that is in use today), being approximately 700 m³, is not sufficient even for disposal of the RW arising from SRR decommissioning. The process of decommissioning alone is expected to yield in 1200 cubic meters of RW [3], however, the other objects are contributing to the total volume as well.

Creation of a spare vault for emergency situations is desirable too, as the experience of other countries shows that even a single source can cause hundreds of cubic meters of RW if accidentally melted in a scrap metal factory. Analysis of the IAEA Data Base on illicit trafficking of radioactive materials and nuclear materials shows that nearly every week in some European country there is a case of illicit trafficking, and many of such cases are related to the finding of an ionising radiation source in scrap metal. Hence, the probability of a radiological emergency due to melting of an ionising radiation source being in the metal scrap, or melting of contaminated metal scrap is considerable.

Since July 2002, there is operating a system for the scrap yards' control in respect to their obligation to measure the radiation level in the scrap metal, however, this cannot be taken as a measure precluding an emergency situation.

In conclusion, the safety and economic considerations and criteria altogether are initiating the following major challenges:

- a) the establishment of a geological repository,
- b) the establishment of a long term storage space for disused sealed ionising radiation sources.
- c) as an immediate and independent measure shall be enlargement of existing repository via building of additional vault(s).

Enlargement of the existing repository

In the frame of the PHARE project 2001 and following the CASSIOPEE recommendations [4], Latvia is developing a technical project for enlargement of existing repository (i.e., construction of a new vault – vault No.8 being necessary for disposal of waste arising from SRR decommissioning).

The radiological impact from vault No. 8 has been evaluated in the frame of CASSIOPEE analysis, including applicable criteria, conditions, input data, hypotheses and recommended corrective measures.

During 2003-2004, it is planned to perform the Environmental Impact Assessment (EIA) both in connection with the enlargement of Baldone RW repository and SRR decommissioning. The financial resources for the environmental impact assessment have been allocated and the tenders have been opened.

Although for disposal of decommissioning waste from SRR is necessary to build one new vault (i.e., No. 8), this is only one option among three ones being considered regarding to enlargement of the Baldone repository. Another two options propose construction of two additional vaults, each of volume 1200 m³; in particular:

- option 2 - to construct both vaults till 2006, and
- option 3 – one vault - till 2006, the other – till 2009.

Complex analysis of these options being currently carried out by Latvian authorities in order to specify the forthcoming waste management activities in Latvia, has derived that the optimal would be option 2, taking into account that:

- option 1, although having the least expenses, has not foreseen significant spare space for RW disposal arising from possible emergency case,
- in the Baldone repository there is sufficient area for construction of two new vaults,
- option 3 will be more expensive due to necessity to repeat EIA as well as to update the technical project.

Detailed terms (including financial) for construction of additional vaults are shown in Table III.

Table III. Expenses for construction of RW vaults and execution terms

No.	The stages of the problem solving	Expenses	Execution terms
1.	Preparation of outlines for a detailed design plan of RW vaults	Have been allocated in the frame of PHARE project on Nuclear safety LE 01.09.01. ("Design of additional disposal vault and integral storage facility for long-lived waste") – 100 000 EUR ~ 60 000 Ls	2002-2004
2.	Assessment of impact of RW construction works on the environment	Financing has been allocated by the Environmental Protection Fund – in the volume 70 000 Ls	2003-204
3.	Preparation of a technical design plan for RW vaults	It is necessary additional financing – in the volume 250 000 Ls	2004
4.	Construction of RW vaults	Necessary additional financing – in the volume 500 000 Ls	2005-2006
	Total expenses:	880 000 Ls	
	Necessary additional financing:	750 000 Ls	

Safety on the existent repository

An essential goal of the national system of RW management is to provide protection of the Baltic sea against radioactive contamination. This really means prohibition of the storage or deposition of RW near the sea, except if it is possible to prove by internationally accepted scientifically profound methods, that such a storage or deposition creates negligible risk to the population and to the sea ecosystems as well as being not in conflict with other activities performed in the sea. In any case, sufficient measures shall be observed to prevent contamination of the sea.

In the nearest future Latvia is planning a practical implementation of CASSIOPEE recommendations for further upgrading of the long-term safety, in particular, in order to carry out an updated inventarization of RW being in storage – with the purpose to get more precise information about activity levels and the RW shapes and forms – and, on the basis of such acquired more precise information, to continue safety assessments of the storage site. Requirements on performing corresponding safety assessments have been elaborated in the National legislation (the Cabinet Regulations No.129).

In order to improve the long-term safety in the storage vaults of RW repository and to reduce a potential threat to population, the safety should be upgraded – in accordance with CASSIOPEE recommendations - via building - over the closed vaults - a long-term cover as an additional barrier layer, of a thickness 5 m and having the following components:

- hydroisolation layer – preferably of clay (with maximal permeability $10^{(-9)}$ m/s), the minimal thickness - 0,5 m
- a draining layer – of gravel or sand
- a geotextile – to protect the drainage layer from plugging during the placement of the top layers
- an anti-intrusion layer (mainly of crushed rock) - as a topsoil layer, with rocks to provide erosion resistance.

As an optimal option of arrangement of this barrier layer will be its building simultaneously with the repository enlargement, because in this case the acquired soil as well as the ground being sunk from the foundation pit would be rationally used for construction of the long-term cover.

In order to improve radiation control system in the repository, it is planned (the terms – in Table IV):

- to set up radiation control gate for equipment and personnel,
- to establish control drills for monitoring of gamma background.

Table IV. Safety upgrade of RW management – terms

No.	Measures	Expenses	Execution time
1.	Long-term safety upgrades of the RW vaults	Total expenses: 150 000 Ls*	2005.-2006.
1.1.	Investigation of the RW vaults No.1-6 and their preparation for additional hermetization	Necessary additional financing – 40 000 Ls	
1.2	Covering of the RW vaults No. 1-6 with the additional hermetization layer	Necessary additional financing – 110 000 Ls	
2.	Upgrade of radiation control system in the RW repository	Total expenses: 76 000 Ls	2004.
2.1.	Setting up radiation control gate for equipment and personnel		
2.2.	Establishment of control drills for monitoring of gamma background		

* The average rate (in November 2003): 1 USD = 0,56 Ls

The construction of a long term storage and the geological disposal site

In compliance with the IAEA generic safety principles of RW management, in particular:

- the Principle 4 „Protection of future generation”,

- the Principle 5 „Burdens on future generation” („Radioactive waste should be managed in such a way that will not impose undue burdens on future generations”), and
- the Principle 9 „Safety of facilities”,

Latvia is planning to realize the minimization of impact and burden for future generations, via:

- a) institutional measures in the post-closure period of the repository
- b) considering the possibilities of a storage of long-lived RW in the geological site – the sole option which would minimize the risk in the distant future as well as would decrease the transferred responsibility for the safe management of RW.

Safe isolation of long-lived RW from the biosphere can be achieved by a storage in the geological disposal site only, since the near-surface repository has greater probability of unintentional destruction which may result in a harm to the environment and population [5, 6]. The near-surface repository demands the state supervision during whole period of dangerousness of RW that for long-lived isotopes constitutes much longer time than the existence of a state.

The disposal of long-lived RW in a geological repository:

- a) supports the interests of this as well as future generations by the use of the standards guaranteeing the minimum of risk today as well as in the distant future, simultaneously minimising the transferred responsibility for the safe management of RW;
- b) ensures fair satisfaction of the current interests of population by implementation of the newest scientific and technical solutions in the building of the repository and by consultations with all the interested parties throughout all phases of the repository building process.

As main strategic aims for solution of these problems Latvia is planning:

- a) To construct a long-term storage for disused sealed sources that must not be stored in near-surface repositories;
- b) To investigate potential possibilities for construction of geological repository in Latvia: to search for a site with the sufficient thickness of clay layer ~100 m deep underground, and – in case of detection of such a site - to do preliminary investigations of physical properties of such a clay layer and to conclude on the correspondence of the physical properties of this clay layer to the international recommendations for barrier layers around a geological repository.

In particular, there has been accepted the newly recommended strategy to build a dedicated long term storage for disused (spent) sealed sources – in the frame of the PHARE project “Design of additional waste disposal vault and integral storage facility for long-lived waste” (LE 01.09.01) as well as the EU project “Management of Spent Sealed Radioactive Sources in Bulgaria, Latvia, Lithuania, Romania and Slovakia”.

Besides enlargement of the existing repository, in the frame of the PHARE project 2001 Latvia is also developing - following the CASSIOPEE recommendations - a technical project for the long-term storage facility for the RW types being not suitable for near-surface disposal.

The detailed project drafts for the enlargement of the RW repository “Radons” and for the long-term storage have to be prepared in 2003. The tender for the 2001 PHARE project LE 01.09.01 will be organised by the Ministry of Environment (ME) according to CASSIOPEE recommendations.

After the receipt of the outline project design, the next tender is planned for the elaboration of the technical project and for actual construction of a new vault and the long-term storage space. The

construction is planned to be finished by 2005. Detailed terms (including financial) for construction of the long-term storage are shown in Table V:

Table V. The design terms of the long-term storage facility

No.	Measure	Expenses	Execution time
1.	Preparation of outlines for a detailed design plan of long-term storage	Have been allocated in the frame of PHARE project on Nuclear safety LE 01.09.01. ("Design of additional disposal vault and integral storage facility for long-lived waste") -	Till 2004
2.	Preparation of a technical design plan for RW vaults and their construction	Necessary additional financing – 300000 Ls	2005-2006

Detailed measures and provisions for the desirable forthcoming geological disposal of long-lived RW have been specified in the Cabinet Regulations No. 129 via formulating of updated waste acceptance criteria for geological disposal as well as by specifying requirements to long-term safety assesment for such disposal facility.

In compliance with aferomentioned IAEA generic safety principles of RW management, the feasibility studies for deep geological disposal option in the country is, first of all, a moral obligation – also because from the economic point of view, the total amount of long-lived waste is so small that there are no economic reasons for such disposal – if no such option has been envisaged.

The risks that RW management poses to population and environment; public perception

Negative public perception to RW management activities

RW management is linked to risks of radiological incidents and accidents, consequently, to the risk analysis and acceptance of the risk taking by population. The conclusions reached by the study on long term safety of Baldone RW repository - performed by the international consortium CASSIOPEE - show that there is comparatively small level of risk created by RW management. Despite of this, the public perception of these questions is negative or, at best, neutral.

Such a perception is felt to be a consequence of the period, when many questions related to the use of radioactive materials and depositing of RW were classified as those creating certain fear in a population and leading to a negative perception of these questions both from local governments and population. The other factor creating fear is the Chernobyl accident in 1986.

There is a lack of information on the risks in everyday life as well as comparison between risk levels from different dangers in the society of today. As a consequence of association between the risk from radiation and the nuclear accidents (the highly unlikely accidents with the major consequences), one tries to implement the concept of the null risk, i.e., a demand that any undesirable event must have a risk of occurrence near zero. This leads to negative perception of any activity that could possibly have any pessimistic consequences.

The current situation where some part of society enjoys benefits from the use of the ionising radiation sources and some part fears the risks created by the RW repository, leads to unjustified requirements in a dictate form. As the activities, posing certain risks to a certain part population (the local residents), are necessary for the society as a whole, there is a need to find some compromise between different parts of society, for example, by introducing some compensation mechanism for the risks that cannot be justified otherwise.

Compensation to municipality: the purpose and possible mechanisms

The altogether negative perception of any activities with RW seriously hinders the projecting of new storage places, enhancing the expenses and delaying the building of repository. Thus, the Baldone local government has demanded compensation for the very fact that the RW repository lies in its territory, for the consequences of fear that is raised in the population by the presence of the repository, and that is claimed to result in fewer investment in businesses and in decreased capability of competition on the food market.

However, there is no method as yet to determine the amount of compensation for the risk and no way to prove the economic effect of the fear at the moment. There is a hope that introduction of some compensation mechanism would stimulate more positive perception of activities performed with RW. For the opinion poll that needs to be conducted before public hearings for issuing the site licence for the new vault(s) and for the long-term storage facility of long-lived waste, as well as for those planned forthcoming activities being connected with probable construction of a geological disposal site, introduction of some efficient compensation mechanism could serve as a positive factor.

Nature resource tax for the import of radioactive substances is considered to be one of possible mechanisms in order to implement the principle "polluter pays", by raising funds for RW management in Latvia. The amount of such a tax has to be carefully justified, in order to make a minor impact on economic development, whilst stimulating re-export of radioactive materials and return of disused sources back to their producers.

Among the three options for the best possible solution of the problem "Compensations for municipality":

- 1) to introduce that Nature resource tax on RW disposal and all receipts are counted in the budget of Baldone municipality,
- 2) to perform annual payments from the State budget to a relevant local municipality for a possible endangerment caused by RW management, and
- 3) to foresee no direct or indirect payments, but essentially intensify explanation efforts as well as accomplish the total risk analysis –

as the result of analysis of these versions, the Cabinet accepted the option 2; the payment terms are illustrated in Table VI:

Table VI Compensation to Baldone municipality for the risk caused by RW management

No.	Measures	Necessary financing	Execution time
1.	Option 1		
1.1.	Burying of RW arising from dismantling and decommissioning of SRR	510 000 Ls	Till 2009
1.2.	Burying of annually arising RW (~ 3-5 m ³ /y, the volume to be buried – 2 times more)	7500 Ls/year 7500 Ls/y *6 y = 45000 Ls	
	In total:	~555 000 Ls	regularly
2.	Option 2 – accepted		
	Annual payment from the State budget to Baldone municipality for the risk caused by RW management	10000 Ls/y *6 y =60000 Ls	regularly
	In total:	60 000 Ls	2004.-2010.

Information, education of public and stakeholder involvement

The informing of Baldone population about the actual amount of RW in the repository would be two times a year (as a possible option) as well as in cases of the changes in radiological situation which could affect the population.

The awareness and consciousness of the society are important prerequisites to successful development and implementation of radiation safety policy. On the other hand, the efficacy of resolutions in the radiation safety directly depends on the level of professional knowledge, responsibility, and understanding of the situation. Hence, the education of population in field of radiation protection, by forming, in its turn, positive perception in society is, therefore, of utmost importance. The higher the level of such information and understanding, the larger and more efficient will be participation of society in the development of the radiation safety system and, correspondingly, the less fear for the risks involved in management of ionising radiation sources.

There is a direct relation between the efficacy of RW management and the quality of information. This is a reason for raising the requirement for a well developed information system supplying the necessary knowledge to decision makers as well as to general public. The sources of such an information flow are the science, the monitoring of the environment quality as well as the early warning system.

In order to improve the level of public knowledge and comprehension in the field of the safety of Baldone RW the repository, as well as to improve the level of the environment quality, it is foreseen to enter in the homepages of Radiation Safety Centre and of „RAPA” the early warning monitoring data including also those of the Baldone site.

Pertaining to assessment and observing of interests for central and local governments, as well as in order to facilitate the role of public consultations in RW management, Latvia have started in stakeholder involvement [7], in compliance with international recommendations on more intensive involvement of various institutions, companies and groups of public in decision making process and increasing of transparency of the implementation of radiation safety policy [8, 9]. In the RW management area, as the major stakeholders from the public part are non-governmental organisations, and mainly – local municipalities – because the benefits from the uses of radioactive materials are at the State level, but problems arise at a certain local site, and there could be also some economic losses, i.e., a non-received profit, less investments etc. due to the fact of proximity of RW disposal facilities.

Latvia has established certain legal requirements (via the Law on EIA, the Regulations on the EIA procedure and the Regulations on the Procedure of issuing of a Licence for Activities involving Ionising Radiation Sources and Procedure for Public Dispute on the Establishment of Ionising Radiation Facilities of State Significance or Essential Modifications thereto) on collection of opinions from major stakeholders as well as possible procedures in case if there is no chance to find solution acceptable for all relevant parties.

The competence level of the employees involved in RW management.

The main problems concerning the maintenance of the competence level by the personnel as well as the availability of human resources for RW management are the following:

- a) The work with RW is not prestigious, despite that it demands additional specific knowledge and experience to perform it adequately. As the main source of financing such work is the State budget, the level of wages is still too low in order to attract high-qualified resources.
- b) The scientific development is necessary to ensure not only a proper information flow but also appropriate education in the field of RW management. The number of studies on the radiation safety in Latvia is rather small. This might be mainly related to the limited and ever decreasing use of radioactive materials and nuclear energy in the country. As there is a small amount of ongoing theoretical and experimental studies in Latvia, and as the remaining specialists are still not widely involved directly in the studies conducted internationally, there is insufficient practical experience for conducting different safety related calculations or assessments.

This is the reason why the first long-term safety assessment was financed by the European Commission and performed by international consortium CASSIOPEE. The lack of education and scientific development in this field might lead to a situation where in a decade or two there will be insufficient amount of specialists of working age able to ensure the adequate control over the storage and disposal of RW.

Taking into account the above mentioned, Latvia should more actively support various international projects and disperse the results of such projects more widely. In addition, Latvia should support the participation of its specialists in international conferences and seminars, at least - as observers.

POSSIBLE CONSEQUENCES IN CASE OF MISSING SOLUTIONS OF AFORESAID PROBLEMS

1. In order to prevent potential harm to environment and to public health, it is necessary to dispose the RW arising from dismantling and decommissioning of Salaspils research reactor as soon as possible.
2. In case of missing safety upgrading measures of RW management, including construction of long-term storage facility for long-lived RW as well as safety upgrading of existing repository, RW would be stored in improper places (e.g., the places of their origin) which would be very dangerous and could increase an accident probability.
3. In case of missing start of feasibility studies of deep geological disposal in Latvia, there would be endangered the schedule of enlargement of existing repository, as in such a case the municipality and public will have no guaranties that the long-lived RW will be timely removed from the near-surface repository. Besides, in case of no information on actual possibilities to build in Latvia a geological repository, there would be no legal and ethical basis to ask for any international assistance in solution of this problem.

CONCLUSIONS

The implementation of the Concept of RW management ensures proper implementation of the requirements of following international documents:

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, 1997;
- The Vienna convention on the safe management of used nuclear fuel and radioactive waste;
- The Third principle of 1992-07 Declaration of the Rio de Janeiro Conference on the Environment and Development (the Rio Declaration);
- The Twenty-second part "Safe and Sustainable Development" of the Agenda 21 of the 1992-07 Rio de Janeiro Conference on the Environment and Development;
- The Fourth Convention signed 1989-12-15 by the countries of EEU, Caribbean and Pacific countries, and African countries in Loma;
- The Code of cross-border trafficking of radioactive waste developed by IAEA in 1995;
- The 1972-12-29 London Convention on prohibition of burial of radioactive waste in the seas or oceans;
- The 1971-02-11 Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-Bed and Ocean Floor and in the Subsoil Thereof;
- The 1991-02-25 Espoo Convention on the environmental impact assessment in the international context.

Restriction and minimization of impacts on future generations is foreseen by the Concept of RW management by considering, in particular, possibilities of storage of long lived waste in the deep geological disposal only, which would minimize the risk in the distant future as well as decrease the transferred responsibility for the safe management of RW.

The developed conceptual solutions of the identified problems of RW management in Latvia, being characterized as of a local-country origin, nevertheless – after their proper generalization and elaboration – could be considered also as relatively generic issues having a more wider – i.e., regional – significance, and might be used not only as guidelines for advanced RW management practices in the given country, but also for countries with rather similar situation in the area of basic problems of RW management, as well as for performing exchange of information and experiences in RW management.

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FOOTNOTES

- ¹ The Contract B7-0320/2000/166079/MAR/C2 has been signed in april 2002 by European Commission and CASSIOPEE consortium under the title “The long-term safety analysis of Baldone radioactive waste repository and the definition of criteria for the acceptance of radioactive waste in the repository”. This Contract accepted the results of assessment performed in RW repository by a consortium of six EU countries