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DELIVERABLE 1

ASSESSMENT OF THE PRESENT SITUATION OF RESEARCH IN RADIOECOLOGY IN EUROPE

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FUTURAE

The objective of the FUTURAE project is to evaluate the potential for establishing deeper and sustainable collaboration in radioecology in Europe possibly in the form of Network(s) of Excellence.

The project started in October 2006 and is to end by September 2008.

Project Coordinator: Institute for Radiological Protection and Nuclear Safety

Contractors:

Institute for Radiological Protection and Nuclear Safety	IRSN
Swedish Radiation Protection Authority	SSI
Centre of Ecology and Hydrology	NERC
Belgian Nuclear research Centre	SCK•CEN
Research Centre in Energy, Environment and Technology	CIEMAT
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Executive summary

The maintenance of radioecological competence for assessment of the impact of radionuclides on man and the environment requires qualified personnel, competence in a variety of scientific areas, specialist technical resources, tools and infrastructure. There are concerns that future expertise is at risk

The objective of Work Package 1 (WP1) is to assess the current levels of research capacity, human resources, infrastructure, research programmes and funding of radioecology in Europe. To achieve this, we analysed responses to a targeted questionnaire sent to research groups, government authorities, consultants and industry who are known to have been engaged in radioecological research either directly or through supportive funding. In this report the results of the questionnaire are presented and analysed.

Radioecology in the context of this project is defined as a branch of environmental sciences devoted to a specific category of stressors *i.e.* natural and artificial radioactive substances, including key characteristics some of which are similar to other groups of pollutants, particularly metals (*e.g.*, transport, fate, speciation, bioavailability, biological effects at various organisational levels) and others which are specific to radionuclides (*e.g.*, external irradiation pathway, radiation dosimetry, decay products). Under this project, we consider these issues for all types of sources of radioactivity: routine and accidental releases, deep and surface disposed waste, areas of high natural radioactivity and environmental contamination/waste products linked with NORM industry, radiation dispersive devices, radiological attacks, etc.

In total, 354 questionnaires were sent out and 89 completed questionnaires were returned. Except for Cyprus, Luxembourg and Malta, at least one reply for each EC country was received. We received additional replies from non-EC countries including Switzerland and Norway. Most replies were obtained from universities (44), followed by research institutes (28), government authorities (12) and consultancies (5).

The number of personnel working in radioecology per organisation ranges from one to as many as 142. 33 % of the organisations have 5 or fewer people working in radioecology and about 25 % between 6 and 10 people. In total, 845 permanent staff members and 101 temporary staff members are involved in radioecological research in Europe at the responding organisations. The present radioecological situation in Europe hence seems unbalanced, with a few organisations holding real radioecology laboratories with significant teams and many small groups, usually university-based, characterised by one or a few researchers.

More than 50 % of the responding organisations have an annual budget allocated to radioecology smaller than 0.1 MEuros. Most universities fall in this category. About 25 % of the organisations have a budget between 0.1-0.5 MEuros. Only 3 organisations have an annual budget exceeding 1 MEuros. More money is allocated to radioecology in the countries with a nuclear power programme.

The source of funding for research and modelling activities in radioecology is almost equally shared between government authorities, organisation's own funds and national research funds. Monitoring is 56 % financed by government assignments, 20 % by organisation's own funds and 14 % by industry. Of the total amount of funding for radioecology, only 2-13 % is carried out through international public funding.

Overall, there seems to be a good coverage of different research disciplines by the organisations: about 60 organisations conduct studies on transfer processes in the

environment and 58 also studies other contaminants, mostly heavy metals (46). Field or laboratory studies related with site remediation issues are conducted by 42 organisations. 23 organisations perform studies on radiation effects on the environment and 16 more have the potential to do.

Terrestrial and freshwater ecosystems are mostly covered. Fewer organisations study marine, estuarine and 'urban' ecosystems. Plants are the most studied organism followed by mammals, fish, fungi, lichens and bryophytes, invertebrates and micro-organisms. Only a few groups study birds, amphibians and reptiles.

Slightly more organisations perform gamma radiation exposure studies (28), than alpha and beta exposure studies. External exposure experiments are performed at 18 organisations and 16 organisations perform internal exposure experiments. Terrestrial ecosystems are mostly studied, followed by freshwater and marine ecosystems. Plants, invertebrates and mammals are equally frequently studied, followed by micro-organisms, lichens and bryophytes and fish. Birds and amphibians are hardly studied and amphibians are not studied.

There are a number of organisations developing (44) and using models (59). Soil models (migration) are the most frequently used/developed by the organisations, followed by agricultural and freshwater models and marine and forest/seminatural models. Models used for remediation, for modelling in the geosphere and in urban environments are developed/used by a smaller number of organisations. Most models are used for transfer processes, routine discharges and accidental releases.

Organisations registered 581 projects/research programmes they were involved in during the last 5 years of which 50 % are national projects. The projects are mostly focused on radionuclides present in the environment (NORM, fallout, historical contamination), followed by accidental and routine discharges.

More than 80 % of the responding universities and between 50 and 60 % of the responding research institutes and government authorities provide training in radioecology.

Most organisations (68 %) think the staff in radioecology will remain constant and 17 % assume staff number will increase. A rather similar picture is given with respect to funding of radioecology. More optimistic were the organisations' views on the evolution of radioecology in general and for their organisation in particular: 57 % replied radioecology would increase, 35 % it would remain constant and 8 % replied radioecology would decline. The perspectives for the future of infrastructure and education are very similar: Activities which were expected to increase most according to organisations from nuclear countries were related with radiation dispersive devices and radiological attacks, multiple pollution, NORM, effect of radiation on the environment and waste disposal. For non-nuclear countries multiple pollution, waste disposal, site and environmental remediation and radiation dispersive devices and radiological attacks were the domains in radioecology where most increase was expected.

Whether the number of scientific staff in radioecology, the scientific competence and areas of competence, the level of collaboration, the available infrastructure and education, are sufficient to maintain competence and accommodate specific needs in radioecology will be subject of Work Package 3 which will compare the requirements for radioecological research (WP2) with the current/future competence and facilities (WP1).

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1 Introduction

1.1 State of the art

The maintenance and enhancement of radioecological competence for assessment of the impact of radionuclides on man and the environment, requires qualified personnel, competence in a variety of scientific areas, specific technical resources, tools and infrastructure. For the broader area of nuclear fission and radiation protection, several international organisations have expressed their concern about current and future availability of appropriate expertise (*e.g.*, EURATOM, 2001; GRS, 2003; OECD/NEA, 2000).

Our assessment focuses on the current levels of research capacity, human resources, infrastructure and funding of radioecology in Europe.

Radioecology in the context of this project was defined as a branch of environmental sciences devoted to a specific category of stressors *i.e.* natural and artificial radioactive substances, including key characteristics some of which are similar to other groups of pollutants (*e.g.*, transport, fate, speciation, bioavailability, biological effects at various organisational levels) and others which are specific to radionuclides (*e.g.*, external irradiation pathway, radiation dosimetry, decay products). Under this project, we consider these issues for all sources of radioactivity: routine and accidental releases, deep and surface disposed waste, areas of high natural radioactivity and environmental contamination/waste products linked with NORM industry, radiation dispersive devices, radiological attacks, etc...

1.2 Objectives and connection with other Work Packages

The objective of Work Package 1 (WP1) is to assess the current levels of research capacity, human resources, infrastructure, research programmes and funding of radioecology in Europe.

Mapping of the existing competence, resources and funding were based on analysis of the inputs to a targeted questionnaire sent to research groups, universities, government authorities, consultants and industry engaged in radiological research.

The radioecological capacity will be compared with the identified needs (WP2) under WP3. The output from this consultation will help to identify the major current players in radioecology (WP4) to determine the feasibility/requirement for a Network of Excellence in radioecology under the EC EURATOM 7th Framework Programme.

1.3 Approach

The approach used to generate the questionnaire and prepare this report was conducted as follows. A draft questionnaire was discussed at the first coordination meeting and a final targeted questionnaire (Annex 1.1) was prepared to collate information on 5 issues: general information on organisations, current scientific competence, research programmes the organisations are/were involved in, the available infrastructure and status of training. Five groups of organisations were defined: research institutes, universities, government authorities, consultancies and industries.

Consortium partners were assigned geographical regions for responsibility and were requested to prepare lists of organisations (potentially still) active in radioecology to which the questionnaire together with an introductory letter was sent (November 2006). The aim was to collect a data set for each EU country. Respondents were given 2 months to reply.

In total 67 completed questionnaires were initially received. Available information was analysed and presented at the first WP1 meeting organised by SCK•CEN, Mol, Belgium from 13-14 March 2007. Since the regional distribution was not optimal and some important organisations had not yet returned the questionnaire, a shortened version of the questionnaire was prepared (Annex 1.2) which was sent to non-repliers together with an adjusted introductory letter.

In total, we received 75 comprehensive and 14 shortened questionnaires.

2 Report structure

The report represents the findings of this questionnaire. The report is divided into two sections. The first section is concerned with overall analysis of the questionnaires considering all entries, by organisation type, and by nuclear or non-nuclear countries. It then discusses the results and highlights the main findings. The second part of the report (Annexes) provides supporting information (Annex 1) and lists specific information obtained from the questionnaire respondents (Annexes 2-5).

3 Questionnaire-related issues

3.1 Structure of questionnaire

As mentioned above, the questionnaire was structured around 5 areas:

General information on the organisations

Information was collated on organisation type, total manpower and manpower active in radioecology, on experimental and non-experimental activities and expected changes with time, on the extent of funding and its source for radioecology related activities and expected changes in time. Information was also requested on organisations' willingness to collaborate in a future Network of Excellence or any other mechanisms to enhance and maintain (collaboration in) radioecological research.

Current scientific competence

Information was requested on research areas, experimental and non experimental (modelling, monitoring, analysis) activities or competences, scientific output and research perspectives.

Research programmes

Information was requested on involvement in research programmes and the research programmes themselves; the geographical scope, the nature of the co-operation, the main issues dealt with under the project, and funding issues.

Infrastructure

We gathered information on radioanalytical facilities and other relevant equipment and on laboratory experimental facilities.

Training

Organisations were requested to provide information on training provided (courses, master and PhD theses) and the extent of these activities in radioecology and also the expected changes with time.

3.2 Response to questionnaires

Five different groups of organisations were sent the questionnaires: research institutes, universities, government authorities, consultants and industries. Organisations to be sent questionnaires were identified by a number of mechanisms *i.e.* membership of individuals of the IUR; relevant institutes invited to participate in the Radiation Protection questionnaire launched by GRS (2003); relevant institutes interrogated by EURAC; personal contacts of the consortium, conference attendee lists (in some instances multiple contacts in a given institution were targeted).

Number of respondents for different organisation categories both for nuclear and non nuclear countries

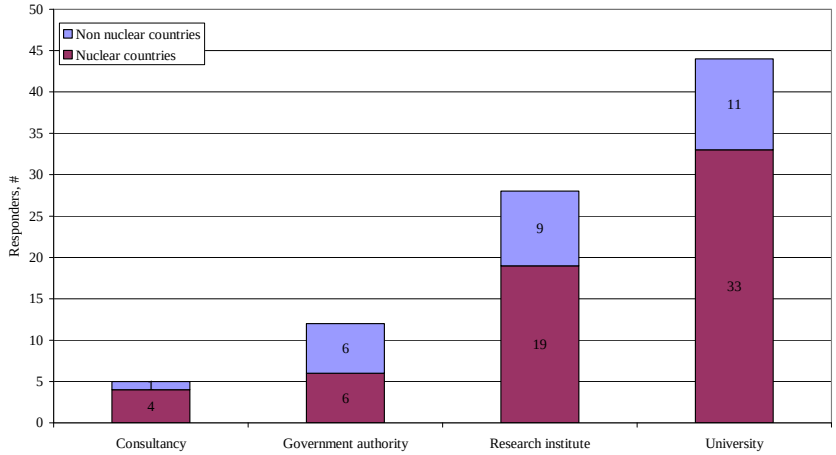


Figure 1: Number of respondents per country (top); number of respondents for the different organisation categories both for nuclear and non-nuclear countries (bottom).

In total, 354 questionnaires were sent out. Seventy five long and 14 short questionnaires were completed (Figure 1). Except for Cyprus, Luxembourg and Malta, at least one reply for each EC country was received. We received replies from the non-EC countries Switzerland,

Norway and Faroe Islands. Most replies were obtained from the United Kingdom, Spain, Germany and Sweden. Most replies were obtained from Universities followed by Research institutes, Government authorities and consultancies (Figure 1). There were more replies from countries with power generating nuclear facilities [1]. Not all respondent completed all aspects of the questionnaire

3.3 Data treatment

When several questionnaires were received from different research groups from a single organisation, these questionnaires were merged to just one response.

Most of the questions in the questionnaire were tick-boxes or boxes with a select option. Only these questions are specifically treated in this report. There were also some free-fill-in-text boxes, to provide information such as radionuclides and bio-indicators studied. Few of the latter were filled in and their content is not discussed here.

In the main body of the text of this report the general findings are presented. No correlation analysis was performed but, for some questions, answers were presented subdivided for the different organisation types, or for nuclear (NC) and non-nuclear countries (Non NC).

Institute specific answers are generally presented in the annexes but specific institutes' names are not given to preserve the promised non attribution. Instead, a code is given consisting of a letter (C: Consultancies; GA: Government authorities; I: Industry; RI: Research institutes; U: Universities) and a number.

3.4 Quality assessment and quality control

Most questionnaire inputs were checked for consistency and correctness. Some key parameters were given special attention: organisation type, budget allocated to radioecology, number of personnel working in radioecology, number of publications related to radioecology. If input to these issues was not provided, the respondents were recontacted and asked to provide this information (at least twice).

Where required, inputs were adjusted, if there were doubts about questionnaire inputs, we contacted the authors and discussed the answers and then modified the input accordingly. For example, if an organisation reported very high scientific output scores in radioecology, and if the scientific output file was available to the consortium, we compared the numbers given with the list, and modified the number to include only those outputs which we considered to be specifically in the area of radioecology.

[1] EC-Countries that have NPPs: Belgium, the Czech Republic, Germany, Spain, France, Lithuania, Hungary, the Netherlands, Slovenia, Slovakia, Finland, Sweden, the United Kingdom, Bulgaria and Romania.
Countries that do not have NPPs: Denmark, Estonia, Greece, Ireland, Italy, Austria, Poland, Portugal, Latvia, Cyprus, Luxembourg, Malta.
Non EC countries: Norway, Switzerland, and the Faroe Islands (shown separately from Denmark in the data analysis)

4 Questionnaire results

4.1 Organisation details

4.1.1 Personnel in radioecology

The number of personnel working in radioecology per organisation ranges from one to as many as 142. Of the replying organisations (70) about 30 organisations have up to 5 staff members in radioecology, 16 between 6 and 10, 22 between 11 and 20 and only 2 have more than 50 staff members in radioecology (Figure 2). Universities have generally a very small number of staff working in radioecology. The present radioecological situation in Europe seems unbalanced, with a few organisations holding real radioecology laboratories with significant teams and many small groups, usually university-based, characterised by one or a few researchers.

For the responding organisations, in total 845 permanent staff members and 101 temporary staff members are involved in radioecological research in Europe. A total of 845 permanent staff members is surprisingly high. Possibly the numbers entered are not full-time positions. On the other hand, there are also some large research institutes who did not enterred the numbers of staff working in domain of radioecology.

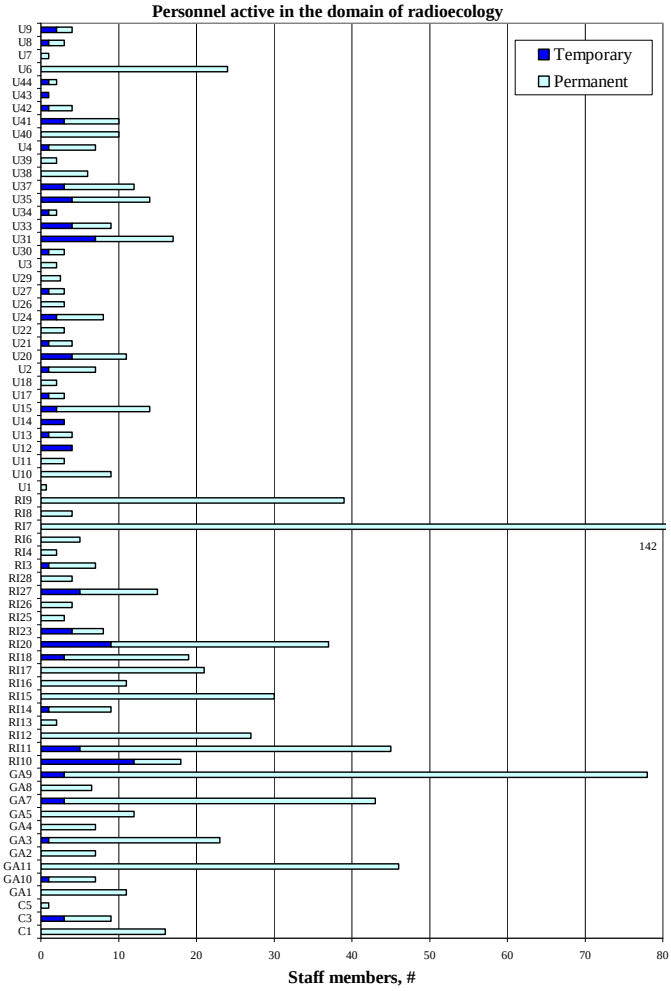


Figure 2: Number of permanent and temporary personnel working in radioecology

Figure 3 shows the repartitioning of personnel between different activities. Overall, only 40 % of personnel are involved in research and more than 40 % are active both in analysis and monitoring. This repartitioning is not the same for all organisation types (Table 1). About 50 % of university personnel is involved in research followed by analysis activities. In research institutes about equal percentages (~30 %) are involved in research and analysis. The majority of radioecology personnel at government agencies (70 %) are involved in monitoring and analysis. The results for consultancies should be considered with care (85 %were involved in research and modelling) since only 3 consultancy offices replied to this question.

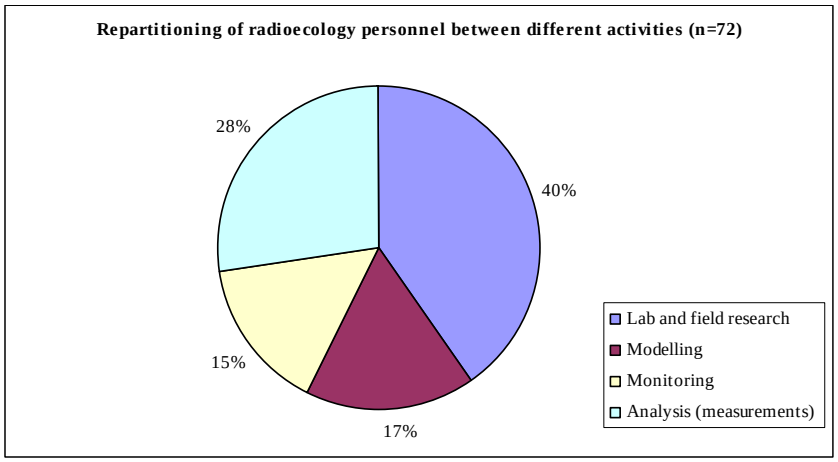


Figure 3: Overall repartitioning of radioecology personnel (permanent+temporary) between different activities

Table 1: Partitioning of radioecology personnel (permanent+temporary) between different activities and different organisation types (presented as a percentage of replies by organisation type). N= Number of respondents.

	Research	Modelling	Monitoring	Analysis	N
Research institutes	35	14	20	31	22
Universities	48	19	10	23	37
Government authorities	18	12	28	41	10
Consultancies	48	38	8	6	3

4.1.2 Annual budget allocated to radioecology

The annual budget allocated to radioecology was smaller than 0.1 MEuros for 34 out of 62 organisations who supplied this information. Most universities fall in this range. For 14 of the responding organisations the budget ranged between 0.1 and 0.5 MEuros. Ten organisations have budgets between 0.5-1 MEuros. Only 3 organisations have a budget for radioecology exceeding 1 MEuros. Clearly more money is allocated to radioecology in the nuclear countries. For the non-nuclear countries the maximum budget allocated to radioecology per institute ranges from 0.5-1 MEuros.

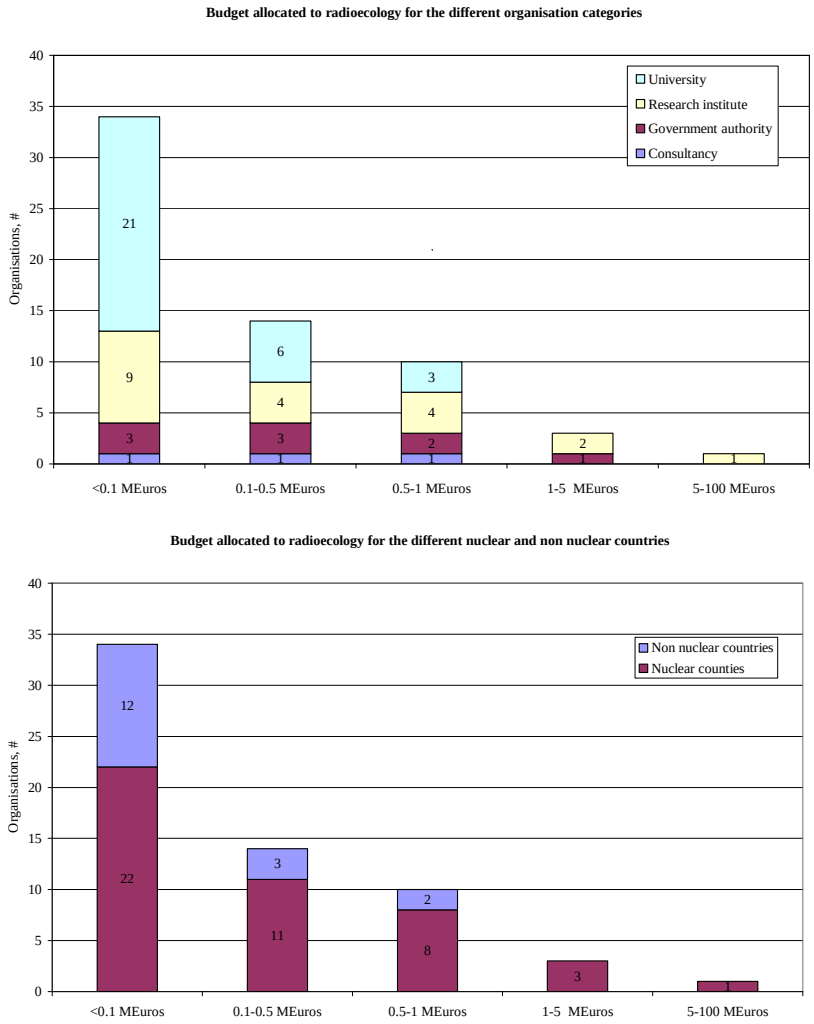


Figure 4: Budget allocated to radioecology for the different organisation types (top), in nuclear and non-nuclear countries (bottom).

Research in radioecology is mostly financed by government authorities (32 %), then by organisations themselves (25 % - although part of the organisation funds may themselves come from the government) and national research funds (21 %). The budget for modelling activities in radioecology comes equally (25% each) from organisations own funds, national research funds and government. Monitoring is 56 % financed by government assignments, followed by organisations own funds (20 %) and industry (14%). Only 2-13 % by organisation type is obtained through international public funding (e.g. EU, IAEA) (Figure 5). Organisation specific information can be found in Annex A2.1.

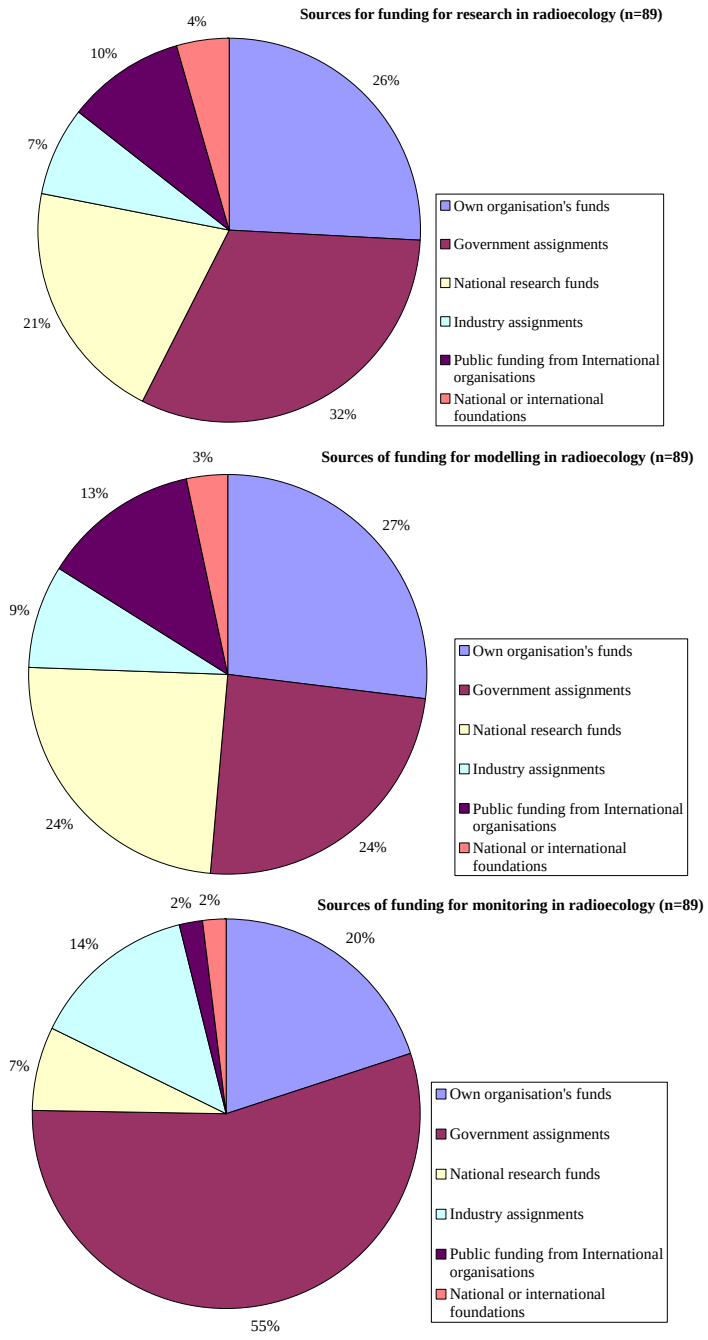


Figure 5: Source of funding for research (top), modelling (middle) and monitoring (bottom) in radioecology

4.1.3 Outlook for radioecology

Organisations were asked about their view on the likely changes with time in both the number of personnel working in radioecology and financing in radioecology and related fields in the next decade. Most organisations (68 %) think that staff working in radioecology will remain constant; 15% think staff numbers will increase and 15% that it will decrease (Figure 6). Of the responding research institutes, a higher percentage think that staff will decrease (24 %) whereas at universities only 7 % of the respondents presume staff numbers active in radioecology will decline. About 20 % of respondents from non-nuclear countries assume

radioecological staff will either decrease or increase and for nuclear countries this is about 15 % (Table 2).

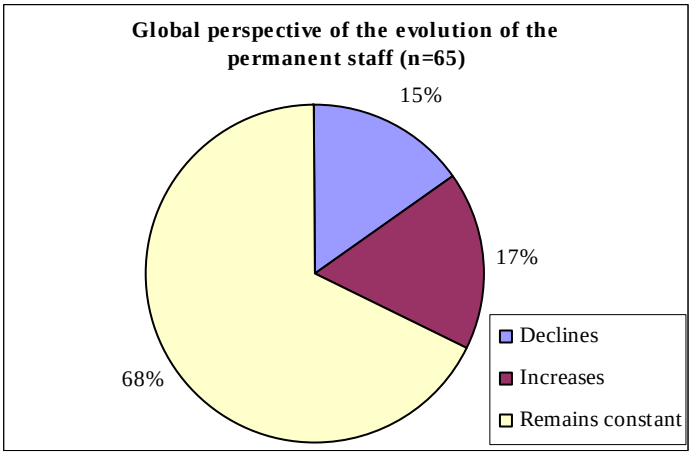


Figure 6: Expected changes with time in staff numbers working in radioecology considering all respondents

Table 2: Expected changes with time ((presented as a percentage of replies by category) in staff numbers working in radioecology considering respondents from research institutes and universities or from nuclear and non-nuclear countries. N=number of respondents.

	Increase	Constant	Decline	N
Research institutes	14	62	24	21
Universities	17	76	7	30
Government authorities	18	64	18	11
Consultancies	33	33	33	3
Nuclear Countries	15	72	13	46
Non Nuclear countries	21	58	21	19

About 50 % of the organisations that sent in a questionnaire replied to the question of the perspectives of financing through different sources for research in radioecology and about 30 % on perspectives of financing for modelling and monitoring in radioecology. Except for consultancies (but here only three replies) all organisation types expected a similar trend (constant), also government authorities who can also be viewed as funding entity.

Most of the respondents assumed that financing from the different sources would remain constant. About 20 % of replying organisations think that funding from a particular source will increase or decrease, respectively (Figure 7). About 20 % of the organisations replying expected financing by their own organisation funds to increase. Given the importance of ‘own organisantion's funds’ in financing radioecology seems to partially contradict the overall optimistic view which can be inferred from the questionnaire replies.

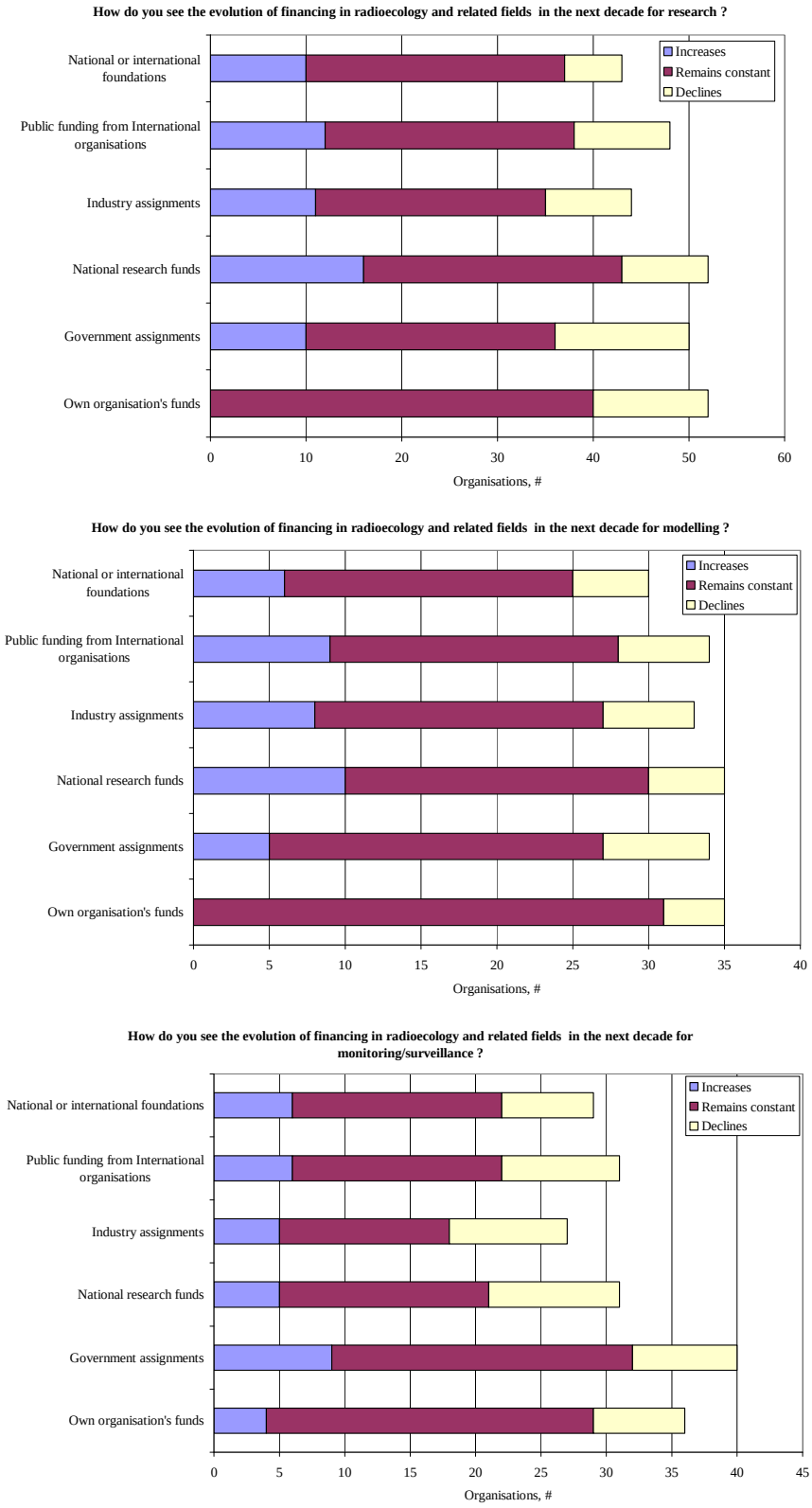


Figure 7: Expected changes with time in funding for research (top), modelling (middle) and monitoring (bottom) in radioecology

Organisation specific information on issues treated above can be found in Annex 2.1.

4.2 Scientific competence

4.2.1 Major competences in radioecology

Overall, 71 organisations replied they carried out field and laboratory experiments, 63 were involved in monitoring and 48 in modelling. Organisations were questioned about their major activities in radioecology. Universities were relatively more involved in field and laboratory research and least in monitoring. For research institutes, the distribution of activities between the three areas was similar (Figure 8).

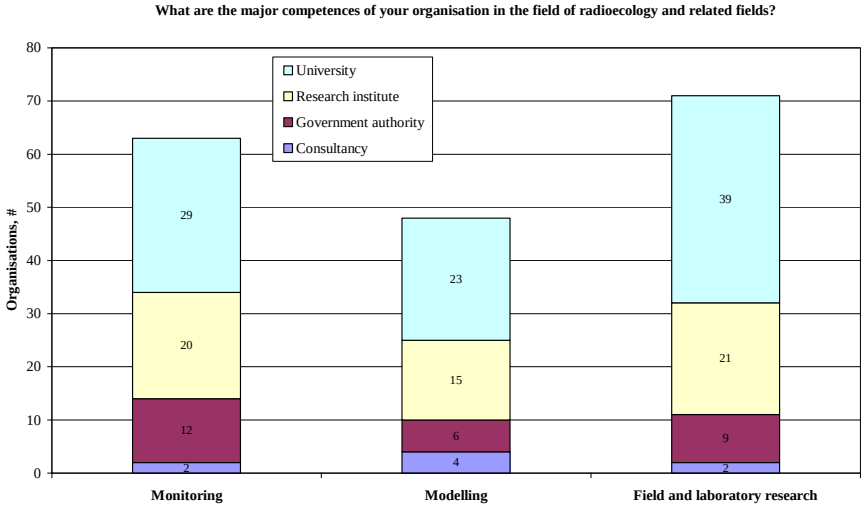


Figure 8: Major competences in radioecology for different organisations.

4.2.2 General questions on research activities

An almost equal number of organisations conduct studies on transfer processes in the environment or on other contaminants. Almost all of the research institutes who sent in a questionnaire (24) were involved in both of these studies. Field or laboratory studies related to site remediation issues are conducted by 41 organisations. Twenty three organisations perform studies on radiation effects on the environment and 16 more have the potential to do so (Figure 9).

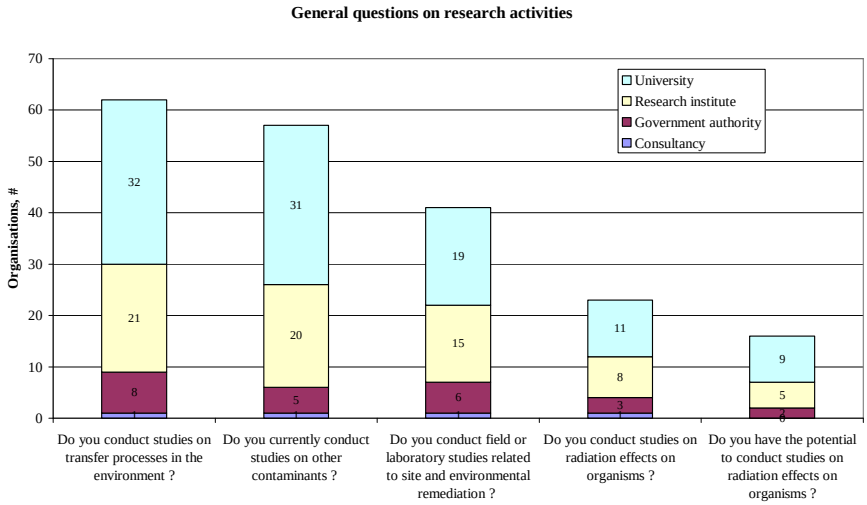


Figure 9: Major activities in radioecology of different organisations.

4.2.3 Ecosystems studied

Most organisations perform research for terrestrial and freshwater ecosystems. Fewer organisations study marine ecosystems, 'urban' areas and estuaries. Universities and research institutes focus on the first two ecosystem types. A comparable number of research institutes, universities and government authorities/consultancies are involved in the latter three categories. Partitioning between the different ecosystems is similar for environmental transfer studies as for research in radioecology in general (Figure 10).

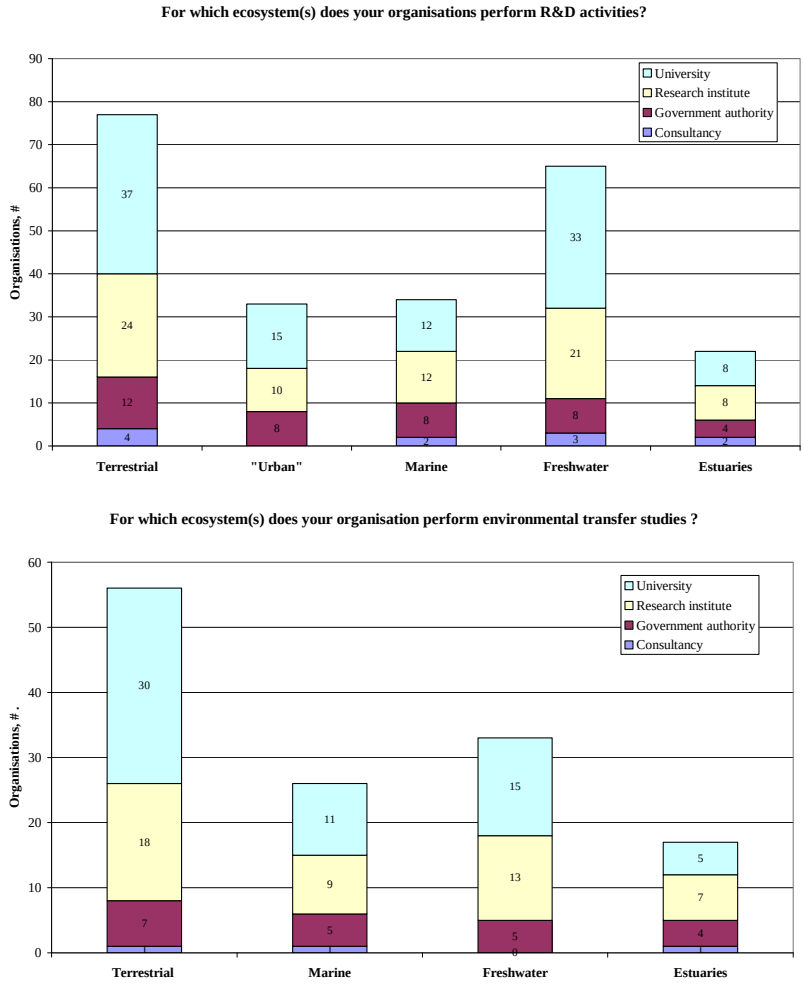


Figure 10: Number of organisations conducting research for specific ecosystems (top) and number of organisations conducting environmental transfer studies for specific ecosystems (bottom).

Most organisations conduct environmental transfer studies on plants (52), followed by mammals, fish, fungi, lichens and bryophytes (about 27), invertebrates (19) and micro-organisms (17). Few groups study birds, amphibians and reptiles (Figure 11). All organisms groups are studied both by universities and research institutes.

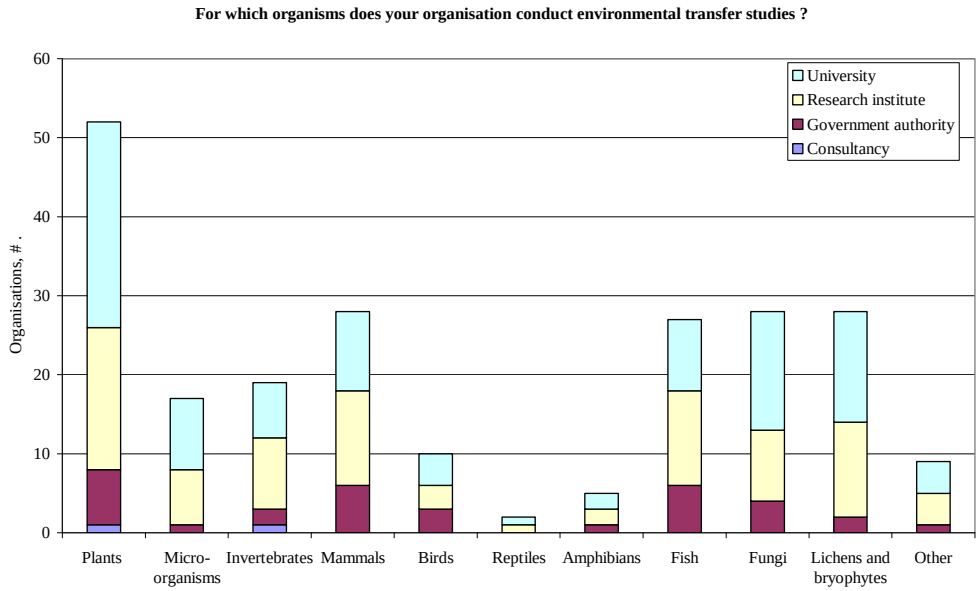


Figure 11: Number of organisations conducting environmental transfer studies for selected organisms.

Organisation specific information on ecosystems and organisms studied can be found in Annex 3.1a-b.

4.2.4 Radiation studies

Slightly more organisations perform gamma irradiation studies, than alpha and beta irradiation studies. About 10 research institutes and universities are capable of performing all three radiation types. Radiation studies are rarely performed at government authorities or consultancies.

External and internal exposure experiments are performed at 19 and 16 organisations respectively (Figure 12).

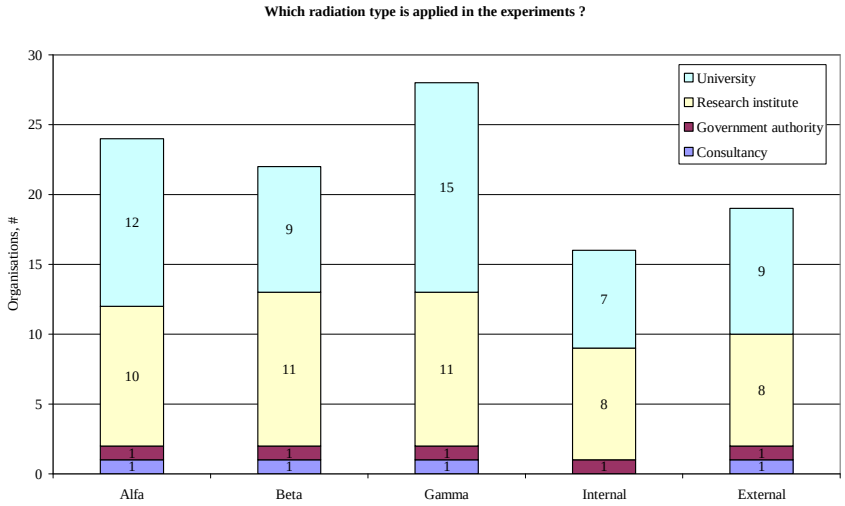


Figure 12: Number of different organisations performing alpha, beta and gamma radiation and internal or external radiation studies.

Far fewer organisations perform radiation effects studies than environmental transfer studies (10 to 40 less depending on ecosystem type studied).

As for the environmental transfer studies, radiation effects are most often studied in terrestrial ecosystems. Almost the same number of organisations performs laboratory and field experiments for terrestrial ecosystems. For freshwater and marine ecosystems and estuaries, more organisations perform field studies than laboratory studies (Figure 13). In Norway both laboratory and field radiation effects studies are performed in all ecosystems types considered. This is also the case for the UK with the exception of laboratory research on estuarine ecosystems. Only three countries carry out laboratory experiments for marine ecosystems (France, Norway, UK).

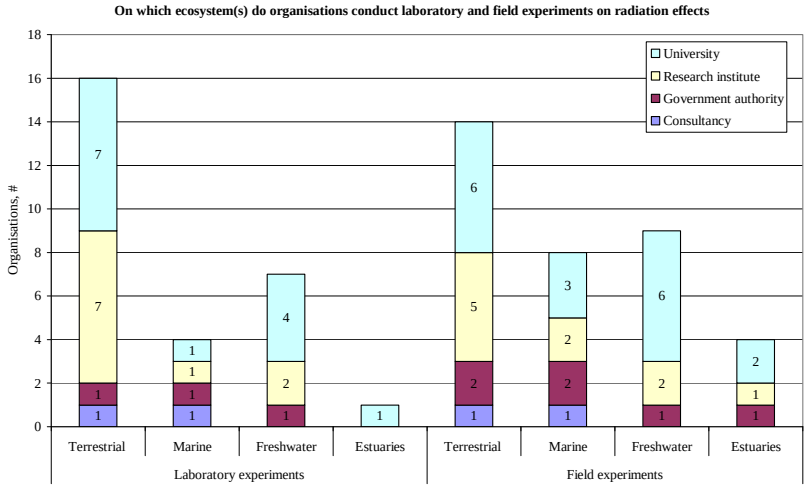


Figure 13: Number of different organisations performing radiation experiments at laboratory or field scale in terrestrial, marine and freshwater ecosystems and estuaries.

The distribution of organism type studied in irradiation experiments is different than that for the environmental transfer studies. Plants, invertebrates and mammals are equally frequently studied, followed by micro-organisms, lichens and bryophytes and fish. Birds and amphibians are only studied by one institute and amphibians are not studied by any responding organisation. Generally, radiation effects are more frequently studied under laboratory than under field conditions except for lichens and bryophytes, fish and fungi (Figure 14).

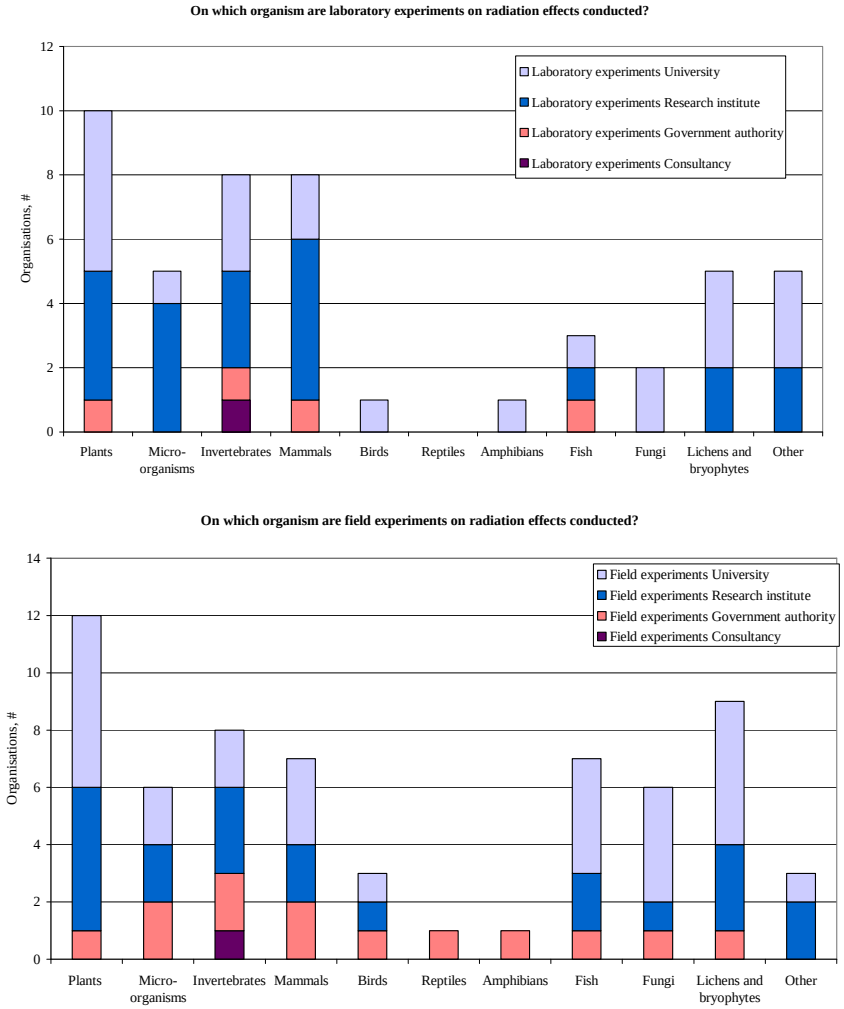


Figure 14: Number of organisations performing radiation experiments at laboratory (top) or field scale (bottom) for specific organism groups.

Organisation specific information on radiation experiments and organisms studied can be found in Annex 3.2.

4.2.5 Other contaminants studied

Forty six of the responding organisations also study heavy metals, most frequently in universities (26) followed by research institutes (16). Pesticides are studied by 21 organisations, followed by polyaromatic hydrocarbons (PAH), polychlorinated biphenyls (PCB) and dioxins (Figure 15).

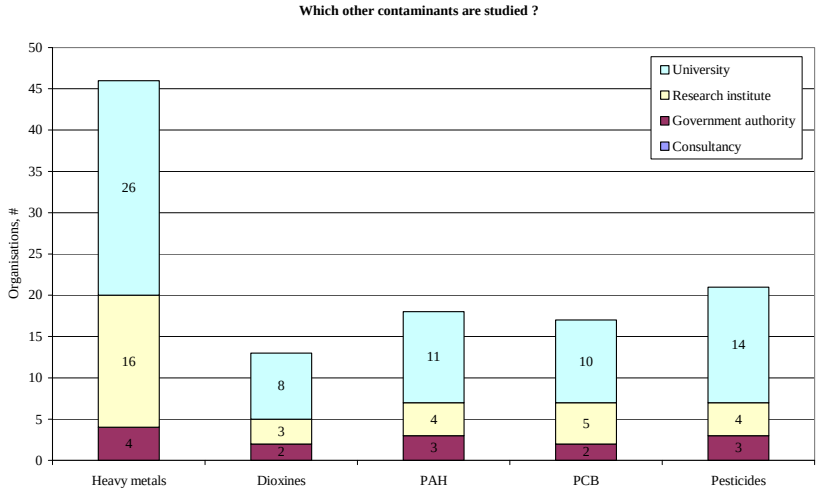


Figure 15: Number of organisations performing studies on contaminants other than radionuclides.

Thirty organisations of which 50% were universities stated that they have the capacity to conduct multiple stressor studies (Figure 16).

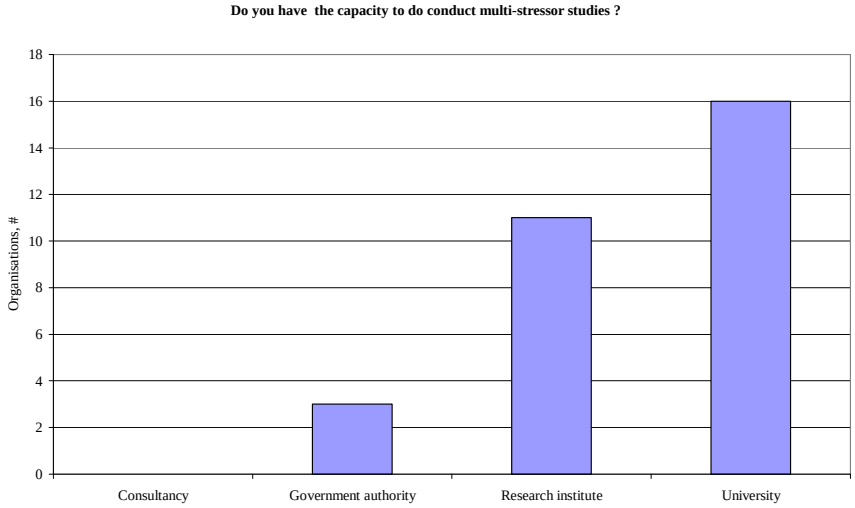


Figure 16: Number of organisations with the capacity to conduct multiple stressors studies

Organisation specific information on other contaminants studied can be found in Annex 3.3.

4.2.6 Experience and use of radioecological models

Of the responding organisations, 44 replied they develop radioecological models and 59 said they use these models (Figure 17).

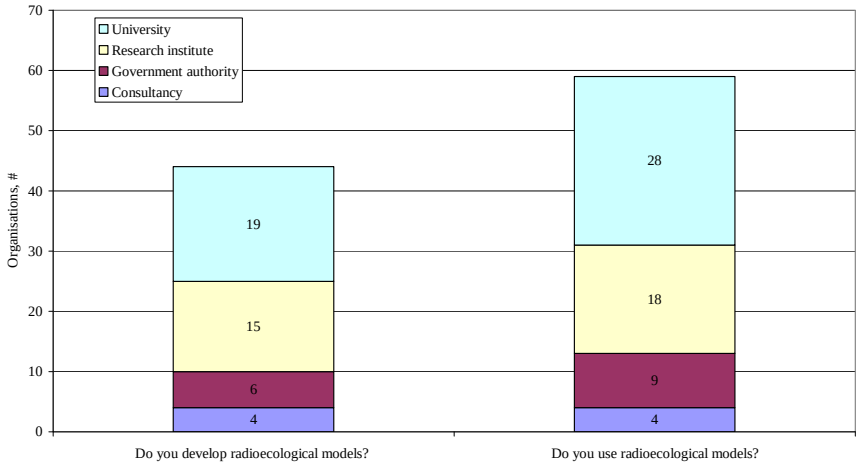


Figure 17: Development and use of radioecological models by the responding organisations.

Soil migration models are the most frequently used/developed by the respondents, followed by agricultural and freshwater models, and atmospheric, marine and forest/seminatural models. Models used for remediation purposes, for modelling in the geosphere and in urban environments are developed/used by fewer institutes (Figure 18).

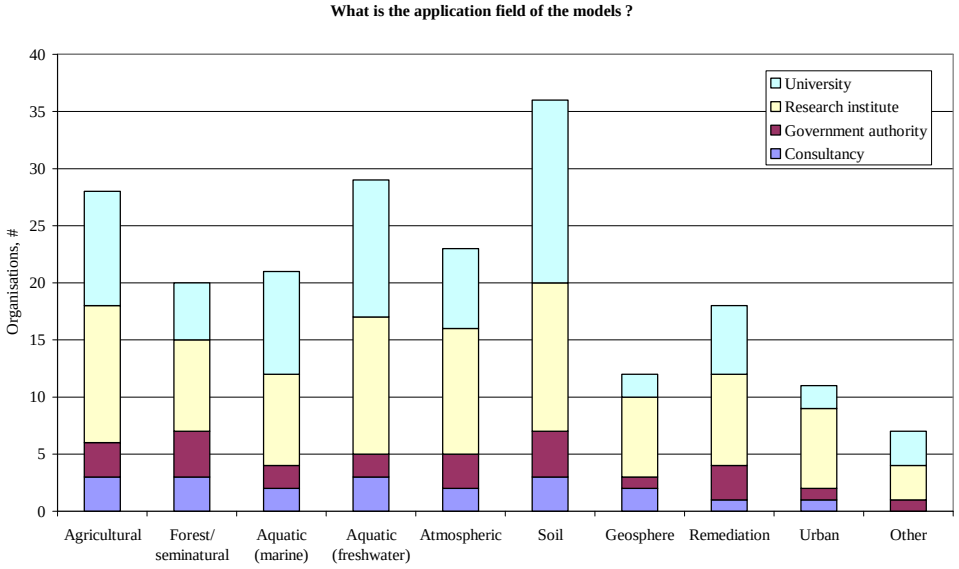


Figure 18: Number of organisations using or developing models for specific application fields.

Slightly more organisations use/develop models for transfer processes, routine discharges and accidental releases than for ecological and human risk assessment. Yet it is understood that models for transfer processes and the accidental/routine discharge models are used for either human or ecological assessment. Research institutes are more actively using/developing models than other organisation types (Figure 19).

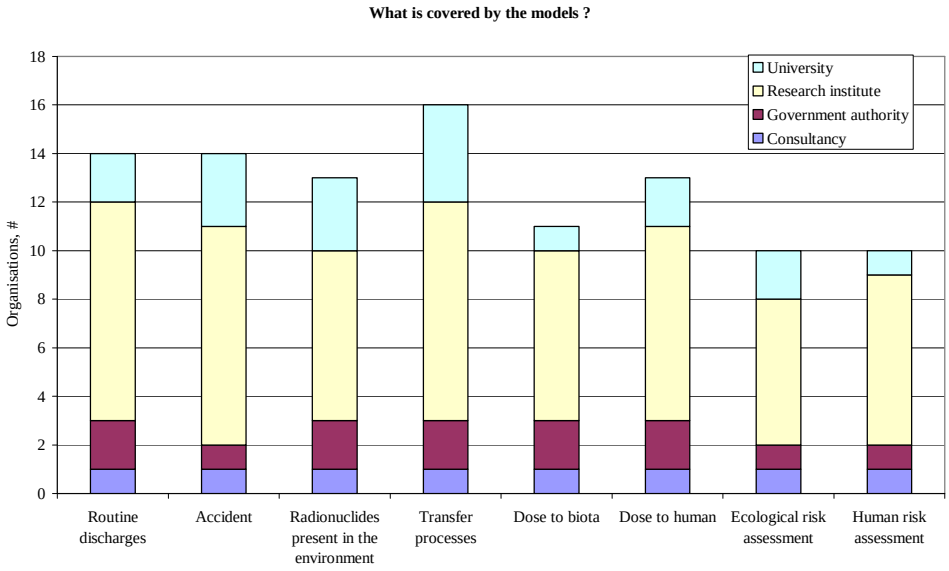


Figure 19: Number of organisations using or developing models with a specific coverage

Organisation specific information on model application field and coverage can be found in Annex 3.4a-b.

4.2.7 Publications

The organisations were requested to provide information on the number of scientific outputs in radioecology over the last 5 years (2002-2006). Scientific output was subdivided into publications in journals, conference proceedings, reports, books, contribution to books, PhD theses and master theses of which respectively 1586, 1766, 725, 41, 127, 188 and 282 were recorded.

Organisations were also asked to send in a reference list for radioecology publications for 2002-2006. Some organisations provided a list with publications of their full institute output which was not limited to radioecology. References were selected which were in the area of radioecology from these lists and only these were considered for the evaluation.

Figure 20 gives the number of publications in peer reviewed journals and number of PhD thesis in radioecology for the institutes who replied. From this figure it is clear that some organisations are highly active in radioecology.

For more detailed information on the total scientific output, the reader is referred to Annex A3.5.

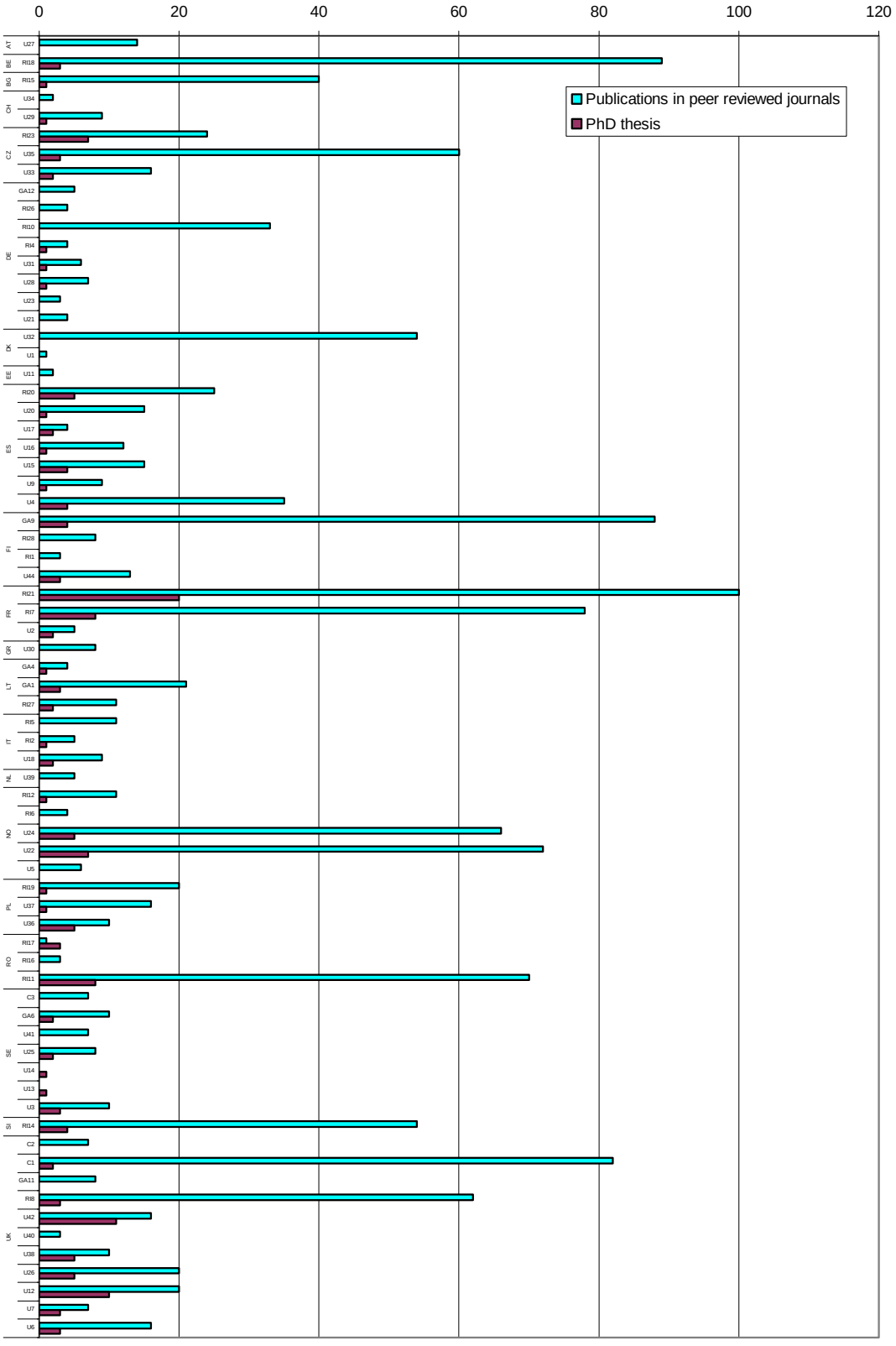


Figure 20: Number of publications in the area of radioecology in peer reviewed journals and PhDs during the period 2002-2006 for the different organisations.

4.2.8 Perspectives for radioecology

Organisations were asked to express their view on the likely changes of radioecology in general and for their organisation in particular. They were also asked to present their view on the future of radioecology in specific area.

Of all respondents, 57 % replied radioecology would increase, 35 % replied it would remain constant and 8 % think that radioecology would decline in the next decade. For their own organisation they see the future a bit less optimistically: 42 % replied research in radioecology would increase, 48 % that it would remain constant and 10 % that it would decline (Figure 21). This outcome is different from the expectations organisations have on the evolution of staff (Figure 6) where 68 % of organisations would answer staff is expected to remain constant and 17 % that staff is expected to increase.

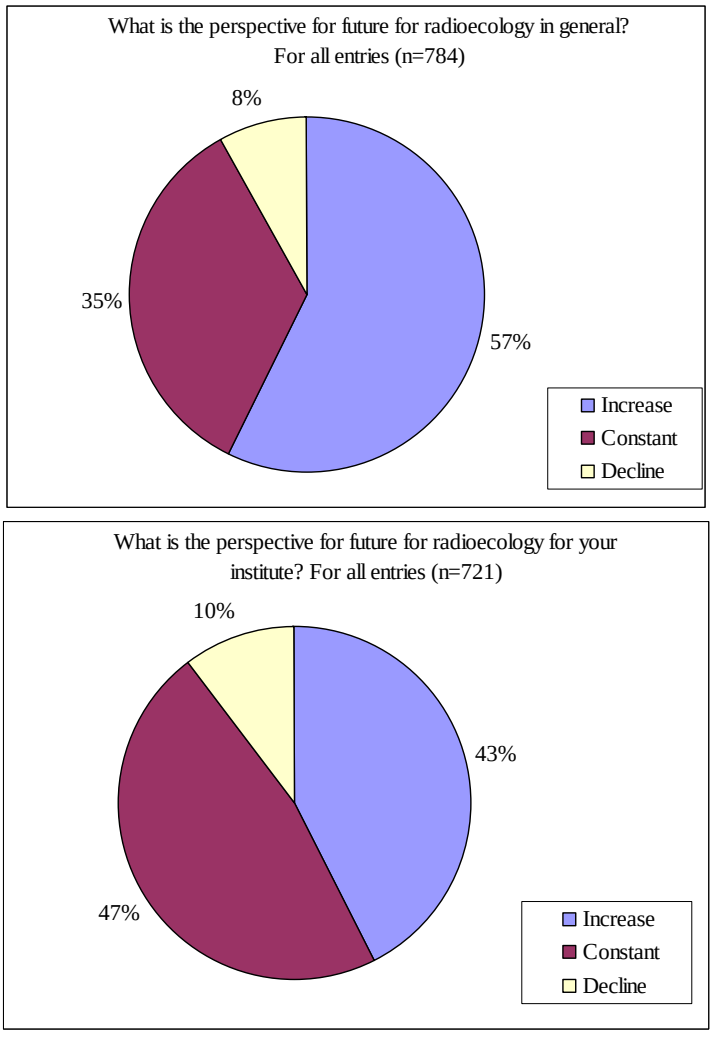


Figure 21: Perspectives of the future of radioecology in general (top) or for the responding organisation (bottom) considering all entries

We investigated if the answer would be dependent on organisation type or if the organisation was in a nuclear or non-nuclear country but the same replies were obtained irrespective of the classification made (Table 3).

Table 3: Perspective for the future of radioecology in general or for the organisation for different classes of repliers (%).

	In general			For your organisation		
	Increase	Constant	Decline	Increase	Constant	Decline
Nuclear Countries	56	36	8	43	45	12
Non Nuclear countries	59	32	9	41	52	7
Research institutes	55	36	9	43	44	13
Universities	59	34	7	42	46	12
Government authorities	57	35	8	42	54	4

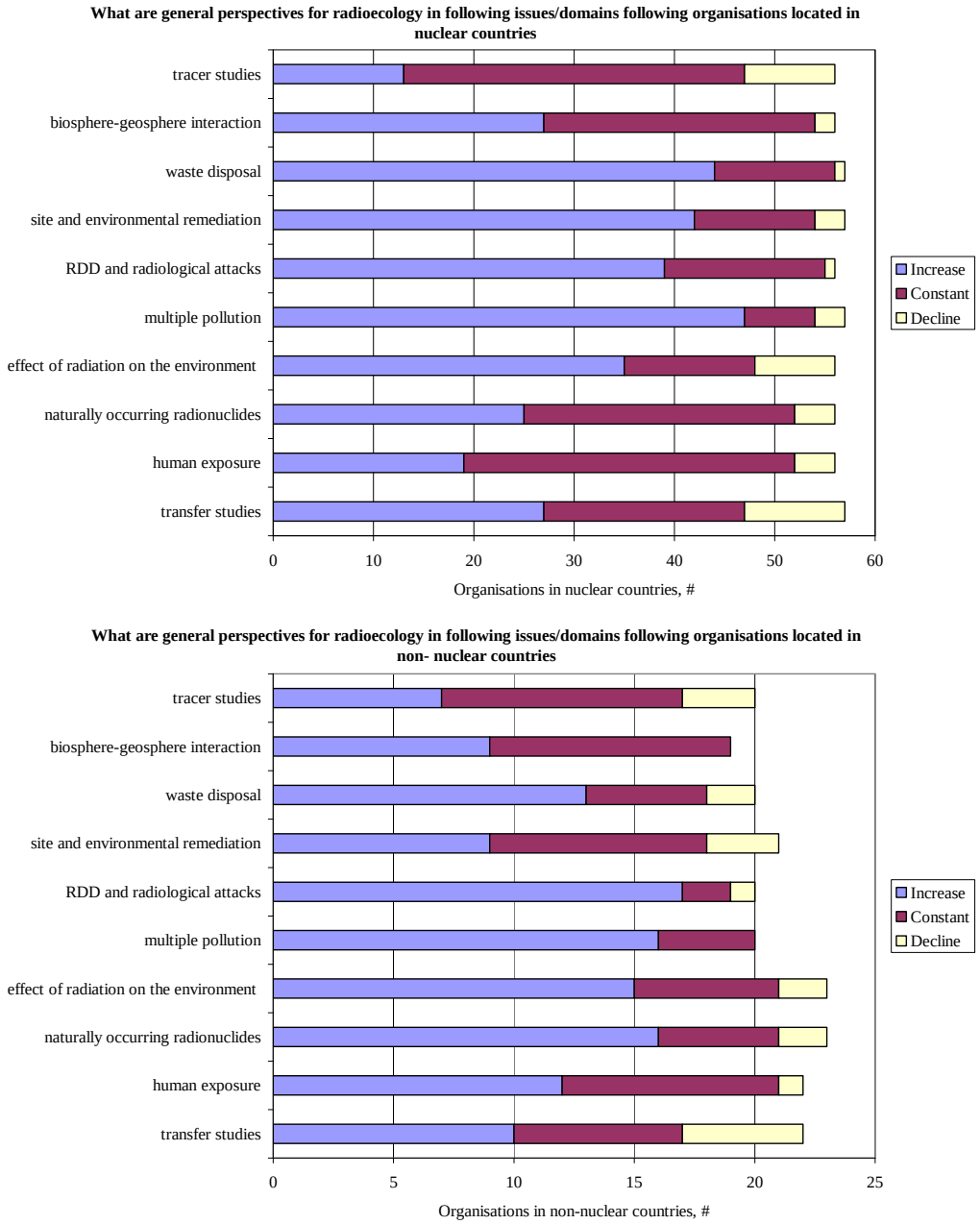


Figure 22: General perspectives of the future for specific domains/issues in radioecology. Evaluation for organisations in nuclear (top) or non-nuclear countries (bottom).

Organisations in nuclear countries felt that activities in most domains in radioecology would increase (more than 60 %) or remain constant (about 30 %). Activities which were expected to increase most were related with radiation dispersive devices and radiological attacks, multiple pollution, NORM, effect of radiation on the environment and waste disposal (Figure 22). For non-nuclear countries, the expected trend was also positive yet but with a slightly different ordering of the activities for which an increase is expected: multiple pollution, waste disposal, site and environmental remediation and radiation dispersive devices (RDD) and radiological attacks (Figure 22).

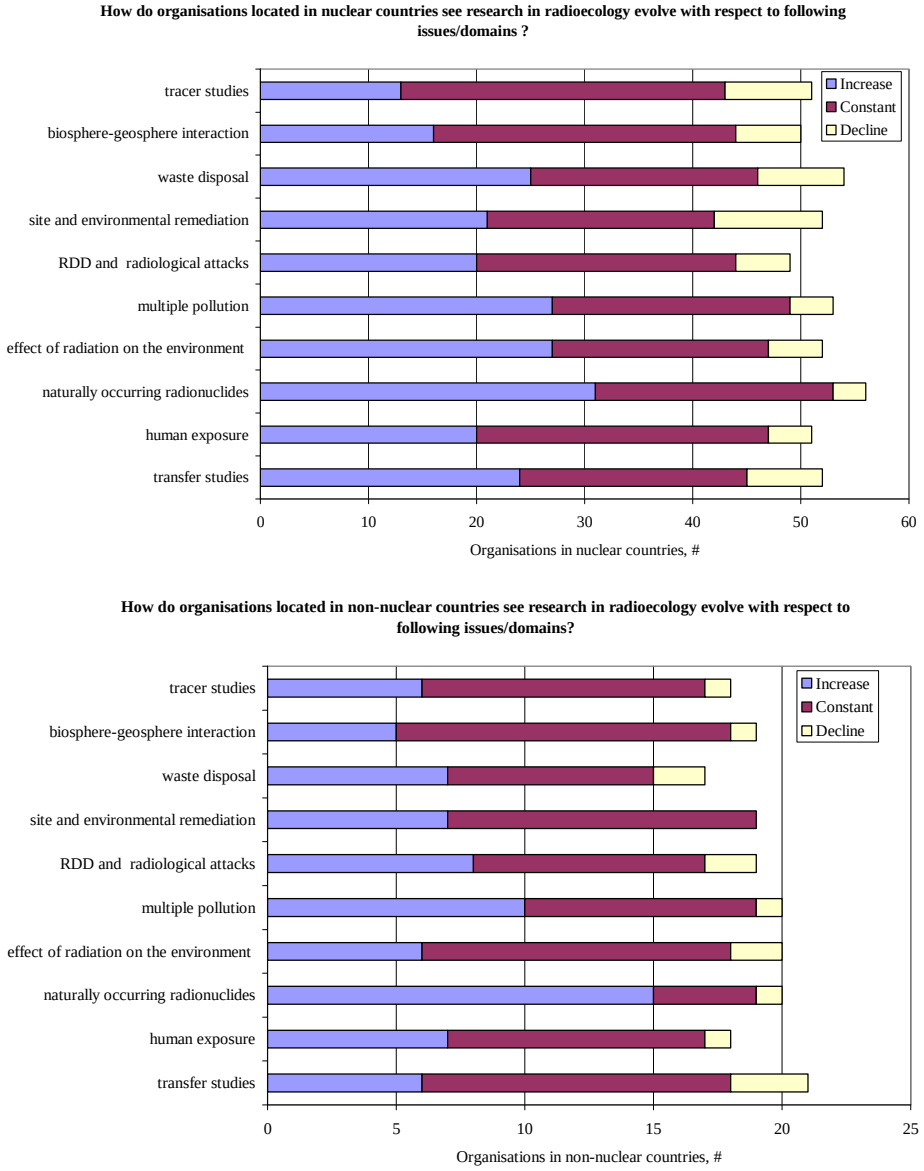


Figure 23: Perspectives for respondent own organisation of the future for specific domains/issues in radioecology. Evaluation for organisations in nuclear (top) or non-nuclear countries (bottom).

The perspective of respondents for the own organisation was less optimistic than for radioecology in general. About 40 % of organisations from nuclear countries replied they expected an increase in radioecology related activities and about 50 % replied it would remain constant. Domains with expected increases were NORM issues, multiple pollution, transfer studies effect of radiation on the environment and waste disposal (Figure 23). For

organisations from non-nuclear countries, NORM was the research areas where increase were most expected followed by multiple pollution issues and radiation dispersive devices and radiological attacks.

Organisation specific information on perspectives in research domains of radioecology or radioecology related issues can be found in Annex 3.6.

4.3 Research programmes in domain of radioecology and related fields

4.3.1 Geographical scope and activities of the projects and research programmes

Organisations were asked to give information on the projects/research programmes in radioecology and related fields they were involved in during the last 5 years. Of the 611 registered projects there are about 30 "double" counts since different organisations can be involved in the same projects. These double counts all concern international projects. Figure 24 presents the figures including the double counts since it was not possible to assign a specifc project to which many contributed to a specific organisation type. About 50 % (304) of registered projects are national projects. There are in total 172 (substracting double counts 142) international and 135 bilateral projects registered. Research institutes and universities are involved in an equal number of projects (Figure 24). Universities participate in the most national programmes, research institutes in the most international programmes.

There were some apparent contradictions: for instance for the source of funding for radioecology, only 3-12% of the total radioecology budget is reported to come from international organisations, whereas more than 25 % of the projects/research programmes are international projects. This apparent contradiction may be (partially) explained by the fact that almost all international/European projects are only partially funded by an international/European body. For example, the EC contribution to research projects is maximally 50 %, the remainder being financed by the organisation's own funds.

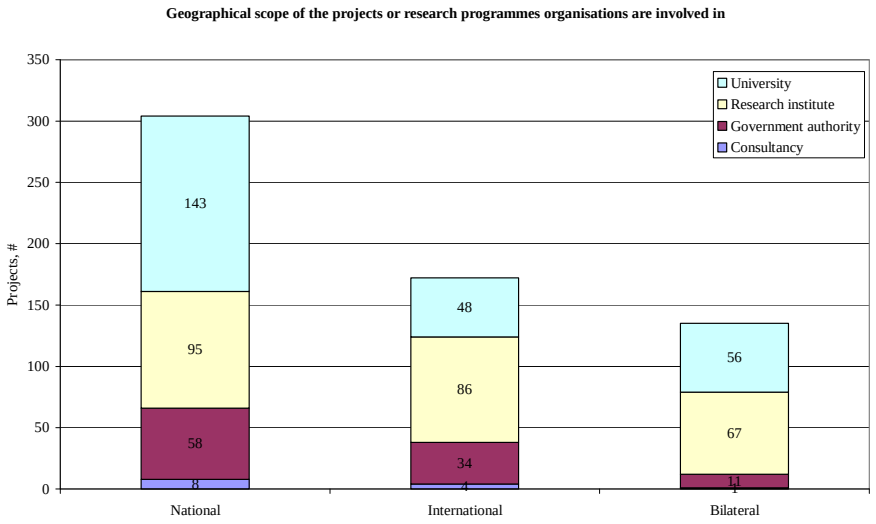


Figure 24: Geographical scope of radioecology-related projects and research programmes and involvement of different organisations

Project activities partition equally between research, modelling and monitoring and this partitioning is independent of organisation type (Figure 25).

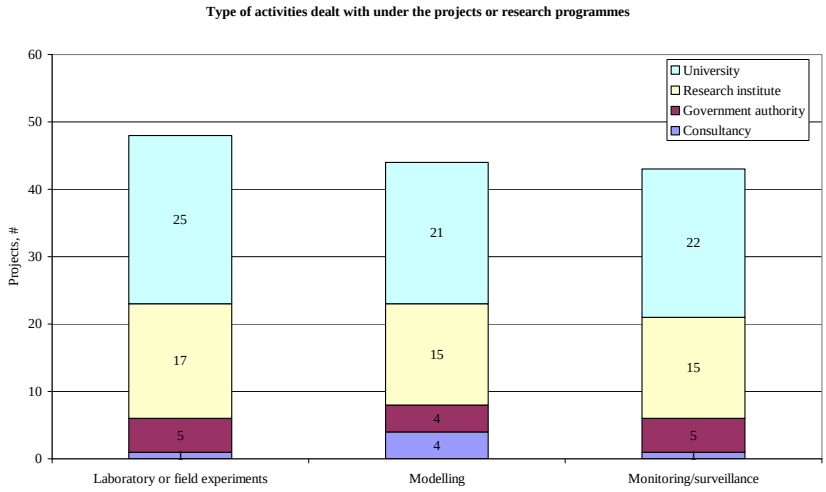


Figure 25: Activities undertaken in radioecology-related projects and research programmes

Organisation specific information is given in Annexes 4.1 and 4.2.

4.3.2 Issues dealt with in the projects and research programmes

Most projects/research programmes deal with environmental transfer processes. Slightly more projects/research programmes deal with ecological risk assessment than with human exposure or human risk assessment which is a bit surprising, but this result may be attributed to the way the question was interpreted. Biota exposure and dose-effect relationships to non-human biota are least dealt with in the projects (Figure 26). There is an almost equal distribution in involvement of organisation types in the different issues dealt with under the projects except perhaps for dose effect relationship where there is a smaller involvement of universities.

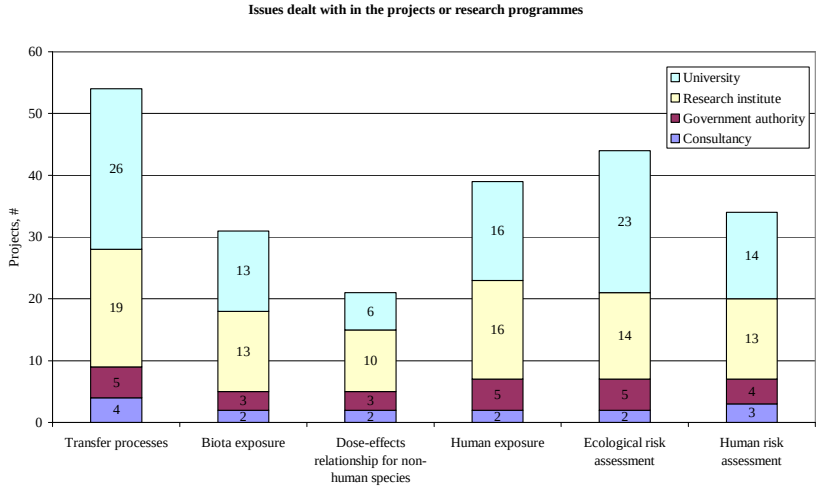


Figure 26: Issues dealt with in radioecology-related projects and research programmes and involvement of the different organisations types.

Organisation specific information is given in Annex 4.3.

4.3.3 Focus of the projects and research programmes

The focus of the projects is mostly on radionuclides present in the environment (NORM, fallout, historical contamination), followed by accidental and routine discharges. All the other application domains are equally present in the projects, except for the lower representation of

radiation dispersive devices and radiological attacks related issues in projects (Figure 27). There is an almost equal distribution in involvement of organisation types in the application domains of the projects.

Information was also collated on project funding but information received was too fragmented to be treated at this stage.

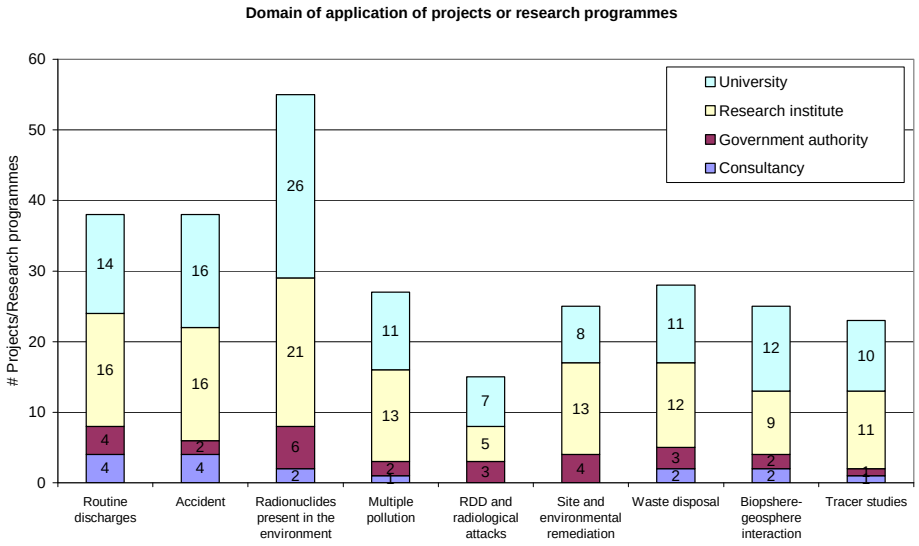


Figure 27: Areas of radioecology-related projects and research programmes and involvement of different organisations

Organisation specific information on above issue can be found in Annex 4.4.

4.4 Status of infrastructure for research in domain of radioecology and related fields

Organisations were asked to provide general information on the availability of relevant infrastructure for specific experiment types: availability and migration studies, transfer experiments on organisms, external and internal radiation experiments; and on radioanalysis facilities. This information is presented in Figure 28. Most groups have facilities to conduct migration experiments. A smaller number have facilities to conduct transfer experiments in terrestrial ecosystems and aquatic ecosystems. About 20 groups can conduct internal or external radiation experiments in terrestrial environments and about 10 in aquatic environments.

Between 50 and 60 organisations indicated they have alpha, beta and/or gamma spectrometry equipment.

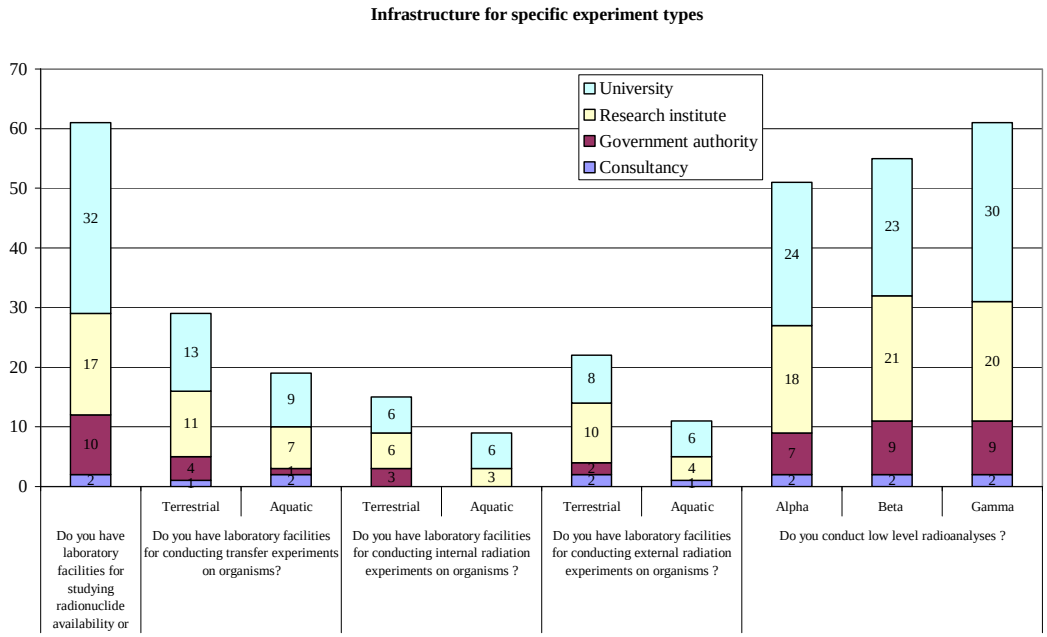


Figure 28: Available infrastructure for different experiment types

Organisation specific information on general infrastructure facilities is given in Annex 5.1. More detailed information could be given by the organisations (e.g. on the specific laboratory facilities used, on radionuclides and organisms studied) but this information is not treated here.

Organisations were also asked to provide information on their specific equipment. This information is presented in Annex 5.2.

Considering all entries, 32 % of the organisations assume that infrastructure will increase, 51 % that it will remain constant and 17 % that it will decrease (Figure 29).

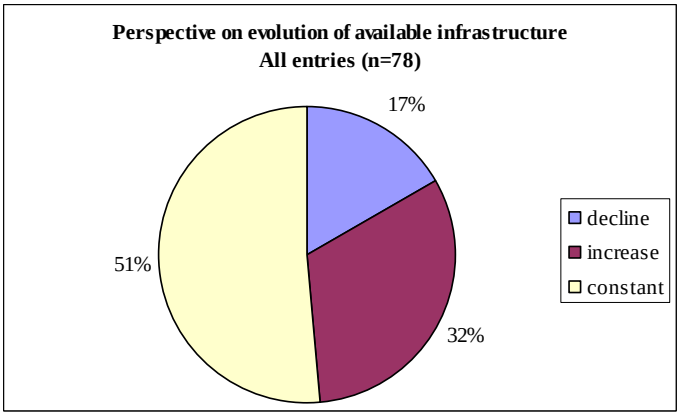


Figure 29: Expected change with time in infrastructure required for carrying out research/monitoring in domain of radioecology considering all respondents

Considering different respondents groups and comparing with the overall entries, more universities and less research institutes think infrastructure will increase; nuclear and non-nuclear countries have a distribution equal to the overall entries (Table 4).

Table 4: Expected change with time (%) in infrastructure required for carrying out research/monitoring in domain of radioecology subdivided into respondents from research institutes and universities or from nuclear and non-nuclear countries

	Increase	Constant	Decline	N
Research institutes	22	67	12	27
Universities	41	42	17	36
Government authorities	25	50	25	12
Consultancies	33	33	33	3
Nuclear Countries	34	49	17	53
Non Nuclear countries	28	56	16	25

4.5 Status of radioecology education

More than 80 % of the responding universities and between 50 and 60 % of the research institutes and government authorities provide training in radioecology.

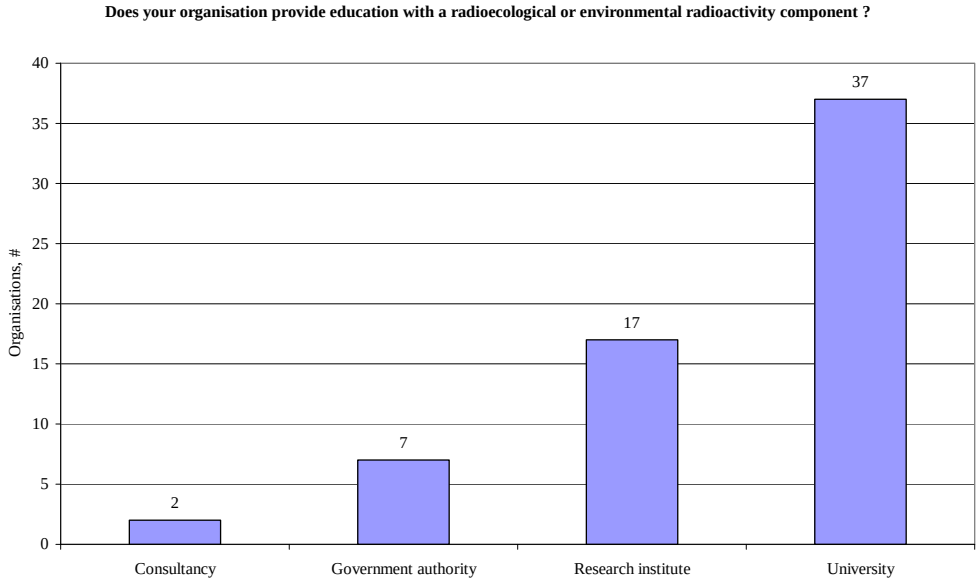


Figure 29: Training in radioecology provided by the several organisation types

According to the respondents, courses are given in radioecology at 41 organisations. 24 organisations have PhD programmes, accommodating together about 100 PhDs yearly. This appears a high figure: there are not 100 PhDs in radioecology delivered each year. Referring the number of PhD theses recorded under the scientific output (188 over 5 years hence annually about 35), the number of PhDs registered by many institutes is likely to be the number of students working towards a PhD and not the number of students delivering a PhD each year.

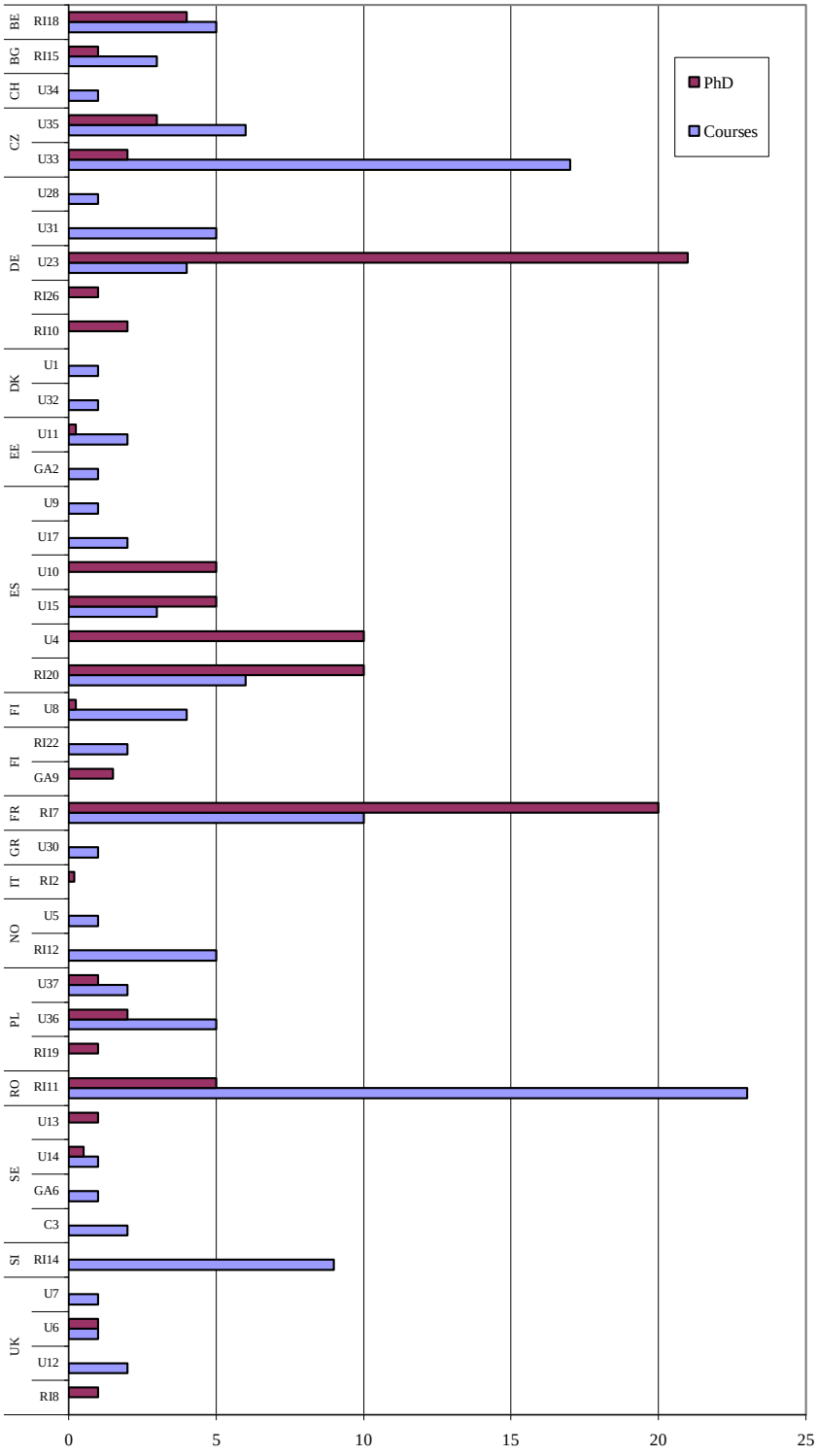


Figure 30: Number of courses in radioecology provided by the different organisations and annual number of students working towards a PhD or obtaining a PhD.

Considering all entries, 44 % of the organisations assume that training will increase, 34 % that it will remain constant and 22 % that it will decrease (Figure 31).

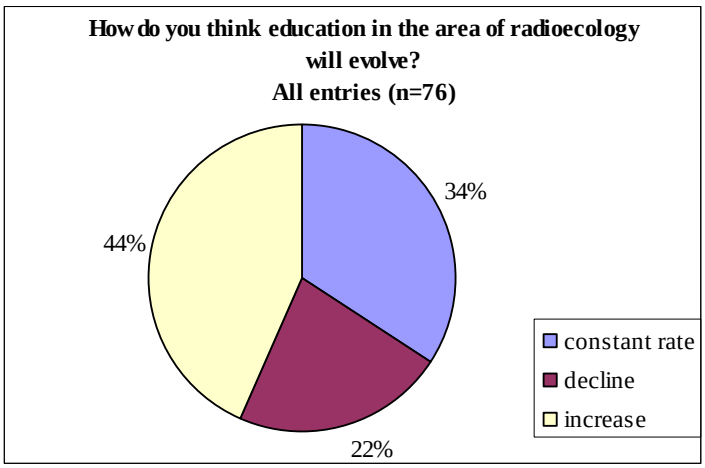


Figure 31: Expected evolution in education in domain of radioecology considering all respondents

Considering different respondents groups: research institutes consider the change with time in training more positively and universities more negatively compared with the overall picture. For universities, 28 % assume education will decline. Government authorities, on the other hand, expect education to increase. Nuclear countries have a distribution equal to the overall entries and 50 % of organisations from non-nuclear countries believe education will increase (Table 5).

Table 5: Expected change with time (%) in education in domain of radioecology respondents from research institutes and universities or from nuclear and non-nuclear countries

	Increase	Constant	Decline	N
Research institutes	35	50	15	20
Universities	42	30	28	39
Government authorities	50	25	25	12
Consultancies	75	25	0	4
Nuclear Countries	41	35	24	53
Non Nuclear countries	50	32	18	22

5 Conclusions

We obtained a 25 % reply rate to the 354 questionnaires sent out; completed questionnaires covered most EC-countries (except Cyprus, Luxembourg and Malta) and three non-EC countries including Switzerland, Norway and Faroe Islands. Most replies were obtained from Universities, followed by Research institutes, Government authorities and Consultancies.

There is a large heterogeneity in the size of the groups ranging from one to as many as 142, with one third of the organisations having five or less staaf members working in domain of radioecology. The annual budget allocated to radioecology is on average low with more than 50 % of the responding organisations having an annual budget <0.1 MEuros.

The source of funding for research and modelling activities in radioecology is almost equally shared between government authorities, organisation's own funds and national research funds, international public funding taking only 10 % of the share.

Overall, there seems to be a good coverage of different research disciplines and modelling capacity by the organisations. Some areas were identified where hardly any of the responding organisations were active (e.g. processes in estuaries ecosystems, transfer and radiation effects studies on reptiles and amphibians). Requirements to develop expertise in identified research gaps will depend on the outputs of WP2.

The important number of projects that the different responding organisations are involved in indicates there is certainly still a need and interest in radioecology related research programmes.

More than 80 % of the responding universities and between 50 and 60 % of the responding research institutes and government authorities provide training in radioecology.

Overall, most organisations gave a positive view of the future evolution in radioecology. For the different aspects surveyed (personnel, funding, education, infrastructure), about 80 % of the organisations expect an increase or a steady state. Whether this positive outlook will set through will largely depend on position of funding organisations. In this context it can be mentioned that Government Authorities, that can be viewed as funding organisation, also believe in a positive outlook for radioecology.

Whether the number of scientific staff in radioecology, the scientific competence and areas of competence, the level of collaboration, the available infrastructure and education is sufficient to maintain competence and accommodate specific needs in radioecology will be subject of Work Package 3 where the needs for radioecological research (WP2) will be compared with available resources (WP1).

6 References

EC (2003) - EUR 20634 – The energy challenge of the 21st century : the role of nuclear energy. Luxembourg : Office for Official Publications of the European Communities, 2003.

GRS (2003). Assessment of the situation of centres of competence in the fields of nuclear fission and radiation protection, Final report, GRS-188. Contract FIEV-CT2000-96001.

OECD/NEA (2000) Nuclear Education and Training : cause of concern ? A summary report, Nuclear Energy Agency, Organisation for Economic Co-operation and Development.

ANNEXES

Annex 1: Questionnaires

A1.1 Initial targeted questionnaire

1. SCIENTIFIC COMPETENCE

Radioecology is defined as a branch of environmental sciences devoted to a specific category of stressors i.e. natural and artificial radioactive substances. This science includes key issues (i) common with other groups of pollutants, particularly metals (e.g., transport, fate, speciation, bioavailability, biological effects at various organisational levels) and (ii) specific to radionuclides (e.g., external irradiation pathway, radiation dosimetry, decay products). Under this project we consider mentioned key issues related to all types of sources of radioactivity (routine and accidental releases, deep and surface disposed waste, areas of high natural radioactivity and environmental contamination/waste products linked with NORM industry, dirty bomb, terrorist attacks, etc. We wish to receive just one questionnaire per institute and we would be pleased if you could fill in this questionnaire for all radioecology-related groups in your institute, potentially through assistance by colleagues, and not limit yourself to your (research) group.

For fields with a 'Yes/…/No'-dropdown box answer, any empty answer will be processed as a "No".

General

What are the major competences of your institute in the field of radioecology and related fields?

Field and laboratory research :	(select)
Modelling :	(select)
Monitoring :	(select)

	Terrestrial	Urban	Marine	Freshwater	Estuaries
For which ecosystem(s) are you performing R&D activities?	☐	☐	☐	☐	☐

Environmental transfers

Do you conduct studies on transfer processes in the environment : (select)

What are the organisms studied?	Terrestrial	Marine	Freshwater	Estuaries
Plants/Algae	☐	☐	☐	☐
Micro-organisms	☐	☐	☐	☐
Invertebrates	☐	☐	☐	☐
Mammals	☐	☐	☐	☐
Birds	☐	☐	☐	☐
Reptiles	☐	☐	☐	☐
Amphibians	☐	☒	☐	☒
Fish	☒	☐	☐	☐
Fungi	☐	☒	☒	☒
Lichens and bryophytes	☐	☒	☐	☒
Other, please specify	…	…	…	…

Do you conduct experiments on availability and transfer?	Laboratory experiments	Field studies
On availability/migration in soils/sediments :	(select)	(select)
If, yes, please provide brief details on systems and radionuclides studied :	…	…
On transfer to organisms-(transfer factors/fluxes) :	(select)	(select)
If, yes, please provide brief details on systems and radionuclides studied :	…	…

If you have the potential to conduct studies on transfer processes in the environment, please provide brief details: …

Radiation effects

Do you conduct studies on radiation effects on organisms ? (select)

If yes, please provide brief details if you do or if you have the potential to do ?

What are the organisms you study **in the laboratory**?	Terrestrial	Marine	Freshwater	Estuaries	What are the organisms you investigate **in the field studies** ?	Terrestrial	Marine	Freshwater	Estuaries
Plants/Algae	☐	☐	☐	☐	Plants/Algae	☐	☐	☐	☐
Micro-organisms	☐	☐	☐	☐	Micro-organisms	☐	☐	☐	☐
Invertebrates	☐	☐	☐	☐	Invertebrates	☐	☐	☐	☐
Mammals	☐	☐	☐	☐	Mammals	☐	☐	☐	☐
Birds	☐	☐	☐	☐	Birds	☐	☐	☐	☐
Reptiles	☐	☐	☐	☐	Reptiles	☐	☐	☐	☐
Amphibians	☐	☐	☐	☐	Amphibians	☐	☐	☐	☐
Fish	☐	☐	☐	☐	Fish	☐	☐	☐	☐
Fungi	☐	☐	☐	☐	Fungi	☐	☐	☐	☐
Lichens and bryophytes	☐	☐	☐	☐	Lichens and bryophytes	☐	☐	☐	☐
If other, please specify :	…	…	…	…	If other, please specify :	…	…	…	…

	Alpha	Beta	Gamma	Internal	External	Radionuclides
Please provide information on radiation type or radionuclides studied	☐	☐	☐	☐	☐	…

Please provide brief details on main experience/strengths with respect to responses analysed …

Do you conduct dosimetric measurements (i.e. TLD readings, Whole body counting) ? (select)

Please provide brief details if you do or if you have the potential to do ? …

Multipollution

Does your organisation currently conduct studies on other contaminants? (select)

Which other contaminants are studied ?

Heavy metals	☐
Dioxines	☐
PAH	☐
PCB	☐
Pesticides	☐
Others	…

Do you have the capacity to do conduct multi-stressor studies ? (select)

If yes, please provide brief details : …

Remediation

Do you conduct field or laboratory studies related to site and environmental remediation? (select)

If, yes, please provide brief details of main experience/strengths and context of studies …

Perspectives

How do you see the field of radioecology evolve in the next decade, with respect to following issues and application domains ?	transfer studies	human exposure	naturally occurring radionuclides	effect of radiation on the environment	multiple pollution	dirty bomb and terrorist attacks	site and environmental remediation	waste disposal	biosphere-geosphere interaction	tracer studies	other, please specify below
In General	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
For your organisation	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)

You can add comments about the perspectives for this research, in general …

You can add comments about the perspectives for this research, for your organisation …

Modelling expertise

Do you develop radioecological models?	(select)
If yes, provide names of models.	…
Do you use radioecological models?	(select)
If yes, provide names of models.	…

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
What is the application field of your model	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)
Agricultural	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Forest/seminatural	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Aquatic (marine)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Aquatic (freshwater)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Atmospheric	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Soil	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Geosphere	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Remediation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Urban	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other (please specify)	…	…	…	…	…	…	…	…	…	…

Details on the resolution of the model	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)
Spatial resolution	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Scale	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Time resolution	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Was model developed for research or application purposes	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Has the model been tested and validated	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)

What is covered by the model ?	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)
Routine discharges	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Accident	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Radionuclides present in the environment (e.g. naturally occuring radionuclides, fallouts)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Transfer processes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dose to biota	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dose to human	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ecological risk assessment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Human risk assessment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)	(fill in name)
What are the radionuclides/elements considered in the model?	…	…	…	…	…	…	…	…	…	…

Publications

We would like to receive an attachment (addendum) with at least the reference of the peer review publications and the PhDs in your institure in the 2002-2007 period.
Other types of publications can be added (Please mention the types).
The publication have to be traceable and accessible.
This attachment may be in any format (as in most institutes a publication list is standard available).
Please provide the numbers of publications in the 2002-2007 period in the table below.

	Count.
Publications in peer reviewed journals	…
Conference proceedings	…
Reports	…
Books	…
Book chapters	…
PhD thesis	…
Master thesis	…
Other	…
Models	…

(name of the attached file/addendum)

Do you have any other comments/questions/suggestions?

…

2. PROJECTS/RESREACH PROGRAMMES

We prefer that you consider the work your organisation is involved in in the domain of radioecology or related environmental studies during the last 5 years when filling in this worksheet.

If this is too much effort, you may consider only the work currently going on. Please tick the checkbox if you consider only currently ongoing work. ☐

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6	Project 7	Project 8	Project 9	Project 10
Project name/title	…	…	…	…	…	…	…	…	…	…
Geographical scope	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Duration (*e.g.* 2005-2007)	-	-	-	-	-	-	-	-	-	-
Number of the partners involved	…	…	…	…	…	…	…	…	…	…
Funding of the project										
Project name/title	…	…	…	…	…	…	…	…	…	…
Your own organisation's funds	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Government assignments	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
National research funds	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Industry assignments	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Public funding from International organisations (EU, IAEA, ICRP, …)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
National or international foundations	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
Type of activities										
Project name/title	…	…	…	…	…	…	…	…	…	…
Laboratory or field experiments	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Modelling	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Monitoring/surveillance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other, please specify	…	…	…	…	…	…	…	…	…	…
Issues dealt with in project										
Project name/title	…	…	…	…	…	…	…	…	…	…
Transfer processes	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Biota exposure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dose-effects relationship for non-human species	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Human exposure	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Ecological risk assessment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Human risk assessment	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Domain for application										
Project name/title	…	…	…	…	…	…	…	…	…	…
Routine discharges	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Accident	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Radionuclides present in the environment (e.g. naturally occurring radionuclides, fallouts)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Multiple pollution	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Dirty bomb and terrorist attacks	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Site and environmental remediation	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Waste disposal	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Biopshere-geosphere interaction	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Tracer studies	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. INFRASTRUCTURE

Do you have laboratory facilities for studying radionuclide availability or migration?	(select)
Specific laboratory facilities used:	…
Radionuclides studied:	…

	Terrestrial	Aquatic	Other, please specify
Do you have laboratory facilities for transfer experiments on organisms?	(select)	(select)	…
Specific laboratory facilities used:	…		
Organisms studied:	…		

	Terrestrial	Aquatic	Other, please specify
Do you have laboratory facilities for internal radiation experiments on organisms ?	(select)	(select)	…
Specific laboratory facilities used:	…		
Organisms studied:	…		

	Terrestrial	Aquatic	Other, please specify
Do you have laboratory facilities for external radiation experiments on organisms ?	(select)	(select)	…
Specific laboratory facilities used:	…		
Organisms studied:	…		

Do you conduct low level radioanalyses ?		For which Radionuclides ?	How many detectors do you have ?	Are they accredited ?	Comments on accreditation :
Alpha	(select)	…	…	(select)	…
Beta	(select)	…	…	(select)	…
Gamma	(select)	…	…	(select)	…

Do you have access in your institute to the following equipment ?

Whole body counter	(select)
ICP-MS	(select)
ICP-AES	(select)
HPIC	(select)
HPLC	(select)
Gas chromatographs	(select)
TEM	(select)
XRF	(select)
Nuclear microprobe	(select)
RT-PCR	(select)
Micro-array	(select)
Flow cytometry	(select)
LSC (Liquid scintillation counter)	(select)
Alpha-spectrometry	(select)
Gamma-spectrometry	(select)
Other, please specify	…
Other, please specify	…
Other, please specify	…
Other, please specify	…
Other, please specify	…
Other, please specify	…

Remarks:	…

Perspectives

How do you think the availability/presence of infrastructure actually available for performing radiological research will evolve in the future?	(select)

4. EDUCATION

Does your organisation provide education with a radioecological or environmental radioactivity component?	(select)

If yes, please provide details below

What type of education/training offered do you offer ?		Number of courses ?	Specify the number of students per year
Courses	☐	…	…
Master thesis	☐	…	…
PhD	☐	…	…
Others, please specify …		…	…

Please give course titles …	

Perspectives

How do you think education in the area of radioecology will evolve within the next decade ?	(select)

Do you have any other comments/questions/suggestions? …	

5. ORGANISATION DETAILS

Contact details

Please provide contact details within the database for two permanent members of staff who can be contacted by the FUTURAE staff to respond to any future surveys.

	Contact 1	Contact 2
Name :	…	…
Title :	…	…
Organisation :	…	…
Tel :	…	…
Fax :	…	…
e-mail :	…	…
Postal address :	…	…
Web page :	http://…	

Organisation details

Which one of the following best describes your organisation?	(select)
if other, please specify	…
Is your organisation part of a bigger organisation (e.g. faculty at a university)	(select)
If yes, please specify organisation name	…

Staff related issues

How many staff members does your organisation employ (all institute) ?

Permanent staff :	…
Temporary staff :	…
PhD students :	…

What are the number of staff members involved in radioecological research and related fields ? (If staffmember are active in differnet fields select their main occupation)	Permanent	Temporary	PhD students
Total	0	0	0
Lab and field research	…	…	…
Modelling	…	…	…
Monitoring	…	…	…
Analysis (measurements)	…	…	…

Do you work with subcontractors for parts of the projects ?	(select)
If yes, in which domain ?	
Research	(select)
Modelling	(select)
Monitoring/surveillance	(select)
Radionuclides metrology	(select)

Funding capacities

What percentage of your institutes activities (**average over last 5 years**) in radioecology and related fields is financed by :	Research	Modelling	Monitoring/ surveillance
Your own organisation's funds :	…	…	…
Government assignments :	…	…	…
National research funds :	…	…	…
Industry assignments :	…	…	…
Public funding from International organisations (EU, IAEA, ICRP, …) :	…	…	…
National or international foundations :	…	…	…
(each field should add up to 100 %)	0%	0%	0%

What is the total (own funds+contracts+ …) annual budget (in Euros) of your organisation allocated to radioecology ?	(select)

Perspectives

What is the expected change in the number of staff members involved in radioecological research and related fields in the next 10 years in the field of radioecology ?	
for permanent staff :	(select)
for temporary staff :	(select)
for PhD students :	(select)

How do you see the evolution of financing in radioecology and related fields in the next decade ?	Research	Modelling	Monitoring/ surveillance
Your own organisation's funds	(select)	(select)	(select)
Government assignments	(select)	(select)	(select)
National research funds	(select)	(select)	(select)
Industry assignments	(select)	(select)	(select)
Public funding from International organisations (EU, IAEA, ICRP, …)	(select)	(select)	(select)
National or international foundations	(select)	(select)	(select)

Please complete

I would like to receive a summary report of the results of this questionnaire when available	(select)
I agree on behalf of my organisation that information entered in this database can be used for the purposes given in the introductory letter accompanying this questionnaire	(select)
I would be willing to participate within meetings of the FUTURAE project	(select)

A1.2. Short questionnaire

1. SCIENTIFIC COMPETENCE

Radioecology is defined as a branch of environmental sciences devoted to a specific category of stressors i.e. natural and artificial radioactive substances. This science includes key issues (i) common with other groups of pollutants, particularly metals (e.g., transport, fate, speciation, bioavailability, biological effects at various organisational levels) and (ii) specific to radionuclides (e.g., external irradiation pathway, radiation dosimetry, decay products). Under this project we consider mentioned key issues related to all types of sources of radioactivity (routine and accidental releases, deep and surface disposed waste, areas of high natural radioactivity and environmental contamination/waste products linked with NORM industry, dirty bomb, terrorist attacks, etc.
We wish to receive just one questionnaire per institute and we would be pleased if you could fill in this questionnaire for all radioecology-related groups in your institute, potentially through assistance by colleagues, and not limit yourself to your (research) group.

For fields with a 'Yes/…/No'-dropdown box answer, any empty answer will be processed as a "No".

General

What are the major competences of your institute in the field of radioecology and related fields?

Field and laboratory research :	(select)
Modelling :	(select)
Monitoring :	(select)

For which ecosystem(s) are you performing R&D activities?	Terrestrial	Urban	Marine	Freshwater	Estuaries
	☐	☐	☐	☐	☐

Environmental transfers

Do you conduct studies on transfer processes in the environment :	(select)

Radiation effects

Do you conduct studies on radiation effects on organisms ?	(select)

Multipollution

Does your organisation currently conduct studies on other contaminants?	(select)

Remediation

Do you conduct field or laboratory studies related to site and environmental remediation?	(select)

Perspectives

How do you see the field of radioecology evolve in the next decade, with respect to following issues and application domains ?	transfer studies	human exposure	naturally occurring radionuclides	effect of radiation on the environment	multiple pollution	dirty bomb and terrorist attacks	site and environmental remediation	waste disposal	biosphere–geosphere interaction	tracer studies	other, please specify below
In General	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)
For your organisation	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)	(select)

Modelling expertise

Do you develop radioecological models?	(select)
Do you use radioecological models?	(select)

Publications

We would like to receive an attachment (addendum) with at least the reference of the peer reviewed publications and the PhDs in your institute in the 2002-2007 period and related to radioecology.
Other types of publications can be added (Please mention the types).
The publications have to be traceable and accessible.
This attachment may be in any format (as in most institutes a publication list is standard available).
Please provide the numbers of publications in the 2002-2007 period in the table below.

	Count.
Publications in peer reviewed journals	…
Conference proceedings	…
Reports	…
Books	…
Book chapters	…
PhD thesis	…
Master thesis	…
Other	…
Models	…

(name of the attached file/addendum)

2. PROJECTS/RESEARCH PROGRAMMES

How many national projects have you been involved in the last 5 year ?	…
How many international projects have you been involved in the last 5 year ?	…
How many bilateral projects have you been involved in the last 5 year ?	…

3. INFRASTRUCTURE

Do you have laboratory facilities for studying radionuclide availability or migration?	(select)

	Terrestrial	Aquatic
Do you have laboratory facilities for transfer experiments on organisms?	(select)	(select)
Do you have laboratory facilities for internal radiation experiments on organisms ?	(select)	(select)
Do you have laboratory facilities for external radiation experiments on organisms ?	(select)	(select)

Do you conduct low level radioanalyses ?		Are they accredited ?
Alpha	(select)	(select)
Beta	(select)	(select)
Gamma	(select)	(select)

Perspectives

How do you think the availability/presence of infrastructure actually available for performing radiological research will evolve in the future?	(select)

4. EDUCATION

Does your organisation provide education with a radioecological or environmental radioactivity component?	(select)

Perspectives

How do you think education in the area of radioecology will evolve within the next decade ?	(select)

5. ORGANISATION DETAILS

Contact details

Please provide contact details within the database for two permanent members of staff who can be contacted by the FUTURAE staff to respond to any future

	Contact 1	Contact 2
Name :	…	…
Title :	…	…
Organisation :	…	…
Tel :	…	…
Fax :	…	…
e-mail :	…	…
Postal address :	…	…
Web page :	http://…	

Organisation details

Which one of the following best describes your organisation? (select)

Staff related issues

How many staff members does your organisation employ (all institute) ?

Permanent staff :	…
Temporary staff :	…
PhD students :	…

What are the number of staff members involved	Permanent	Temporary	PhD students
Total	0	0	0
Lab and field research	…	…	…
Modelling	…	…	…
Monitoring	…	…	…
Analysis (measurements)	…	…	…

Funding capacities

What percentage of your institutes activities (**average over last 5 years**) in radioecology and related fields is financed by :	Research	Modelling	Monitoring/ surveillance
Your own organisation's funds :	…	…	…
Government assignments :	…	…	…
National research funds :	…	…	…
Industry assignments :	…	…	…
Public funding from International organisations (EU, IAEA, ICRP, …) :	…	…	…
National or international foundations :	…	…	…
(each field should add up to 100 %)	0%	0%	0%

What is the total (own funds+contracts+ …) annual budget (in Euros) of your organisation allocated to radioecology ? (select)

Perspectives

What is the expected change in the number of staff members involved in radioecological research and related fields in the next 10 years in the field of radioecology ?

for permanent staff :	(select)
for temporary staff :	(select)
for PhD students :	(select)

How do you see the evolution of financing in radioecology and related fields in the next decade ?	Research	Modelling	Monitoring/ surveillance
Your own organisation's funds	(select)	(select)	(select)
Government assignments	(select)	(select)	(select)
National research funds	(select)	(select)	(select)
Industry assignments	(select)	(select)	(select)
Public funding from International organisations (EU, IAEA, ICRP, …)	(select)	(select)	(select)
National or international foundations	(select)	(select)	(select)

Please complete

I would like to receive a summary report of the results of this questionnaire when available	(select)
I agree on behalf of my organisation that information entered in this database can be used for the purposes given in the introductory letter accompanying this questionnaire	(select)
I would be willing to participate within meetings of the FUTURAE project	(select)
Do you agree that your organisation name is explicitly cited in the report and that organisation specific information from the questionnaire is presented ?	(select)

Thanks for completing the questionnaire !

[FUTURAE]

Annex 2: Organisation details

A2.1: Source of funding research, modelling and monitoring in radioecology for the different organisations and number of people working in radioecology at the different organisations. Organisations are sorted by nuclear/non nuclear country and organisation type.

			Research						Modelling						Monitoring/ surveillance						
Country	Nuclear status	Organisation	Own organisation's funds	Government assignments	National research funds	Industry assignments	Public funding from International organisations	National or international foundations	Own organisation's funds	Government assignments	National research funds	Industry assignments	Public funding from International organisations	National or international foundations	Own organisation's funds	Government assignments	National research funds	Industry assignments	Public funding from International organisations	National or international foundations	# people
AT	Non NC	U27	50%	50%																	3
BE	NC	RI18	57%	33%		1%	9%		50%	41%			9%		10%	90%					19
BG	NC	RI15	10%		10%	60%	20%								10%		10%	60%	20%		30
CH	NC	GA8	100%													100%					6.5
CH	NC	U29	100%													100%					2.5
CH	NC	U34	10%		90%											90%		10%			2
CZ	NC	RI23		30%	50%			20%													8
CZ	NC	U33	20%	10%	20%	30%	20%		20%	10%	20%	30%	20%								9
CZ	NC	U35	40%		40%		10%	10%	50%		20%			30%	40%	30%				30%	14
DE	NC	GA12		100%						100%						100%					N.G.
DE	NC	RI10	50%		25%		25%		50%		25%		25%								18
DE	NC	RI26																			4
DE	NC	RI4		90%	5%	5%				100%						100%					2
DE	NC	U21	70%					30%	70%					30%	80%			20%			4
DE	NC	U28	10%	90%					10%	90%					10%	90%					N.G.
DE	NC	U31		0%	4%	1%	95%														17
DK	Non NC	U1	90%					10%	90%					10%	90%					10%	0.7
EE	Non NC	C5														28%		72%			1
EE	Non NC	GA2							80%					20%	40%	40%				20%	7
EE	Non NC	RI25		80%	15%	5%															3
EE	Non NC	U11	6%		47%	12%	35%				100%										3
ES	NC	RI20		95%			5%			85%		10%	5%			65%		35%			37
ES	NC	RI3		100%												100%					7
ES	NC	U10		50%				50%		100%						70%		30%			9
ES	NC	U15	25%	38%		25%		13%										100%			14
ES	NC	U17		100%												100%					3
ES	NC	U20			100%						100%					100%					11
ES	NC	U4		0%	100%					0%	100%					75%	25%				7
ES	NC	U43																			1
ES	NC	U9		100%												100%					4
FI	NC	GA9		80%	5%		10%	5%		25%	5%		70%			100%					78
FI	NC	RI22	35%		35%	15%	15%		30%		35%	20%	15%								4
FI	NC	RI28	90%					10%	80%	10%	5%		5%		100%						4
FI	NC	U44																			2
FI	NC	U8	10%	60%		30%															3
FR	NC	RI7	80%		5%	10%	5%		80%		5%	10%	5%		100%						142
FR	NC	U2	10%	40%				50%													7
GR	Non NC	U30		100%																	3
IE	Non NC	GA10																			7
IT	Non NC	RI13																			2
IT	Non NC	U18	70%			30%			100%												2
LT	NC	GA1														100%					11
LT	NC	GA4														80%			20%		7
LT	NC	RI27		50%	50%					40%	60%										15
LV	Non NC	GA5													67%	33%					12
NL	NC	RI9			50%		50%				25%	25%	50%					100%			39
NL	NC	U39	20%				80%		20%				80%								2
NO	Non NC	GA7	25%		50%		25%		60%		30%		10%		10%	90%					43
NO	Non NC	RI12	10%	46%	29%	1%	14%								6%	3%	92%				27
NO	Non NC	RI6	80%	20%											20%	80%					5
NO	Non NC	U22	30%	20%	50%																3
NO	Non NC	U24																			8
PL	Non NC	U37	90%		10%										90%	10%					12
RO	NC	RI11	10%		60%	5%	20%	5%	10%		50%	10%	20%	10%	50%		40%	5%	5%		45
RO	NC	RI16	1%	22%	67%		10%		2%	18%	75%		5%		15%	25%	55%		5%		11
RO	NC	RI17	10%		90%				10%		90%				50%		50%				21
SE	NC	C3							20%		20%	60%									9
SE	NC	U13																			4
SE	NC	U14	31%	63%				6%		100%						100%					3
SE	NC	U3	75%		13%	13%															2
SE	NC	U41		90%				10%		90%				10%		90%				10%	10
SI	NC	RI14		80%		20%										100%					9
UK	NC	C1				90%	10%					90%	10%					90%	10%		22
UK	NC	GA11																			46
UK	NC	GA3	40%	20%		20%	20%		60%				40%		30%	40%		30%			23
UK	NC	RI8	40%	10%		5%	40%	5%													4
UK	NC	U12		25%	40%	15%	15%	5%			25%	25%	50%								4
UK	NC	U26																			3
UK	NC	U38																			6
UK	NC	U40																			10
UK	NC	U42																			4
UK	NC	U6	5%	10%	60%	10%	10%	5%	25%	20%	30%	10%	10%	5%	5%	30%	20%	20%	20%	5%	24
UK	NC	U7																			1

Annex 3: Scientific competence

A3.1a. For which ecosystems and for which organisms do organisations perform laboratory or field work?

		Ecosystem				Organisms											
Country	Organisation	Terrestrial	Marine	Freshwater	Estuaries	Plants	Micro-organisms	Invertebrates	Mammals	Birds	Reptiles	Amphibians	Fish	Fungi	Lichens and bryophytes	Lab	Field
AT	U27	✓	✓			✓	✓		✓					✓	✓		✓
BE	RI18	✓				✓	✓							✓		✓	✓
BG	RI15	✓	✓		✓	✓			✓					✓	✓	✓	✓
CH	U34																✓
CH	U29	✓		✓		✓			✓						✓		✓
CH	GA8	✓		✓		✓			✓				✓	✓			✓
CZ	U35	✓		✓		✓							✓	✓	✓		✓
CZ	U33	✓				✓								✓	✓	✓	✓
CZ	RI23	✓		✓	✓	✓										✓	✓
DE	U31	✓		✓		✓	✓	✓								✓	✓
DE	U28	✓		✓		✓			✓				✓	✓			✓
DE	U23	✓				✓	✓							✓		✓	✓
DE	U21	✓				✓											✓
DE	RI4	✓		✓		✓										✓	✓
DE	RI26															✓	✓
DE	RI10	✓		✓		✓	✓		✓							✓	✓
DK	U32	✓	✓	✓		✓		✓	✓				✓	✓	✓		✓
DK	U1	✓	✓	✓		✓			✓				✓		✓		
EE	U11	✓													✓		✓
ES	U4	✓				✓	✓							✓		✓	✓
ES	U20			✓					✓								✓
ES	U16	✓	✓	✓		✓							✓			✓	✓
ES	U15	✓	✓		✓	✓							✓			✓	✓
ES	U10															✓	✓
ES	RI20	✓	✓			✓		✓	✓				✓			✓	✓
FI	U8	✓				✓									✓		✓
FI	RI22	✓	✓	✓		✓			✓				✓	✓	✓		
FI	RI1																✓
FI	GA9	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓
FR	U2	✓		✓		✓	✓	✓		✓			✓				✓
FR	RI7	✓	✓	✓	✓	✓	✓	✓	✓				✓		✓	✓	✓
FR	RI21	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
GR	U30	✓				✓	✓	✓							✓		✓
IT	U18	✓				✓										✓	✓
IT	RI13	✓						✓								✓	
LT	GA1	✓	✓	✓	✓	✓			✓				✓				✓
LV	GA5	✓	✓			✓							✓				
NO	U5	✓		✓		✓							✓		✓		✓
NO	U24	✓	✓	✓	✓	✓		✓					✓	✓	✓	✓	✓
NO	U22	✓				✓			✓					✓	✓	✓	✓
NO	RI6	✓		✓		✓			✓	✓			✓		✓		
NO	RI12	✓	✓	✓		✓	✓	✓	✓				✓	✓	✓	✓	✓
NO	GA7	✓	✓	✓	✓	✓			✓	✓			✓	✓	✓	✓	✓
PL	U37	✓				✓				✓				✓	✓	✓	✓
PL	U36	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓
PL	RI19	✓	✓	✓		✓		✓	✓	✓			✓	✓	✓		✓
RO	RI17	✓		✓		✓							✓			✓	✓
RO	RI16	✓				✓									✓		✓
RO	RI11	✓	✓	✓	✓	✓	✓		✓				✓		✓	✓	✓
SE	U3															✓	✓
SE	U25	✓	✓	✓				✓				✓					✓
SE	U14	✓				✓			✓					✓		✓	✓
SE	U13	✓	✓			✓											✓
SE	GA6	✓				✓			✓					✓			✓
SI	RI14	✓	✓	✓	✓	✓		✓				✓	✓	✓	✓	✓	
UK	U6	✓		✓		✓		✓	✓	✓	✓	✓		✓	✓	✓	✓
UK	U38	✓	✓		✓	✓			✓					✓		✓	✓
UK	U26	✓				✓	✓							✓			
UK	U12	✓	✓	✓	✓		✓							✓		✓	✓
UK	RI8	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK	GA3	✓	✓	✓	✓	✓		✓	✓	✓			✓			✓	✓
UK	C1	✓	✓		✓	✓		✓								✓	✓

A3.1b. For which particular ecosystem (T=Terrestrial, F=Freshwater, M=Marine, E=Estuaries) are specific organisms studied by the different organisations?

Country	Organisation	Plants	Micro-organisms	Invertebrates	Mammals	Birds	Reptiles	Amphibians	Fish	Fungi	Lichens and bryophytes	Other
AT	U27	T	T		M					T	T	
BE	RI18	T	T							T		T M F E
BG	RI15	T M E			T					T	T	
CH	U29	T F			T						F	
CH	GA8	T			T				F	T		
CZ	U35	T F							F	T	T	
CZ	U33	T								T	T	T
CZ	RI23	T F E										
DE	U31	T F	T F	T F								
DE	U28	T			T				F	T		
DE	U23	T	T							T		
DE	U21	T										
DE	RI4	T F										
DE	RI26	T	T	T								T
DE	RI10	T F	T		T							
DK	U32	M		M	T M				M F	T	T	
DK	U1	T M			T M				M F		T	
EE	U11										T	
ES	U4	T	T							T		
ES	U20				F							
ES	U16	T M							M F			
ES	U15	T E							M E			
ES	RI20	T		T	T				M			
FI	U8	T									T	
FI	RI22	T M F			T				M F	T	T	
FI	GA9	T M F E	M E	M E	T M F E	T M E		F	M F E	T	T	T
FR	U2	T	T	T F		T			F			
FR	RI7	T M F E	T	T M F	T				M F		T F	T
FR	RI21	T F	T M F	T	T				F E	T	T	
GR	U30	T	T	T							T	
IT	U18	T										
IT	RI13			T								
LT	GA1	T			T				M F E			
LV	GA5	T M							M			
NO	U5	T F							F		F	
NO	U24	M		M					M F E	T	T	T M
NO	U22	T			T					T	T	
NO	RI6	T			T	T			F		T	
NO	RI12	T M F	M	M	M				M F	T	T	
NO	GA7	T M			T M	T M			M F E	T	T	
PL	U37	T				T				T	T	
PL	U36	T M F E	M F E	T M F E	T M E	T M F E			M F E	T	T	
PL	RI19	M		T	T	T M F			M	T	T	
RO	RI17	T F							F			
RO	RI16	T									T	
RO	RI11	T F	T		T				M F E		T	T
SE	U3											T M F E
SE	U25			M				T F				
SE	U14	T			T					T		
SE	U13	T M										
SE	GA6	T			T					T		
SI	RI14	T M F E		T M				F	M F	T	T	
UK	U6	T		T	T	T	T	T F		T	T	
UK	U38	T M E			T					T		
UK	U26	T	T							T		
UK	U12		T M F E							T		T
UK	RI8	T E	T	T E	T E	T E	T	T	F	T	T	
UK	GA3	T M F E		M F E	T M F E	T			M F E			
UK	C1	T M E		T M E								

A3.2a. For which ecosystems do the different institutes perform radiation laboratory or field experiments and which radiation type do they apply or study?

		Ecosystem laboratory				Ecosystem field				Radiation type				
Country	Organisation	Terrestral	Marine	Freshwater	Estuaries	Terrestral	Marine	Freshwater	Estuaries	Alfa	Beta	Gamme	Internal	External
BE	RI18	✓		✓		✓		✓	✓	✓	✓	✓	✓	✓
BG	RI15									✓	✓	✓		
CH	U34									✓		✓		
CZ	U35					✓		✓		✓	✓	✓	✓	✓
CZ	U33	✓								✓		✓		✓
CZ	RI23									✓	✓	✓	✓	
DE	U31	✓		✓		✓		✓		✓	✓	✓		
DE	U23									✓		✓		
DE	RI10									✓	✓	✓	✓	✓
DK	U32					✓	✓	✓						
ES	U9									✓	✓	✓		✓
ES	U20			✓				✓		✓			✓	
ES	RI20	✓										✓		✓
FI	U8	✓												✓
FI	GA9					✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	U2									✓		✓		✓
FR	RI7	✓	✓	✓			✓			✓	✓	✓	✓	✓
FR	RI21	✓								✓	✓	✓	✓	✓
GR	U30											✓	✓	✓
IT	RI13	✓								✓				
NL	RI9													✓
NO	U24	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
PL	U37	✓				✓				✓	✓	✓		
PL	U36					✓	✓	✓	✓	✓	✓		✓	
PL	RI19					✓	✓	✓		✓	✓	✓	✓	
RO	RI16					✓					✓			
RO	RI11	✓				✓				✓	✓	✓	✓	✓
SE	U3									✓		✓		
SE	U25	✓		✓							✓	✓		✓
SE	U13										✓	✓	✓	✓
SI	RI14									✓	✓	✓		
UK	U38	✓				✓					✓	✓	✓	
UK	U26											✓		
UK	RI8	✓				✓					✓	✓	✓	✓
UK	GA3	✓	✓	✓		✓	✓							
UK	C1	✓	✓			✓	✓			✓	✓	✓		✓

A3.2b. For which particular organisms do the different organisations perform laboratory experiments?

Country	Organisation	Plants	Micro-organisms	Invertebrates	Mammals	Birds	Reptiles	Amphibians	Fish	Fungi	Lichens and bryophytes	Other
BE	RI18	T	T F		T							T M F E
BG	RI15	T M								T	T	T M F E
CH	U34	F		F								
CZ	U33	T								T	T	T
CZ	RI23	T F E										
DE	U31	T F	T F	T F							F	
DE	U23		T									
DE	RI10	T			T							
ES	U20				F							
ES	RI20				T							
FI	U8			T	T							
FR	U2											T
FR	RI7	T F	T F	T M F	T				F		F	
FR	RI21	T	T		T						T	
IT	RI13			T								
NL	RI9				T							
NO	U24	T		M					M F E			T
PL	U37	T				T				T	T	
RO	RI11	T			T							T
SE	U3											T M F E
SE	U25							T F				
SE	U13											T
UK	U38	T										
UK	U26	T	T							T		
UK	RI8		T	T								
UK	GA3	M		T	T				M F			
UK	C1			T M								

A3.2c. For which particular organisms do the different organisations perform field experiments?

Country	Organisation	Plants	Micro-organisms	Invertebrates	Mammals	Birds	Reptiles	Amphibians	Fish	Fungi	Lichens and bryophytes	Other
BE	RI18	T F E	T F E	F E					F E		F	T M F E
BG	RI15	M										T M F E
CH	U34	F		F								
CZ	U35	T F							F	T	T	
CZ	U33											T
CZ	RI23	T F E										
DE	U31	T F	T F	T F							F	
DE	RI10	T			T							
DK	U32	M			T M				M F	T	T	
ES	U20				F							
FI	GA9	T M F E	M E	M E	T M F E	T M E	T	T F	F E	T	T	
FR	RI7	M										
NO	U24								M F E			
PL	U37	T								T	T	
PL	U36	T M F E	T M F E	T M F E	T E	T M F E			M F E	T	T F	
PL	RI19	M		T	T	T M F			M	T	T	
RO	RI16	T									T	T
RO	RI11	T										
UK	U38	T										
UK	RI8		T	T	T							
UK	GA3		T	T M	T							
UK	C1			T M								

A3.3. Which other contaminants are studied by the different organisations?

Country	Organisation	Contaminants				
		Heavy metals	Dioxines	PAH	PCB	Pesticides
AT	U27	✓	✓	✓	✓	✓
BE	RI18	✓				
BG	RI15	✓				
CH	U34	✓				
CZ	U35	✓			✓	
CZ	U33	✓				
CZ	RI23	✓		✓		
DE	U31	✓				✓
DE	U23	✓		✓	✓	
DE	RI4	✓				
DE	RI26	✓				
DE	RI10	✓	✓	✓	✓	✓
EE	U11	✓				
ES	U9	✓		✓	✓	✓
ES	U4	✓				
ES	U20	✓		✓		
ES	U16	✓		✓		✓
ES	U15	✓			✓	✓
ES	RI20	✓	✓			
FI	U8	✓	✓	✓		✓
FI	RI1	✓				
FI	GA9	✓				
FR	U2	✓	✓	✓		✓
FR	RI7	✓				
FR	RI21	✓			✓	
GR	U30	✓				✓
IT	U18	✓				✓
LT	GA4	✓		✓	✓	✓
NL	RI9	✓			✓	✓
NO	U24	✓				✓
NO	U22	✓	✓	✓	✓	✓
NO	RI6	✓		✓	✓	
NO	RI12	✓				
PL	U37	✓				
PL	U36	✓				
PL	RI19	✓				
RO	RI11	✓				✓
SE	U3	✓				
SE	U25		✓		✓	✓
SE	GA6	✓	✓	✓		✓
UK	U7	✓	✓	✓	✓	✓
UK	U6	✓	✓	✓	✓	✓
UK	U38	✓				
UK	U26	✓	✓	✓	✓	
UK	U12	✓				
UK	RI8	✓	✓	✓	✓	✓
UK	GA3	✓	✓	✓	✓	✓

A3.4a. What is the application field of the models?

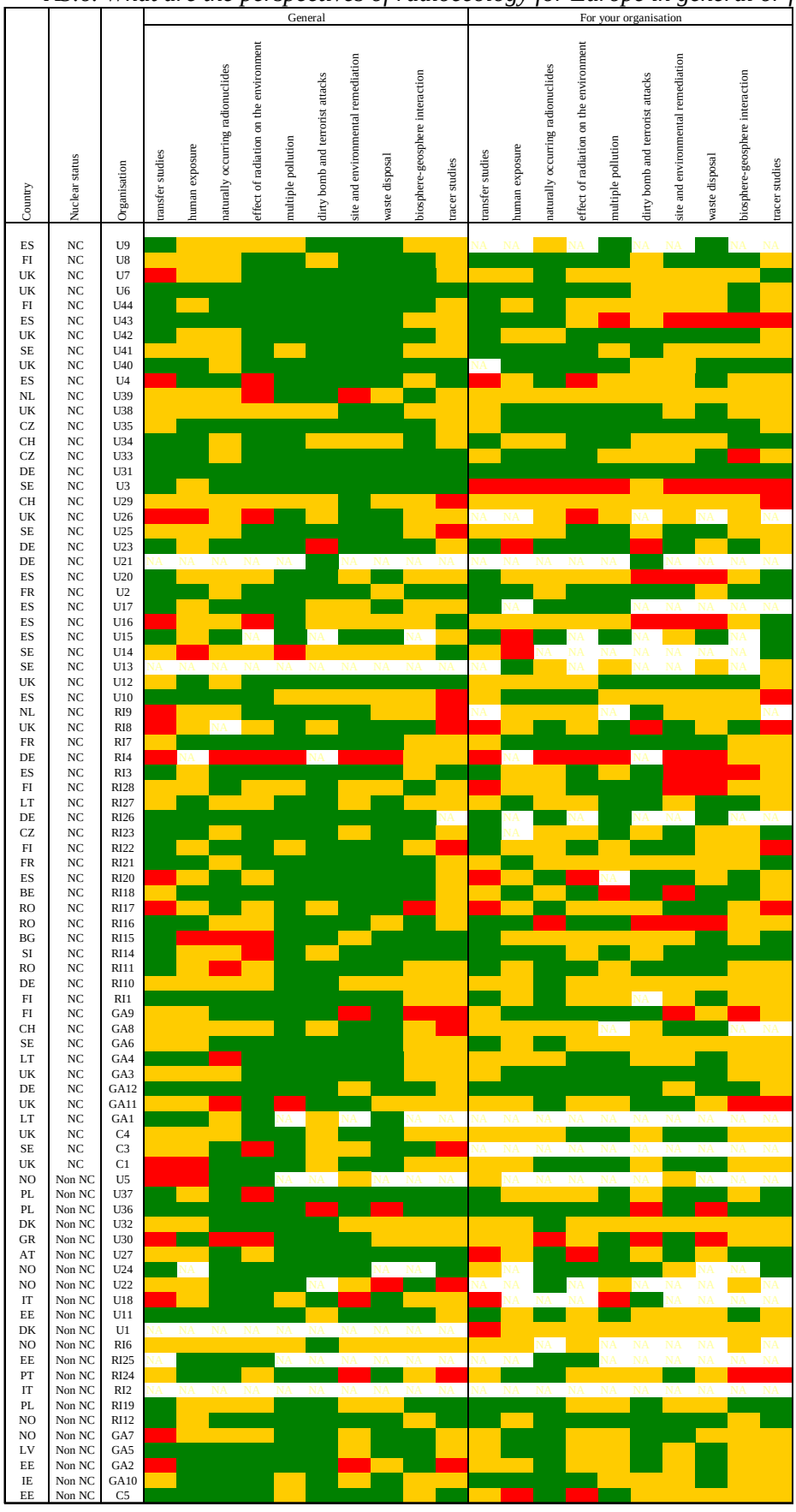
Country	Organisation	Agricultural	Forest/seminatural	Aquatic (marine)	Aquatic (freshwater)	Atmospheric	Soil	Geosphere	Remediation	Urban
AT	U27	✓								
BE	RI18	✓	✓		✓	✓	✓	✓	✓	
BG	RI15			✓						
CZ	U35			✓	✓	✓	✓			✓
CZ	U33				✓		✓	✓		
DE	U31				✓		✓		✓	
DE	U28		✓		✓		✓			
DE	U21			✓	✓	✓	✓			
DE	RI10	✓	✓	✓	✓	✓	✓	✓	✓	✓
DK	U32	✓		✓			✓			✓
DK	U1	✓								
EE	U11				✓	✓	✓		✓	
EE	GA2					✓	✓	✓		
ES	U4	✓	✓				✓		✓	
ES	U20	✓	✓	✓	✓		✓			
ES	U17					✓				
ES	U10					✓	✓			
ES	RI20	✓	✓	✓	✓	✓	✓	✓	✓	✓
FI	RI22	✓	✓	✓	✓	✓	✓		✓	✓
FI	GA9		✓		✓				✓	
FR	RI7	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	RI21	✓	✓		✓	✓	✓	✓		
IT	U18	✓				✓				
IT	RI5				✓					
IT	RI2	✓	✓				✓			
LV	GA5	✓					✓		✓	✓
NL	RI9	✓		✓	✓	✓	✓	✓	✓	
NO	U5				✓				✓	
NO	U24			✓	✓		✓			
NO	RI12	✓			✓	✓	✓			
NO	GA7	✓	✓	✓		✓	✓		✓	
PL	U37	✓					✓			
RO	RI16				✓	✓	✓			
RO	RI11	✓		✓	✓	✓	✓	✓	✓	✓
SE	U3			✓	✓		✓			
SE	U25			✓	✓					
SE	U14	✓					✓		✓	
SE	U13					✓				
SE	GA6		✓							
SE	C3		✓							✓
SI	RI14	✓			✓	✓	✓			✓
UK	U6			✓	✓					
UK	U38	✓	✓	✓			✓		✓	
UK	U26	✓	✓				✓			
UK	U12							✓		
UK	RI8	✓	✓	✓			✓		✓	✓
UK	GA3	✓	✓	✓	✓	✓	✓			
UK	C4	✓	✓	✓	✓		✓	✓	✓	
UK	C2	✓			✓	✓	✓			
UK	C1	✓	✓	✓	✓	✓	✓	✓		

A3.4b. What is covered by the organisations' models?

Country	Nuclear status	Organisation	Routine discharges	Accident	Radionuclides present in the environment (e.g. naturally occuring radionuclides, fallouts)	Transfer processes	Dose to biota	Dose to human	Ecological risk assessment	Human risk assessment
ES	NC	RI20	✓	✓	✓	✓	✓	✓	✓	✓
BE	NC	RI18	✓	✓	✓	✓	✓	✓	✓	✓
RO	NC	RI11	✓	✓	✓	✓	✓	✓	✓	✓
UK	NC	RI8	✓	✓	✓	✓	✓	✓	✓	✓
IT	Non NC	RI5	✓	✓	✓	✓	✓	✓	✓	✓
UK	NC	C1	✓	✓	✓	✓	✓	✓	✓	✓
SI	NC	RI14	✓	✓	✓	✓	✓	✓		✓
UK	NC	GA3	✓		✓	✓	✓	✓	✓	✓
FR	NC	RI7	✓	✓	✓	✓	✓	✓	✓	
NO	Non NC	GA7	✓	✓	✓	✓	✓	✓		
NO	Non NC	RI12	✓	✓		✓		✓		✓
UK	NC	U6	✓		✓	✓	✓		✓	
ES	NC	U4	✓	✓	✓	✓			✓	
DK	Non NC	U1		✓	✓	✓		✓		✓
UK	NC	U26		✓		✓		✓		
IT	Non NC	RI2	✓	✓		✓				

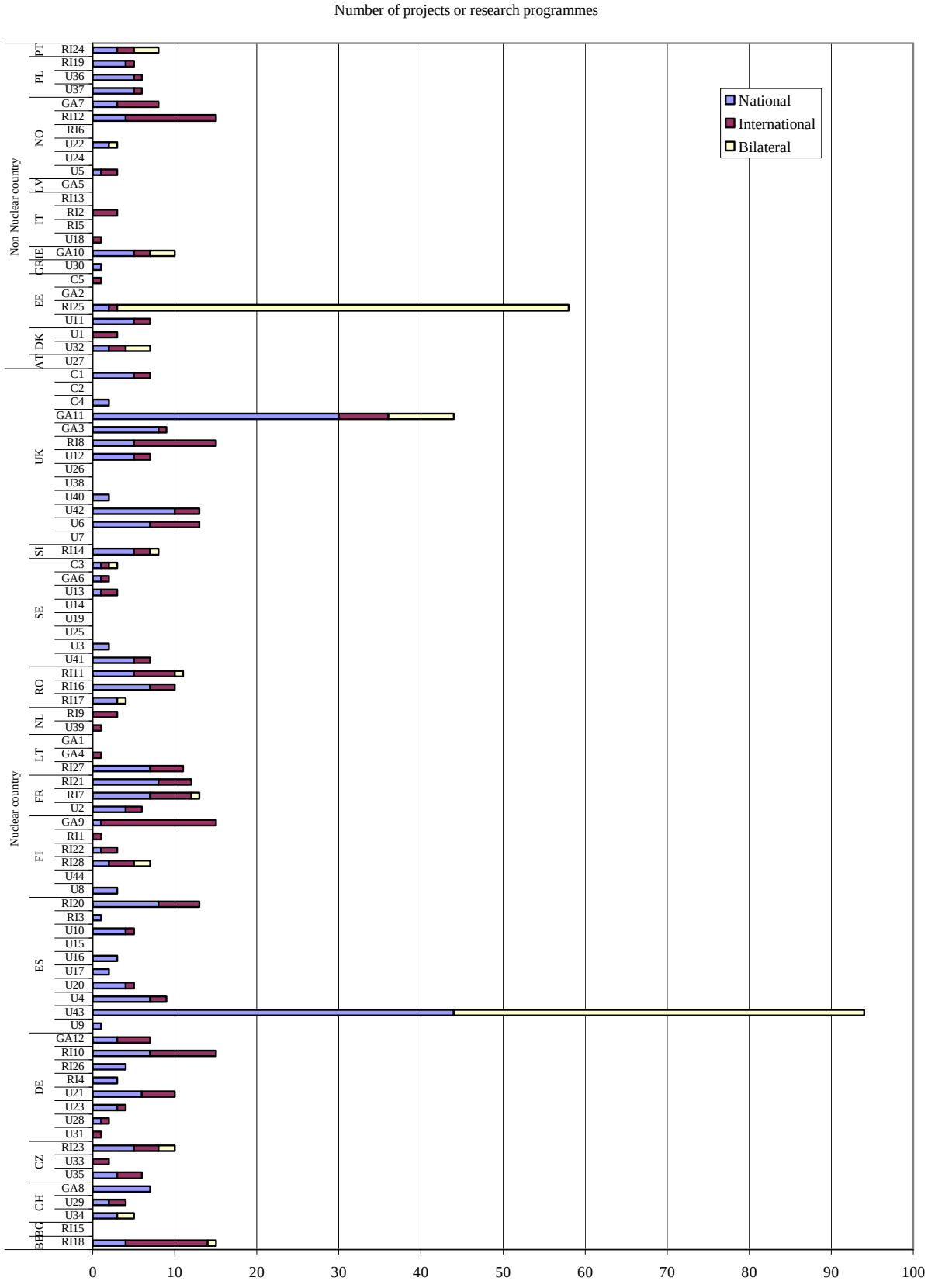
Nuclear status	Country	Organisation	Publications in peer reviewed journals	Conference proceedings	Reports	Books	Book chapters	PhD thesis	Master thesis
Non NC	AT	U27	14	11			1		
NC	BE	RI18	89	105	147	1	11	3	35
NC	BG	RI15	40	30				1	5
NC	CH	GA8			5				1
NC	CH	U34	2						
NC	CH	U29	9				1	1	
NC	CZ	RI23	24	21		1	5	7	15
NC	CZ	U35	60	100	10	2	4	3	6
NC	CZ	U33	16	11	5			2	5
NC	DE	GA12	5	8	6				
NC	DE	RI26	4	14	5				
NC	DE	RI10	33	4	2				
NC	DE	RI4	4	15				1	1
NC	DE	U31	6	37	6			1	16
NC	DE	U28	7	30				1	
NC	DE	U23	3	2					
NC	DE	U21	4	19	2				1
Non NC	DK	U32	192	94					
Non NC	DK	U1	1	8	12				
Non NC	EE	C5							
Non NC	EE	GA2	0	2	0	0	0	0	0
Non NC	EE	RI25							
Non NC	EE	U11	2	11	4				1
NC	ES	RI20	25	8	2	6		5	
NC	ES	RI3							
NC	ES	U43				5			
NC	ES	U20	15	20	10		5	1	
NC	ES	U17	4					2	
NC	ES	U16	12					1	
NC	ES	U15	15	12	5		2	4	10
NC	ES	U10							
NC	ES	U9	9					1	1
NC	ES	U4	35	43	16		5	4	5
NC	FI	GA9	88	64	125	5	40	4	10
NC	FI	RI28	8	26	1		1		1
NC	FI	RI22							
NC	FI	RI1	3	10	6	2			
NC	FI	U44	13	15	1			3	5
NC	FI	U8			2				1
NC	FR	RI21	100	35				20	
NC	FR	RI7	78	246				8	
NC	FR	U2	5	70			11	2	30
Non NC	GR	U30	8	5					
Non NC	IE	GA10							
Non NC	LT	GA4	4	6	1			1	
Non NC	LT	GA1	21	23	7	3		3	
Non NC	LT	RI27	11	15	10	1	1	2	
Non NC	IT	RI13		1	1				1
Non NC	IT	RI5	11	1	7		1		
Non NC	IT	RI2	5	10	4		4	1	
Non NC	IT	U18	9	8				2	
Non NC	LV	GA5		5					
NC	NL	RI9		6					
NC	NL	U39	5	3	6				
Non NC	NO	GA7							
Non NC	NO	RI12	11	51	41		1	1	
Non NC	NO	RI6	4						
Non NC	NO	U24	66	203	61	2	14	5	4
Non NC	NO	U22	72	18	8	1	6	7	8
Non NC	NO	U5	6		9				
Non NC	PL	RI19	20	14		1		1	5
Non NC	PL	U37	16	23				1	25
Non NC	PL	U36	10	8	4	1		5	50
Non NC	PL	RI24							
NC	RO	RI17	1	6	20			3	
NC	RO	RI16	3	10	16				
NC	RO	RI11	70	40	4	2	2	8	8
NC	SE	C3	7						
NC	SE	GA6	10	10	10			2	
NC	SE	U41	7	5	5				7
NC	SE	U25	8	5				2	
NC	SE	U19							
NC	SE	U14						1	7
NC	SE	U13						1	3
NC	SE	U3	10	4	4	1		3	2
NC	SI	RI14	54	7				4	1
NC	UK	C4							
NC	UK	C2	7	7	17				
NC	UK	C1	82	51	0			2	
NC	UK	GA11	8	15	100				
NC	UK	GA3			40				
NC	UK	RI8	62	39	47	6	9	3	1
NC	UK	U42	16	7	15			11	
NC	UK	U40	3						
NC	UK	U38	10	10	5		3	5	2
NC	UK	U26	20					5	
NC	UK	U12	20			1		10	2
NC	UK	U7	7					3	7
NC	UK	U6	16	3	10			3	

A3.6. What are the perspectives of radioecology for Europe in general or for the own institute?



Annex 4: Research programmes

A4.1. What is the geographical scope of projects the different organisations are involved in?



A4.2. What is the type of activities dealt with in the projects or research programmes for the different organisations?

Country	Organisation	Laboratory or field experiments	Modelling	Monitoring/surveillance
BE	RI18	✓	✓	✓
BG	RI15	✓	✓	✓
CH	U34	✓		✓
CH	U29	✓		✓
CH	GA8	✓		✓
CZ	U35	✓	✓	✓
CZ	U33	✓	✓	
CZ	RI23	✓		
DE	U31	✓	✓	✓
DE	U28	✓	✓	✓
DE	U23	✓	✓	✓
DE	U21	✓	✓	✓
DE	RI4	✓		✓
DE	RI26	✓		
DE	RI10	✓	✓	
DK	U32	✓	✓	✓
DK	U1		✓	✓
EE	U11	✓	✓	
ES	U9	✓		✓
ES	U4	✓	✓	
ES	U20	✓	✓	✓
ES	U17			✓
ES	U16	✓	✓	✓
ES	U10	✓	✓	✓
ES	RI3			✓
ES	RI20	✓	✓	✓
FI	U8	✓		
FI	RI22	✓	✓	
FI	RI1	✓		
FI	GA9	✓	✓	✓
FR	U2	✓	✓	✓
FR	RI7	✓	✓	✓
FR	RI21	✓	✓	✓
GR	U30	✓		
IT	U18			✓
IT	RI2		✓	✓
LT	GA4			✓
NL	RI9		✓	
NO	U5		✓	✓
NO	U22	✓		✓
NO	RI12	✓	✓	✓
NO	GA7	✓	✓	✓
PL	U37		✓	✓
PL	U36	✓		
PL	RI19			✓
RO	RI17	✓	✓	✓
RO	RI16	✓	✓	✓
RO	RI11	✓	✓	✓
SE	U3	✓	✓	
SE	U14	✓	✓	✓
SE	U13	✓		✓
SE	GA6	✓	✓	
SE	C3		✓	
SI	RI14	✓	✓	✓
UK	U6	✓	✓	✓
UK	U26		✓	
UK	U12	✓	✓	
UK	RI8	✓	✓	✓
UK	GA3	✓	✓	✓
UK	C4		✓	
UK	C2		✓	
UK	C1	✓	✓	✓

A4.3. What is covered by the projects or research programmes organisations are involved in?

Country	Organisation	Transfer processes	Biota exposure	Dose-effects relationship for non-human species	Human exposure	Ecological risk assessment	Human risk assessment
BE	RI18	✓	✓	✓	✓	✓	✓
BG	RI15	✓	✓			✓	
CH	U34	✓	✓	✓		✓	
CH	U29	✓			✓	✓	
CH	GA8	✓			✓		
CZ	U35	✓	✓	✓	✓	✓	✓
CZ	U33					✓	
CZ	RI23	✓	✓			✓	
DE	U31	✓	✓	✓		✓	
DE	U28	✓				✓	
DE	U23	✓				✓	
DE	U21	✓	✓		✓	✓	✓
DE	RI4	✓			✓		
DE	RI26	✓					
DE	RI10	✓	✓	✓	✓	✓	✓
DK	U32	✓			✓		✓
DK	U1	✓	✓		✓		✓
EE	U11	✓			✓		✓
ES	U9					✓	✓
ES	U4	✓				✓	✓
ES	U20	✓		✓	✓	✓	✓
ES	U17					✓	✓
ES	U16	✓			✓	✓	
ES	U10	✓	✓		✓		
ES	RI3				✓	✓	✓
ES	RI20	✓	✓	✓	✓	✓	
FI	U8	✓	✓			✓	
FI	RI22	✓	✓	✓	✓	✓	✓
FI	RI1	✓					
FI	GA9	✓	✓	✓	✓	✓	✓
FR	U2	✓	✓			✓	✓
FR	RI7	✓	✓	✓	✓	✓	✓
FR	RI21	✓	✓	✓	✓	✓	✓
GR	U30	✓				✓	
IT	U18						✓
IT	RI2				✓		
LT	GA4					✓	
NL	RI9	✓	✓		✓	✓	✓
NO	U5	✓	✓		✓	✓	
NO	U22	✓					
NO	RI12	✓	✓	✓	✓		✓
NO	GA7	✓	✓	✓	✓	✓	✓
PL	U37	✓			✓	✓	
PL	U36	✓	✓	✓	✓	✓	✓
PL	RI19	✓					
RO	RI17	✓			✓	✓	✓
RO	RI16	✓			✓		✓
RO	RI11	✓	✓	✓	✓	✓	✓
SE	U3	✓				✓	
SE	U13	✓	✓		✓	✓	✓
SE	GA6	✓			✓	✓	✓
SE	C3	✓	✓	✓	✓	✓	✓
SI	RI14	✓	✓	✓	✓	✓	✓
UK	U6	✓	✓	✓	✓	✓	✓
UK	U26	✓			✓		
UK	U12	✓	✓		✓	✓	
UK	RI8	✓	✓	✓	✓	✓	✓
UK	GA3	✓	✓	✓	✓	✓	✓
UK	C4	✓					✓
UK	C2	✓			✓		✓
UK	C1	✓	✓	✓		✓	

A4.4. What is the application field of the projects or research programmes organisations are involved in?

Country	Organisation	Routine discharges	Accident	Radionuclides present in the environment	Multiple pollution	RDD and radiological attacks	Site and environmental remediation	Waste disposal	Biopshere-geosphere interaction	Tracer studies
BE	RI18	✓	✓	✓	✓		✓	✓	✓	✓
BG	RI15	✓	✓	✓	✓	✓		✓		
CH	U34	✓	✓	✓	✓		✓			✓
CH	U29			✓		✓			✓	
CH	GA8	✓		✓			✓			
CZ	U35	✓	✓	✓	✓			✓	✓	✓
CZ	U33			✓			✓	✓		✓
CZ	RI23				✓		✓			✓
DE	U31			✓	✓	✓	✓	✓	✓	
DE	U28	✓	✓							
DE	U23			✓					✓	
DE	U21	✓	✓	✓		✓		✓		✓
DE	RI4			✓			✓			
DE	RI26	✓		✓	✓				✓	
DE	RI10	✓	✓	✓			✓	✓	✓	✓
DK	U32	✓	✓	✓		✓			✓	
DK	U1			✓						✓
EE	U11	✓	✓	✓			✓	✓		
ES	U9			✓						
ES	U4	✓	✓	✓	✓	✓	✓	✓	✓	✓
ES	U20			✓						✓
ES	U17			✓						
ES	U16			✓	✓					✓
ES	U10	✓	✓	✓						
ES	RI3		✓	✓		✓				
ES	RI20	✓	✓	✓	✓		✓	✓	✓	✓
FI	U8			✓				✓		
FI	RI22	✓	✓	✓			✓			
FI	RI1			✓						
FI	GA9	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	U2		✓	✓					✓	
FR	RI7	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	RI21	✓	✓	✓	✓		✓	✓	✓	✓
GR	U30			✓	✓		✓			
IT	U18		✓			✓				
IT	RI2	✓	✓	✓						
LT	GA4			✓						
NL	RI9	✓	✓	✓	✓			✓		
NO	U5	✓	✓	✓			✓			
NO	U22	✓	✓	✓	✓				✓	
NO	RI6			✓	✓		✓			
NO	RI12	✓	✓	✓	✓	✓	✓	✓		✓
NO	GA7	✓	✓	✓	✓	✓	✓			
PL	U37	✓		✓	✓					
PL	U36	✓	✓	✓				✓	✓	
PL	RI19			✓						
RO	RI17	✓	✓	✓				✓		
RO	RI16	✓	✓	✓						✓
RO	RI11	✓	✓	✓	✓		✓	✓	✓	✓
SE	U3			✓	✓			✓	✓	✓
SE	U13							✓		
SE	GA6			✓		✓		✓		
SE	C3	✓	✓	✓				✓	✓	
SI	RI14	✓	✓	✓	✓		✓	✓	✓	✓
UK	U6	✓	✓	✓	✓				✓	
UK	U26		✓							
UK	U12	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK	RI8	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK	GA3	✓		✓			✓	✓	✓	
UK	C4	✓	✓							
UK	C2	✓	✓					✓	✓	
UK	C1	✓	✓	✓	✓					✓

Annex 5: Infrastructure

A5.1: General indication of available infrastructure for specific experiment types and indication of radioanalysis capacity

Country	Organisation	Do you have laboratory facilities for studying radionuclide availability or migration?	Do you have laboratory facilities for conducting transfer experiments on organisms?		Do you have laboratory facilities for conducting internal radiation experiments on organisms ?		Do you have laboratory facilities for conducting external radiation experiments on organisms ?		Do you conduct low level radioanalysis ?		
			Terrestrial	Aquatic	Terrestrial	Aquatic	Terrestrial	Aquatic	Alpha	Beta	Gamma
BE	RI18	✓	✓		✓		✓	✓	✓	✓	✓
BG	RI15	✓	✓	✓					✓	✓	✓
CH	U34	✓							✓		✓
CH	U29	✓							✓	✓	✓
CH	GA8	✓								✓	✓
CZ	U35	✓							✓	✓	✓
CZ	U33	✓									
CZ	RI23	✓	✓	✓	✓	✓				✓	✓
DE	U31	✓	✓	✓	✓	✓	✓	✓			✓
DE	U28	✓							✓		✓
DE	U23	✓	✓								
DE	U21	✓							✓	✓	✓
DE	RI26	✓									
DE	RI10	✓	✓						✓	✓	✓
DE	GA12	✓	✓		✓		✓		✓	✓	✓
DK	U32	✓							✓	✓	✓
EE	U11	✓							✓		✓
EE	RI25						✓		✓	✓	
EE	GA2	✓									
EE	C5	✓		✓					✓	✓	✓
ES	U9								✓	✓	✓
ES	U43	✓					✓	✓	✓	✓	✓
ES	U4	✓	✓						✓	✓	✓
ES	U20	✓							✓	✓	✓
ES	U17								✓	✓	✓
ES	U16	✓		✓					✓	✓	✓
ES	U15	✓									
ES	U10	✓							✓	✓	✓
ES	RI3						✓		✓	✓	✓
ES	RI20	✓							✓	✓	✓
FI	U8						✓				
FI	U44	✓					✓	✓	✓	✓	✓
FI	RI28								✓	✓	✓
FI	RI22	✓							✓	✓	✓
FI	RI1	✓									
FI	GA9	✓			✓				✓	✓	✓
FR	U2		✓	✓							
FR	RI7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	RI21	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
GR	U30	✓	✓								✓
IE	GA10	✓	✓	✓					✓	✓	✓
IT	U18	✓									✓
IT	RI2						✓				
LT	RI27								✓	✓	✓
LT	GA1	✓							✓	✓	✓
LV	GA5	✓								✓	✓
NL	RI9						✓		✓	✓	✓
NO	U24	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
NO	RI6										✓
NO	RI12	✓					✓	✓	✓	✓	✓
NO	GA7	✓							✓	✓	✓
PL	U37	✓							✓	✓	✓
PL	U36	✓							✓	✓	
PL	RI19								✓	✓	✓
PT	RI24	✓	✓	✓	✓		✓		✓	✓	✓
RO	RI17	✓	✓	✓						✓	✓
RO	RI16	✓								✓	
RO	RI11	✓	✓		✓		✓		✓	✓	✓
SE	U41	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
SE	U3	✓	✓	✓					✓	✓	✓
SE	U25			✓		✓					
SE	U14	✓	✓							✓	✓
SE	U13	✓			✓					✓	✓
SE	GA6	✓	✓		✓		✓		✓	✓	✓
SE	C3						✓				
SI	RI14	✓	✓						✓	✓	✓
UK	U7								✓	✓	✓
UK	U6	✓							✓		✓
UK	U42	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK	U40	✓	✓	✓	✓	✓				✓	✓
UK	U38	✓	✓								✓
UK	U26	✓	✓				✓				
UK	U12	✓							✓	✓	✓
UK	RI8	✓	✓	✓					✓	✓	✓
UK	GA11	✓	✓						✓	✓	✓
UK	C1	✓	✓	✓			✓	✓	✓	✓	✓

A5.2: Available equipment at the different organisations

Country	Organisation	Whole body counter	ICP-MS	ICP-AES	HPIC	HPLC	Gas chromatographs	TEM	XRF	Nuclear microprobe	RT-PCR	Micro-array	Flow cytometry	LSC (Liquid scintillation counter)	Alpha-spectrometry	Gamma-spectrometry
BE	RI18	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
BG	RI15			✓			✓		✓					✓	✓	✓
CH	GA8		✓											✓	✓	✓
CH	U29					✓								✓	✓	✓
CH	U34		✓			✓	✓								✓	✓
CZ	RI23	✓				✓	✓							✓		✓
CZ	U33					✓	✓		✓	✓	✓	✓		✓	✓	✓
CZ	U35	✓				✓	✓		✓					✓		✓
DE	RI10	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓	✓	✓
DE	RI26		✓	✓	✓	✓	✓		✓							
DE	U21													✓	✓	✓
DE	U23	✓	✓	✓		✓	✓	✓			✓	✓		✓		
DE	U28													✓	✓	✓
DE	U31	✓	✓	✓	✓	✓	✓	✓	✓		✓					✓
DK	U1															✓
DK	U32	✓	✓	✓		✓		✓						✓	✓	✓
EE	GA2													✓		✓
EE	U11								✓					✓		✓
ES	RI20		✓			✓	✓							✓	✓	✓
ES	RI3					✓	✓				✓		✓	✓	✓	✓
ES	U10		✓		✓	✓	✓	✓						✓	✓	✓
ES	U15		✓	✓		✓	✓		✓					✓	✓	✓
ES	U16		✓				✓							✓	✓	✓
ES	U17				✓	✓	✓					✓	✓	✓		✓
ES	U20		✓			✓	✓		✓		✓		✓		✓	✓
ES	U4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ES	U9			✓		✓									✓	✓
FI	GA9	✓												✓	✓	✓
FI	RI1		✓	✓					✓							✓
FI	RI22		✓	✓	✓	✓	✓	✓	✓					✓	✓	✓
FI	U8					✓	✓	✓			✓	✓	✓	✓		✓
FR	RI21	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FR	RI7		✓	✓		✓	✓	✓			✓		✓	✓	✓	✓
FR	U2					✓	✓	✓			✓					✓
GR	U30															✓
IT	RI13	✓	✓				✓					✓	✓	✓	✓	✓
IT	U18		✓	✓		✓	✓	✓						✓		✓
LT	GA1	✓												✓	✓	✓
LT	GA4				✓	✓	✓					✓			✓	✓
LV	GA5													✓	✓	✓
NL	RI9	✓	✓	✓	✓	✓	✓							✓	✓	✓
NO	GA7	✓												✓		
NO	RI12	✓				✓	✓	✓						✓	✓	✓
NO	RI6															✓
NO	U22		✓			✓	✓									
NO	U24		✓	✓				✓	✓				✓	✓	✓	✓
PL	RI19						✓		✓			✓		✓	✓	✓
PL	U36			✓		✓	✓							✓	✓	✓
PL	U37					✓	✓		✓					✓	✓	✓
RO	RI11	✓				✓	✓	✓	✓					✓	✓	✓
RO	RI16						✓							✓		
RO	RI17		✓			✓			✓					✓	✓	✓
SE	GA6	✓	✓			✓	✓					✓		✓	✓	✓
SE	U13									✓				✓		✓
SE	U14		✓	✓		✓	✓							✓		✓
SE	U3														✓	✓
SI	RI14		✓	✓		✓	✓							✓		
UK	C1													✓	✓	✓
UK	GA3		✓	✓	✓	✓	✓									
UK	RI8		✓	✓			✓						✓	✓	✓	✓
UK	U12		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
UK	U26		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓
UK	U38									✓				✓		✓
UK	U6		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK	U7		✓			✓	✓							✓	✓	✓