

Programme H. PROTECTION OF THE MARINE AND TERRESTRIAL ENVIRONMENT

Rationale: The United Nations Conference on Environment and Development (UNCED) held in Rio in 1992 produced several agreements including Agenda 21 and the 27 principles of the Rio Declaration. Many of them addressed environmental issues and emphasized that, in order to achieve sustainable development, environmental protection efforts conducted at the international level should be an integral part of the development process. In 2002 this global commitment to sustainable development was once again reinvigorated at the World Summit on Sustainable Development (WSSD) held in Johannesburg. Here a comprehensive review and assessment of the progress achieved since Rio was carried out and recommendations for future actions were made for the maintenance of a high quality of the ocean and fresh waters, soil, air and other natural resources without compromising industrial and agriculture production.

In the framework of its mandate aiming at encouraging and assisting practical applications of, and research on, nuclear techniques for development and environmental health, and responding to the request of its Member States, the Agency has over the years demonstrated that these play an important role in the protection of the environment from radioactive and non-radioactive pollutants. Within this programme, the transfer and behaviour of radionuclides and non-radioactive pollutants in the marine as well as terrestrial environment are investigated to develop and improve transfer models used for impact assessments and to elaborate appropriate remediation strategies for stakeholders dealing with environmental issues. New aspects of the programme are the strengthening of radioecology for the protection of terrestrial environments and contribution to climate change investigations.

The programme will contribute to the ecological and economic sustainability and conservation of clean and healthy environments, and risk assessment and reduction for human well-being. It will further provide scientific information and assistance to international organizations such as WHO, UNDP, UNEP and FAO and enhance capacity building of Member States in Eastern Europe, South America, Africa and Asia experiencing elevated levels of radiation or pollution of either natural or anthropogenic origin.

Objective: To enhance the capability of Member States in the use of nuclear techniques for the identification and mitigation of environmental problems caused by radioactive and non-radioactive pollutants.

Outcomes
<ul style="list-style-type: none"> — Improved understanding in Member States of the transfer, behaviour and fate of pollutants in the environment through the use of nuclear techniques. — Increased use in Member States of the Agency’s recommended techniques for monitoring and protecting the environment. — Identification of specific environmental problems and assistance to Member States in the prediction of the environmental fate of pollutants and the implementation of remediation strategies.
Performance Indicators
<ul style="list-style-type: none"> — Number of institutions in Member States adopting the Agency’s recommended techniques for monitoring environmental pollutants. — Number of institutions in Member States making use of the Agency’s recommended techniques and models to assess the fate of radioactive and non-radioactive pollutants in the environment. — Number of Member States utilizing the Agency’s expertise for implementing environmental remediation strategies.

Specific criteria for prioritization: Activities which:

- Lead to worldwide improvements in the quality of environmental contaminant data on radionuclides and other pollutants and in the methodology used to obtain them;
- Provide an increased understanding of critical physical, chemical and biological processes which affect the dispersion and fate of nuclear and other materials released in the environment;
- Focus on environmentally fragile and sensitive locations (e.g. coastal zones or areas affected by industrialization);
- Use nuclear techniques, plus relevant ancillary supporting methodologies, to address high priority environmental issues identified by Member States, and other intergovernmental and international organizations.

Subprogramme H.1. Measurement and Assessment of Radionuclides in the Marine Environment

Rationale: The marine environment has been widely impacted by nuclear activities and the measurement and assessment of this impact requires further investigation. Member States need information on the present levels of radioactive and stable isotopes in the marine environment in order to evaluate trends, to study oceanographic processes and climate change,

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and to predict future conditions. This assessment requires the quantification of natural and anthropogenic sources of radionuclides in the world's oceans and seas, computer modelling of the dispersion of radionuclides, and water and sediment dynamics studies. Nuclear and isotopic techniques provide tools to investigate oceanographic processes and marine contamination on a quantitative basis and to address the problems of coastal zone management.

Demand driven programmes of assistance to Member States in the quality management of laboratories, capacity building, design and implementation of monitoring programmes, and the provision of training will further improve the understanding and protection of the marine environment. The Agency acts in the framework of the United Nations Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities (GPA) as a clearing house of information on radioactive contamination in the marine environment, and provides advice and assistance on marine radioactivity to Member States (in Europe, North Africa, East Asia, Latin America, South Pacific region), as well as to regional and international bodies, such as the Oslo–Paris Commission for Protection of the Marine Environment of the NE Atlantic (OSPAR), the Helsinki Commission, the Barcelona Convention, and the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP).

This subprogramme concentrates on marine radioactivity assessment and contamination studies in the coastal regions and open seas with technical assistance to Member States, on the provision of radionuclide data, on climate change studies, on implementation of quality assurance programmes in Member State laboratories and provision of reference materials, on training and capacity building, and on the development of methods for analysis of radionuclides in the environment in response to emergencies.

Objective: To enable Member States to assess current and future levels of radioactive and stable isotopes in the marine environment as affected by processes in the water column and sediment, efficiently manage marine coastal zones and understand climate change phenomena.

Outcomes
<ul style="list-style-type: none"> — Use by Member State laboratories of nuclear and isotopic techniques transferred by the Agency in the studies of radioactive contamination and climate change, and for addressing the problems of coastal zones with socioeconomic impact on the management of groundwater resources in coastal zones, the intrusion of seawater into coastal land, fisheries and sustainable development of coastal zones.

Outcomes (cont'd)
<ul style="list-style-type: none"> — Use of the Agency's Marine Information System (MIS) as a systematic approach for the design, implementation and operation of a database on the relation between radioactive and stable isotopes and oceanographic parameters. — New knowledge and objective evaluation of the distribution and behaviour of radionuclides in the marine environment and their impact on humans and marine biota.
Performance Indicators
<ul style="list-style-type: none"> — Number, as well as performance, of Member State laboratories using nuclear and isotopic techniques for studying marine processes and climate change and the amount of validated data provided to regional and international marine environmental programmes. — Increase in the number of datasets on the distribution of radioactive and stable isotopes in the marine environment provided to Member States. — Number, and impact, of reports, conference papers and publications produced by the Agency and collaborators in Member States using nuclear and isotopic techniques to study radioactive contamination and climate change.

Programme changes and trends: Assistance to Member States will continue to be offered to improve their capabilities in marine radioactivity monitoring and assessment, and in addressing the problems of integrated coastal zone management. A major change is the shift of emphasis from the open ocean to coastal zone marine radioactivity studies. New directions will include the application of nuclear and isotopic techniques in climate change studies and the development of methods for response to emergencies. The benefit resulting from this new approach will include the provision of worldwide data on oceanographic parameters and on the distribution of radioactive and stable isotopes in the marine environment. In addition, more rapid techniques for radiological emergencies will become available. Furthermore, quality assurance in marine radioactivity assessment will be maintained, and contributions will be made to climate change studies through the use of nuclear and isotopic techniques. Increased emphasis on coastal zones will advance the understanding of radioactive contamination adversely impacting this valuable and fragile resource.

Resource changes and trends: The proposed resource level for this subprogramme represents a decrease of \$18 000 in 2004 compared with the 2003 adjusted budget as a result of redistribution between Subprogramme H.2 and this subprogramme. Resources proposed for 2005 remain at the 2004 level.

Financial resources (2003 prices)

H.1.	2003	2004	2005
Reg. budg.	1 718 000	1 700 000	1 700 000

Project H.1.01: Worldwide marine radioactivity studies in oceans and seas

Main outputs: The project will result in: an improved relational database — the Marine Information System (MIS) — containing information on the distribution and concentrations of radioactive and stable isotopes in the marine environment and on oceanographic parameters; technical guidelines on the development of national and regional databases to evaluate present levels of radioactive and stable isotopes in the marine environment and predict future conditions and trends in contamination of the marine environment; guidance to Member States for a better understanding of marine processes responsible for future contamination of the marine environment; and proceedings of an international conference on environmental isotope studies.

Duration: 2002–2005

Ranking: 1

Project H.1.02: Contamination studies in selected coastal zones (in co-operation with UNESCO)

Main outputs: The implementation of this project will result in: a package of tools to identify and quantify submarine groundwater discharge using nuclear techniques; guidelines for quantitative evaluation of the contribution of submarine groundwater discharge to the water balance in coastal zones and to the contamination of coastal waters by heavy metals and organic compounds; improved techniques for the investigation of water column processes and sediment dynamics in coastal zones; and effective integrated management of coastal zones by Member States.

Duration: 2002–2005

Ranking: 9

Project H.1.03: Climate change studies using isotopic records in the marine environment (in collaboration with ICTP, Trieste)

Main outputs: The project will produce: a package of isotopic tools for environmental change investigations based on model case studies developed during the project; sea temperature records over the past few hundred years and information on past climate changes (2006); Ocean General Circulation Model for computer modelling of the distribution of isotopes in the oceans, atmosphere–ocean coupling and climate change studies (2007); and trained personnel in the application of nuclear and isotopic methods in climate research.

Duration: 2004–2007

Ranking: 17

Project H.1.04: Analytical Quality Control Services for marine radioactivity studies

Main outputs: The main outputs of the project will be: certified reference materials for the analysis of radionuclides in marine samples; procedures for regional and global intercomparison exercises and proficiency tests; guidelines for the implementation of quality assurance/quality control programmes in Member State laboratories to strengthen their reliability; trained personnel (through the TC programme) in quality assurance/quality control programmes.

Duration: 2002–2005

Ranking: 8

Project H.1.05: Development of methods for analysis of low level radionuclide concentrations in the environment in response to emergencies

Main outputs: The project will result in: methods for low level analyses of radionuclides; guidelines for sampling, sample pre-treatment, radiochemical separation and spectrometric analyses; assistance in the use of sensitive and reliable radioanalytical techniques for the analysis of radionuclides in the marine environment; and trained personnel (through the TC programme).

Duration: 2002–2005

Ranking: 12

Subprogramme H.2. Radioecological Approaches to Coastal Contaminant Problems

Rationale: Basic knowledge about the fate of marine contaminants is critical to issues of human health and environmental protection. Monitoring contaminant levels and distributions alone is not sufficient to evaluate the degree of impact that these pollutants have on ecosystems, seafood products and humans. Sound knowledge of radionuclide behaviour and transfer processes is vital for Member States to make accurate assessment of the impacts from local nuclear releases and from those contaminants transported into territorial waters from distant sources. Furthermore, the use of radiotracers to monitor the transport of analogue stable elements and radiolabelled organic compounds offers a unique ability, compared to classical methods, to discern the behaviour and fate of important conventional pollutants (e.g. heavy metals, PCBs and pesticides) and the fate of greenhouse gases such as CO₂ in the marine environment.

Targeted research on specific marine processes is required to aid Member States in the effective management and protection of coastal zones. Therefore, in response to priorities identified by the Informal Consultative Processes (ICP), the United Nations Global Programme of Action for the

Protection of the Marine Environment from Land-based Activities (GPA), the WSSD, and various coastal Member States, this subprogramme develops and uses nuclear techniques to obtain information on the processes involved in the transfer and transport of radionuclides, conventional contaminants, toxic substances and other key elements through the coastal marine ecosystems.

Objective: To enable Member States to formulate integrated coastal zone management strategies and marine protection policies by identifying, through the use of nuclear techniques, key marine processes governing the transfer and transport of pollutants and other elements in coastal environments.

Outcomes
<ul style="list-style-type: none"> — Enhanced understanding of the transfer, behaviour and fate of key artificial radionuclides, natural radionuclides, and toxic elements and compounds in coastal waters and ecosystems. — New knowledge of processes controlling temporal and spatial variability in the downward flux and export of carbon in coastal and shelf regions and their significance in contaminant transfer and climate change. — Increased capability of Member States to use nuclear techniques for obtaining critical information on the transport and fate of pollutants and toxic substances which can impact coastal resources and environments.
Performance Indicators
<ul style="list-style-type: none"> — Number of Member States using nuclear techniques to determine the transfer, behaviour and fate of radionuclides, heavy metals and other toxic substances in marine coastal environments. — Increase in the number of reports and published papers on radionuclide and element transfer and transport processes in the coastal environments.

Programme changes and trends: The IAEA-MEL's state-of-the-art experimental aquaria facilities will continue to serve to enhance both research and practical training activities in the application of nuclear methods to assess the transfer, behaviour and fate of radionuclides and non-radioactive contaminants in the marine environment. Increased emphasis will be placed on employing radiotracer techniques to investigate the behaviour and transfer processes of radionuclides and toxic substances, particularly in those temperate and tropical coastal zones where seafood is a major part of the local diet and coral reef ecosystems are sensitive to pollutant impacts. Through thematic planning in the use of nuclear and isotopic techniques to address specific coastal zone management problems, a new project activity will support the development of a rapid, radiolabelled toxin assay which will help to mitigate the impact of harmful algal blooms (HABs). These approaches, and the shift in emphasis towards coastal zones, where many developing Member States are located, aim to provide the required information for

decision makers to ensure the safe and sustainable use of marine food resources in their coastal waters, and to properly interpret data from their contaminant monitoring programmes.

Resource changes and trends: The proposed resource level for this subprogramme represents a small increase of \$18 000 in 2004 when compared with the 2003 adjusted budget as a result of redistribution between Subprogramme H.1 and this subprogramme. Resources proposed for 2005 remain at the 2004 level.

Financial resources (2003 prices)

H.2.	2003	2004	2005
Reg. budg.	1 081 000	1 099 100	1099 100

Project H.2.01: Behaviour and transfer processes of radionuclides and analogues

Main outputs: The project will result in: new data on bioaccumulation and transfer rates of anthropogenic radionuclides in sensitive coastal environments such as tropical coral reef ecosystems, and in critical species used as food resources; scientific publications and reports containing site specific parameters required for dose models (e.g. concentration factors and retention times in edible species, transfer factors in food chains, distribution coefficients in sediments, transfer factors for sediment bound radionuclides, and vertical fluxes and residence times of radionuclides in the water column); applied radiotracer techniques and data to establish appropriate criteria for coastal zone management; and trained personnel in applied radiotracer and radionuclide measurement methodologies.

Duration: 2002–2005

Ranking: 3

Project H.2.02: Nuclear and isotopic applications to delineate carbon flux processes

Main outputs: The main products will be: a rapid nuclear technique using the disequilibria between natural uranium and thorium in sea water to indirectly estimate the removal of biologically produced carbon from the upper ocean and its vertical transport to the depths; data for comparison with carbon flux measurements using sediment traps; reports or peer reviewed scientific publications on factors governing the temporal and spatial variability of carbon flux in the coastal shelf waters from different regions, as well as the suitability of the Th–U technique for rapidly estimating carbon removal and downward flux; and trained personnel (through the TC programme) in the application of radiotracer and isotopic techniques to establish the origin and transfer pathways of carbon in the marine environment.

Duration: 2002–2005

Ranking: 13

Project H.2.03: Radiotracer techniques to study ecotoxicological processes and impacts in coastal zones

Main outputs: The main outputs of the project will be: data, reports and scientific publications on transfer rates of toxic metals and organic compounds typically contaminating critical coastal ecosystems as a result of land based activities; appropriate transfer rate and ecotoxicological data to input into specific coastal monitoring programmes and ecotoxicological models; a rapid, reliable and accurate assay for toxin determination in seafood products as a result of work on harmful algal blooms; and trained personnel (through the TC programme) in the use of radiotracers to establish transfer pathways and quantify transfer rates of toxic elements and organic compounds.

Duration: 2002–2005

Ranking: 6

Project H.2.04: Bioaccumulation and transfer of natural radionuclides arising from hydrothermal and anthropogenic sources in coastal environments

Main outputs: This project will result in: an improved database with the production of site specific data on the types and levels of enhanced natural radionuclides entering the coastal environment from natural geothermal activity as well as from land based activities such as mining, oil refining and agrochemical applications; scientific reports and publications on the levels of natural radionuclides which are entering the marine environment as source terms, and their relative contribution to the overall ambient concentration of natural radioactivity at specific coastal locations; and trained personnel (through the TC programme) in the selection of strategies for making such measurements as well as in state-of-the-art radioanalytical methodologies used to measure polonium-210 and other natural nuclides in marine samples.

Duration: 2002–2005

Ranking: 15

Subprogramme H.3. Monitoring and Study of Non-Radioactive Marine Pollution

Rationale: Marine pollution can limit access to coastal resources and even pose a threat to public health. Non-radioactive pollutants currently have a higher environmental impact than radioactive contaminants. There are several types of non-radioactive pollutants such as heavy metals, pesticides and oil products, some of which can be very toxic to marine life. These originate from numerous land based sources and transboundary issues arise due to the easy transport of contaminants in marine waters. Understanding the sources, distribution, fate and effects of marine pollutants is

central to coastal zone management. Marine pollution monitoring requires national, regional and global strategies. The Agency collaborates with Member States, regional bodies and other UN organizations in the assessment and study of marine pollution and is an important partner in joint activities helping laboratory networks obtain harmonized data sets on diverse temporal and spatial scales. It also undertakes research, including the development of isotopic techniques for tracer studies, with an underlying philosophy to deliver pragmatic methods and protocols that can be readily adopted by laboratories in Member States, especially in developing countries. The evaluation of the Environmental Pollution Monitoring and Assessment acknowledged the fundamental role of the Agency in the implementation of the objectives of the GPA at the global level and the implementation of the Regional Seas Programme at the regional level. The Agency, through the Marine Environmental Studies Laboratory (MESL), is the most appropriate agency to undertake this work as it alone in the UN system has operational capabilities in environmental analytical chemistry and pollution assessment of non-radioactive marine contaminants. At the global level, the Agency has had joint activities with UNESCO-IOC and UNEP for many years and has recently started collaborative GEF funded work with UNDP. Regionally, it has undertaken joint activities in the Mediterranean Sea (UNEP-MAP), the Persian Gulf (ROPME), Black Sea (EU) and Caspian Sea (UNDP-CEP). At the national level, it works directly with laboratories in Member States and can provide expertise implementing international conventions, such as the UNEP ban on the use of persistent organic pollutants (POPs) and the IMO convention prohibiting organotin compounds as marine antifoulants.

Objective: To increase the capability of Member States and United Nations organizations to identify and implement common policies and international protocols for protection of the marine environment and its resources from non-radioactive pollution.

Outcomes
<ul style="list-style-type: none"> — Increased capability of Member States to use nuclear and, where appropriate, non-radioactive, techniques to monitor non-radioactive pollutants and to obtain critical information about the environmental chemistry and ecotoxicology of contaminants, especially biocides and industrial pollutants, in coastal marine systems. — Improved regional and inter-agency co-operation in monitoring and assessing pollution in the marine environment. — Better management of regional databases for pollution assessment through the application of recommended reference methods and the implementation of regional quality assurance schemes. — Enhanced understanding of the behaviour, fate and effects of non-radioactive pollutants from land and sea based sources.

Performance Indicators
— Number of Member States and UN organizations provided guidance and training in non-radioactive marine pollution monitoring.
— Number of laboratories in Member States participating in national, regional and global intercomparison exercises.
— Number of analytical laboratories enabled to perform satisfactorily with respect to quality management and the number of marine pollutants analysed.
— Increase in the number of publications and research articles produced by the Agency and collaborators in Member States and other UN organizations in refereed journals and periodicals.

Programme changes and trends: This subprogramme encompasses the fields of marine environmental chemistry and marine pollution assessment, with respect to non-radioactive contaminants. Research and development are vital components of the subprogramme, particularly as many UN and regional organizations rely upon the Agency for expertise in evaluating threats posed by emerging pollution issues. Subject to availability of funds only minor changes are envisaged in the programme for the next biennium.

Firstly, activities in Projects H.3.01 and H.3.02 have more clearly delineated the support to Member States, regional organizations and other UN bodies with regard to marine analytical chemistry and marine pollution assessment, respectively. Secondly, H.3.03 is more focused on marine antifoulants, the relevance of which has increased owing to the recent IMO convention banning the use of tributyltin in marine antifouling paints after 2008.

UNDP-GEF is developing several major marine projects in which the Agency could collaborate and a strengthened relationship with UNEP is anticipated through the acceptance of MESL as a Joint IAEA–UNEP Laboratory.

Resource changes and trends: The proposed resource level for this subprogramme represents a decrease of \$163 000 in 2004 compared with the adjusted budget for 2003. The funds involved were transferred to other subprogrammes or programmes and the proposed work plan for this subprogramme has been correspondingly reduced. Resources proposed for 2005 remain at the 2004 level.

Financial resources (2003 prices)

H.3.	2003	2004	2005
Reg. budg.	563 000	400 100	400 100

Project H.3.01: Environmental analytical chemistry in support of marine pollution monitoring programmes

Main outputs: The project will result in: marine reference materials; updated and translated reference methods; harmonized data outputs through global and regional intercomparison exercises; reports,

evaluations and publications on analytical techniques and the results of the intercomparison exercises; and personnel trained (through the TC programme) in the analysis of organic contaminants and heavy metals in marine matrices.

Duration: 2002–2005

Ranking: 4

Project H.3.02: Marine pollution assessment in coastal regions and bioresources, including support to relevant UN inter-agency activities

Main outputs: The main outputs will be: regional assessments of the state of the marine environment based on contaminant screening programmes; analyses of pollutants in marine biota, especially for important bioresources; reports and scientific publications relating to such marine pollution assessments; and personnel trained (through the TC programme) in sampling techniques.

Duration: 2002–2005

Ranking: 10

Project H.3.03: Nuclear techniques in studies of marine antifoulants in coastal environments

Main outputs: The project will result in: improved database of the distribution of marine antifoulants in coastal marine environments; scientific papers in peer reviewed journals on the subject of marine antifoulants in the coastal ecosystems; and trained personnel in the field.

Duration: 2001–2005

Ranking: 11

Project H.3.04: Isotopic applications in non-radioactive marine contaminant studies

Main outputs: The project will produce: an improved database of inorganic and organometallic pollutants in the coastal marine environments of Member States; biomarker technique for determining the source of organic matter in sea water and sediments; and scientific reports and publications dealing with both technique development and applications in environmental case studies.

Duration: 2001–2005

Ranking: 16

Subprogramme H.4. Measurement and Assessment of Radionuclides and Non-Radioactive Pollutants in the Terrestrial Environment

Rationale: The protection of the terrestrial environment from a broad range of contaminants released by nuclear and non-nuclear activities requires that their impact be investigated, and effective protection and remediation measures be

developed through international co-operation and collaboration. Energy production by fossil fuels and nuclear power plants, as well as industrial and mining activities, often release radionuclides and other pollutants into the environment. Radionuclides have been released into the environment by nuclear activities and tests carried out during the years of the cold war. The public and the media have recently also expressed concern about the environmental impact of nuclear material (depleted uranium) used in conventional ammunition.

Proper assessment of the radiological and conventional risk due to environmental pollutants requires the ability to perform accurate measurements of pollutant concentrations in representative samples and an understanding of their environmental fate. Moreover, due to the possible transboundary transport, there is need to perform these measurements according to internationally agreed and harmonized procedures. Proper models to predict the environmental fate and the impact on human health of the contaminants have to be developed and/or adapted to specific circumstances.

Member States need information on the present level of radionuclides and other potential pollutants in the terrestrial environment in order to evaluate trends, to study transfer processes and environmental changes, and to predict future conditions. This requires the quantification of natural and anthropogenic sources, and computer modelling of the dispersion of the contaminants in air, soils and water, and their impact studies. Nuclear and isotopic techniques provide tools to investigate release processes and contamination on a quantitative basis and to address the problem of environmental management. Demand driven programmes for assistance to Member States for laboratory quality management, for capacity building and the provision of training, and for the design and implementation of environmental monitoring programmes and remediation strategies will further improve the understanding of environmental processes and the protection of the environment. This assistance by the Agency is solicited by Member States as well as by other international organizations. In addition, the Agency serves as a clearing house of information and provides advice on radioactive contamination in the terrestrial environment to regional and international bodies such as WHO, UNEP, UNDP, IUR and the affected Member States in Asia, Africa, South America and East Europe, as well as the Arctic and Antarctic areas.

Objective: To enhance the capability of Member States to assess the current and future levels of radionuclides and other pollutants in the terrestrial environment using nuclear techniques and to effectively manage environmental impacts.

Outcomes
<ul style="list-style-type: none"> — Increased number of participating analytical laboratories in the network with demonstrated capability to assess, with the precision of international standards, radionuclide and other pollutant concentrations in the terrestrial environment. — Enhanced understanding of the transfer processes of pollutants in different ecosystems through the use of Agency co-ordinated data. — Implementation of countermeasures for contaminated areas in affected Member States. — Use of radiotracers and nuclear techniques in Member States for developing and verifying transfer models in ecotoxicology.
Performance Indicators
<ul style="list-style-type: none"> — Number of laboratories of the international network, ALMERA, passing proficiency tests and adopting standardized methods. — Number of new transfer parameters evaluated and ecotoxicological models developed. — Number of new countermeasures for contaminated areas implemented and information strategies developed. — Number of new transfer processes characterized, new models for assessment of exposure developed and new countermeasures implemented

Programme changes and trends: The activities in this subprogramme have been changed to adopt more radioecological assessments in addition to monitoring and measurements. This addresses the extended or new projects. The understanding and quantification of the transfer of radionuclides in the terrestrial and freshwater environment and food chains need to take into account site specific conditions. Based upon this, appropriate remediation strategies can be derived for past, present and future events of radioactive contamination, which may lead to elevated radiation exposures. The concepts developed in radioecology can be combined with data on non-radioactive pollutants and with recorded health effects in the affected area to derive reliable dose effect relationships.

New directions will include the implementation of a geographical information system for environmental decision support and the application of nuclear and isotopic techniques in terrestrial environmental management. These will provide worldwide data on parameters and on the distribution of radioactive and stable isotopes and other pollutants in the terrestrial environment. Assistance to Member States will be offered to improve their capabilities in monitoring and assessing the impact on the terrestrial environment of radioactive and other pollutants.

Efforts aiming at obtaining international consistency and harmonization of measurements will be reinforced through the conduct of geographically broader proficiency tests among laboratories in Member States.

Resource changes and trends: Proposed resources compared with 2003 have been increased by \$115 000 in 2004 due to the strengthening of activities in terrestrial radioecology.

Financial resources (2003 prices)

H.4.	2003	2004	2005
Reg. budg.	418 000	532 500	532 500

Recurrent Project H.4.01: Agency network of laboratories for measuring radionuclides in the environment (ALMERA)

Main outputs: The project will result in a world wide network of environmental radionuclide monitoring laboratories, validated methods for the measurement of radionuclide concentrations in environmental situations, as well as procedures for the Agency proficiency tests for independent evaluation of analytical performance of the network laboratories, including reporting and feedback on possible sources of bias and uncertainty of data. The outputs will be in the form of 100–200 laboratory performance evaluation reports and 5–10 validated radiochemical procedures for the ALMERA members.

Unfunded activities/means of implementation: Organization of annual ALMERA workshops.

Ranking: 2

Project H.4.02: Behaviour of radionuclides in terrestrial and freshwater environments

Main outputs: The main outputs of the project will be: data on terrestrial and freshwater radioactivity transfer; and transfer behaviour of radionuclides in relevant ecological systems of the categories soil–plant, plant–animal, and food–human in Member States. The work will result in 5–10 reports, 3–6 conference proceedings, 7–15 publications giving scientific data, models and radionuclide transfer parameters; and personnel trained (through the TC programme) in the field of radioecology.

Duration: 2004–2008

Ranking: 18

Project H.4.03: Radiological assessment techniques for contaminated areas

Main outputs: The project will provide: reports on radionuclide concentrations, data and parameters for environmental radiological assessments; data on gamma emitting radionuclides in the environment; and new or improved radioanalytical techniques for the measurement of naturally occurring radionuclides. As a result, a total of 5–10 improved standard radiochemical procedures for environmental surveys, in particular for natural radionuclides, 15–25 progress reports, 8–15 publications and 2–4 conference proceedings will be made available, as well as personnel trained (through the TC

programme) in the field of environmental surveys and radioecological assessments.

Unfunded activities/means of implementation: Identification of sensitive pathways, population groups and potential health effects of elevated radiation exposure; a CRP on the characterization of radioactive particles and naturally occurring radionuclides introduced into the environment via industrial activities; and on-site investigations of transfer behaviour of radionuclides to identify radiological sensitive areas.

Duration: 2004–2009

Ranking: 5

Project H.4.04: Remediation strategies for sustainable development of contaminated areas

Main outputs: The project will result in: practical guidance documents for Member States on policies and means of implementation for remediation measures applicable to different categories of contaminated locations; data on the ultimate effectiveness of remediation measures and the associated side effects; and protocols and guidelines for human based countermeasures for radioisotopes other than iodine, strontium and caesium. The activities will produce 10–15 progress reports, 3–6 publications and 2–4 conference proceedings.

Unfunded activities/means of implementation: Co-ordination of CRPs on the development of new animal based and soil based countermeasures to remediate contamination by radionuclides other than Cs, Sr and I.

Duration: 2004–2009

Ranking: 7

Project H.4.05: Application of nuclear analytical techniques to non-radioactive contaminants for ecotoxicological studies

Main outputs: The project will produce: sampling strategies, procedures and storage approaches for a broad range of pollutants; harmonized quality control protocols for environmental pollutants; and distance learning packages on laboratory quality management, analytical methodologies and internal quality control. The work will be documented in form of 5–8 reports, 4–6 validated procedures and 4–8 publications including TECDOCs.

Unfunded activities/means of implementation: Study of transfer behaviour and ecotoxicology using radioactive tracers; and adaptation of existing radioecological transfer models to non-radioactive and organic pollutants.

Duration: 2004–2009

Ranking: 14