REGIONAL COOPERATIVE AGREEMENT (RCA)

Details of the RCA Technical Cooperation Projects Implemented During 2007-2022

Prepared by
RCA Programme Advisory Committee
Updated in June 2023

INTRODUCTORY NOTE

This document contains details of the RCA Projects implemented during 2007-2023 TC cycles. The objective of preparing this document is to provide information on past RCA Projects to the RCA Government Parties to facilitate deciding on the future directions of the RCA Programme. This document contains a list of RCA Projects implemented since 2007, ordered by Thematic Sector and Project Area, a chart depicting the RCA projects by Project Areas and years of implementation, a chart depicting the distribution of RCA projects by Project Area and technical details of each of the projects along with their outcomes and achievements. The technical details of the project were obtained from the TCPRIDE platform of the IAEA and the project achievements are based the LCC reports presented at RCA NRMS held up to 2021.

Implementation of the RCA TC projects during the TC cycles of 2018/2019 and 2020/21 were affected by the Covid 19 pandemic and Work Plans of several projects have been revised.

Table of Contents

List of RCA Projects Implemented since 2007

Thematic Sector: Agriculture

No	Project Area	Project Number	Title	Implem. Period	Lead Country
1	Plant Breeding	RAS5045	Improvement of Crop Quality and Stress Tolerance for Sustainable Crop Production Using Mutation Techniques and Biotechnology (RCA)	2007-2010	China
2		RAS5056	Supporting Mutation Breeding Approaches to Develop New Crop Varieties Adaptable to Climate Change (RCA)	2012-2015	China
3		RAS5070	Developing Bioenergy Crops to Optimize Marginal Land Productivity through Mutation Breeding and Related Techniques (RCA)	2015-2018	Indonesia
4		RAS5077	Promoting the Application of Mutation Techniques and Related Biotechnologies for the Development of Green Crop Varieties (RCA)	2017-2020	China
5		RAS5088	Enhancing Crop Productivity and Quality through Mutation by Speed Breeding (RCA)	2021-2024	China
6	Food Irradiation	RAS5046	Novel Applications of Food Irradiation Technology for Improving Socioeconomic Development (RCA)	2007-2010	China
7		RAS5050	Enhancing Sanitary and Phytosanitary Treatment of Regional Products for Export by Irradiation (RCA)	2009-2011	Australia
8		RAS5057	Implementing Best Practices of Food Irradiation for Sanitary and Phytosanitary Purposes (RCA)	2012-2014	China
9		RAS5071	Strengthening Adaptive Climate Change Strategies for Food Security through the use of Food Irradiation (RCA)	2014-2016	Philippines
10		RAS5087	Promoting Food Irradiation by Electron Beam and X Ray Technology to Enhance Food Safety, Security and Trade (RCA)	2020-2023	New Zealand
11	Soil Fertility	RAS5055	Improving Soil Fertility, Land Productivity and Land Degradation Mitigation (RCA)	2012-2015	Australia
12		RAS5084	Assessing and Improving Soil and Water Quality to Minimize Land Degradation and Enhance Crop Productivity Using Nuclear Techniques (RCA)	2018-2021	Australia
13		RAS5091	Assessing and Mitigating Agro-Contaminants to Improve Water Quality and Soil Productivity in Catchments Using Integrated Isotopic Approaches (RCA)	2022-2025	Australia

14	Food Safety	RAS5081	Enhancing Food Safety and Supporting Regional Authentication of Foodstuffs through Implementation of Nuclear Techniques (RCA)	2018-2021	New Zealand

Thematic Sector: Environment

No	Project Area	Project Number	Title	Implem. Period	Lead Country
1	Marine and coastal environment	RAS7016	Establishing a Benchmark for Assessing the Radiological Impact of Nuclear Power Activities on the Marine Environment in the Asia-Pacific region (RCA)	2007-2010	Australia
2		RAS7019	Harmonizing Nuclear and Isotopic Techniques for Marine Pollution Management at the Regional Level (RCA)	2009-2011	The Philippines
3		RAS7021	Marine benchmark study on the possible impact of the Fukushima radioactive releases in the Asia-Pacific Region (RCA)	2011-2014	Australia
4		RAS7024	Supporting Nuclear and Isotopic Techniques to Assess Climate Change for Sustainable Marine Ecosystem Management (RCA)	2012-2014	The Philippines
5		RAS7028	Enhancing Regional Capabilities for Marine Radioactivity Monitoring and Assessment of the Potential Impact of Radioactive Releases from Nuclear Facilities in Asia-Pacific Marine Ecosystems (RCA)	2016-2019	Indonesia
6		RAS7031	Assessing the Vulnerability of Coastal Landscapes and Ecosystems to Sea-Level Rise and Climate Change (RCA)	2018-2021	Australia
7	Water Resources	RAS8104	Assessment of Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management (RCA)	2007-2008	Pakistan
8		RAS8108	Assessing Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management (RCA)	2009-2011	Pakistan
9		RAS7022	Applying Isotope Techniques to Investigate Groundwater Dynamics and Recharge Rate for Sustainable Groundwater Resource Management (RCA)	2012-2015	Pakistan
10		RAS7030	Assessing Deep Groundwater Resources for Sustainable Management Through the Utilization of Isotopic Techniques (RCA)	2016-2019	Pakistan
11		RAS7035	Enhancing Regional Capability for the Effective Management of Ground Water	2020-2023	Pakistan

No	Project Area	Project Number	Title	Implem. Period	Lead Country
			Resources Using Isotopic Techniques (RCA)		
12		RAS7040	Improving Water Resources Management Practices by Enhancing the Regional Collaboration in Environmental Isotope Analysis and Applications (RCA)	2022-2025	Vietnam
13	Air Pollution Monitoring	RAS7015	Characterization and Source Identification of Particulate Air Pollution in the Asian Region (RCA)	2007-2010	New Zealand
14		RAS7023	Supporting Sustainable Air Pollution Monitoring Using Nuclear Analytical Technology (RCA)	2012-2015	New Zealand
15		RAS7029	Assessing the Impact of Urban Air Particulate Matter on Air Quality (RCA)	2016-2018	New Zealand
16	Wetland Management	RAS7037	Enhancing Wetland Management and Sustainable Conservation Planning (RCA)	2020-2023	Australia

Thematic Sector: Human Health

No	Project Area	Project Number	Title	Implem. Period	Lead Country
1	Nuclear Medicine	RAS6049	Strengthening Clinical Applications of PET in RCA Member States (RCA)	2007-2008	India
2		RAS6061	Improving Cancer Management with Hybrid Nuclear Medicine Imaging (RCA)	2012-2014	India
3		RAS6063	Strengthening the Application of Nuclear Medicine in the Management of Cardiovascular Diseases (RCA)	2012-2014	Philippines
4		RAS6064	Building Capacity with Distance Assisted Training for Nuclear Medicine Professionals	2012-2013	Australia
5		RAS6076	Improving Cancer Management Through Strengthening the Computed Tomography Cancer Staging Process (RCA)	2014-2016	Republic of Korea
6		RAS6083	Improving Patient Care and Enhancing Government Parties Capacity in Nuclear Medicine programmes in RCA Region (RCA)	2016-2018	Republic of Korea
7		RAS6093	Strengthening Capacity to Manage Non-Communicable Diseases Using Imaging Modalities in Radiology and Nuclear Medicine (RCA)	2018-2021	Republic of Korea

No	Project Area	Project Number	Title	Implem. Period	Lead Country
8	Radiation Oncology	RAS6048	Application of High-Precision 3D Radiotherapy for Predominant Cancers in the RCA region (RCA)	2007-2008	Japan
9		RAS6053	Improving Image Based Radiation Therapy for Common Cancers in the RCA Region (RCA)	2009-2013	Japan
10		RAS6062	Supporting 3D Image-Guided Brachytherapy Services	2012-2015	Japan
11	Radiation Oncology	RAS6065	Strengthening the Application of Stereotactic Body Radiation Therapy to Improve Cancer Treatment (RCA)	2012-2015	Republic of Korea
12		RAS6066	Reducing the Shortage of Oncology Professionals through an Applied Sciences of Oncology Course (ASOC)	2012	Australia
13		RAS6071	Strengthening Radionuclide Therapy for High Impact Cancer Treatment Strategy in Member States of the Regional Cooperative Agreement (RCA)	2014-2016	India
14		RAS6072	Strengthening Intensity Modulated Radiation Therapy Capability in the Region (RCA)	2014-2016	Japan
15		RAS6085	Enhancing Stereotactic Body Radiation Therapy for Frequent Cancers in the RCA Region (RCA)	2016-2019	Republic of Korea
16		RAS6086	Strengthening Cancer Management Programmes in RCA States Parties through Collaboration with National and Regional Radiation Oncology Societies (RCA)	2018-2021	Japan
17		RAS6096	Empowering Regional Collaboration among Radiotherapy Professionals through Online Clinical Networks (RCA)	2020-2023	New Zealand
18		RAS6098	Standardizing Radiotherapy in Palliative Care (RCA)	2022-2025	Japan
19		RAS6100	Strengthening Clinical Application of Hypofractionated Radiotherapy (RCA)	2022-2025	Republic of Korea
20	Medical Physics	RAS6038	Strengthening Medical Physics through Education and Training (RCA)	2003-2012	Australia
21		RAS6077	Strengthening the Effectiveness and Extent of Medical Physics Education and Training (RCA)	2014-2017	Australia
22		RAS6087	Enhancing Medical Physics Services in Developing Standards, Education and Training through Regional Cooperation (RCA)	2018-2021	Australia
23		RAS6101	Improving the Quality and Safety of Radiation Medicine through Medical Physicist Education and Training (RCA)	2022-2025	Peoples' Republic of China

No	Project Area	Project Number	Title	Implem. Period	Lead Country
24	Radiopharmaceuticals	RAS6097	Enhancing Capacity and Capability for the Production of Cyclotron-Based Radiopharmaceuticals (RCA)	2020-2023	Republic of Korea

Thematic Sector: Industry

No	Project Area	Project Number	Title	Implem. Period	Lead Country
1	Applications of nuclear tracers and sealed sources	RAS8107	Raising Productivity in the Coal, Minerals and Petrochemical Industries by using Nucleonic Analysis Systems and Radiotracers (RCA)	2007-2008	Australia
2		RAS8111	Diagnosing Industrial Multiphase Systems by Process Visualization using Radiotracers and Sealed Sources (RCA)	2009-2011	China
3		RAS1012	Characterizing and Optimizing Process Dynamics in Complex Industrial Systems Using Radiotracer and Sealed Source Techniques	2012-2016	Pakistan
4	Radiation Processing	RAS8106	Radiation Processing Applications for Health and the Environment (RCA)	2007-2008	Philippines
5		RAS8109	Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation (RCA)	2009-2012	Malaysia
6		RAS1014	Supporting Radiation Processing for the Development of Advanced Grafted Materials for Industrial Applications and Environmental Preservation	2012-2014	Malaysia
7		RAS1028	Improving the Quality Management Practices in Radiation Processing Facilities for Better Performance and Applications (RCA)	2022-25	Malaysia
8	Nondestructive Testing	RAS8105	Development and Application of Advanced Industrial Radiography and Tomography Techniques (RCA)	2007-2008	India
9		RAS8110	Applying Advanced Digital Industrial Radiology and Computed Tomography in Industry and Civil Engineering (RCA)	2009-2011	India
10		RAS1013	Supporting Advanced Non-Destructive Examination for Enhanced Industrial Safety, Product Quality and Productivity	2012-2014	India
11		RAS1020	Building Capacity for Applications of Advanced Non-Destructive Evaluation Technologies for Enhancing Industrial Productivity (RCA)	2014-2016	India

No	Project Area	Project Number	Title	Implem. Period	Lead Country
12		RAS1022	Strengthening Regional Capacity in Non-Destructive Testing and Examination Using Nuclear and Related Techniques for Safer, Reliable, More Efficient and Sustainable Industries Including Civil Engineering (RCA)	2018-2021	Malaysia
13		RAS1029	Enhancing Regional Capabilities in Advanced Non-Destructive Testing Techniques for Improved Safety and Inspection Performance in Industries (RCA)	2023-2026	Malaysia

Thematic Sector: Radiation Safety

No	Project Area	Project Number	Title	Implem. Period	Lead Country
1	Radiation Protection Infrastructure	RAS9042	Sustainability of Regional Radiation Protection Infrastructure (RCA)	2007-2010	Australia / Japan
2	Emergency Response	RAS9092	Strengthening the Capacity to Respond to Radiological Emergencies of Category II and III Facilities (RCA)	2020-2023	Republic of Korea

Other areas

No	Project Area	Project Number	Title	Implem. Period	Lead Country
1	Research Reactor Utilization	RAS4026	Adding Value to Materials through Irradiation with Neutrons (RCA)	2007-2008	Republic of Korea
2	Energy Planning	RAS0045	Formulation of Sustainable Energy Development Strategies in the Context of Climate Change (RCA)	2007-2008	Republic of Korea

Projects by Sector and Year

Project Distribution

PAST RCA PROJECTS BY PROJECT AREA

Thematic Sector : Agriculture

Project Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Mutation Plan Breeding	RAS5045					RAS5056				RAS5077									
								RAS5070						RAS5088					
Food Irradiation	RAS5046					RAS5057								RAS5087					
			RAS5050					RAS5071											
Land use – Soil Erosion						RAS5055						RAS5084							
Food Safety												RAS5081							
Water and soil quality																RAS5091			
Land use – Fertilizer uptake																			
Animal Health and Nutrition																			
Animal Reproduction																			

Thematic Sector :Environment

Project Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Marine and coastal environment	RAS7016					RAS7024				RAS7028									
			RAS7019									RAS7031							
					RAS7021														
Development of water resources	RAS8104		RAS8108			RAS7022				RAS7030				RAS7035					
																RAS7040			
Air-Pollution	RAS7015					RAS7023				RAS7029									
Wetland Management														RAS7037					

Thematic Sector : Human Health

Project Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Nuclear Medicine	RAS6049					RAS6063				RAS6083									
						RAS6064						RAS6093							
						RAS6061													
						RAS6076													
Radiation Oncology	RAS6048		RAS6053							RAS6085									
						RAS6062						RAS6086							
						RAS6065								RAS6096					
						RAS6066		RAS6071								RAS6098			
								RAS6072								RAS6100			
Medical Physics	RAS6038																		
								RAS6077				RAS6087							
																RAS6101			
Radiopharmaceuticals														RAS6097					

Thematic Sector : Industry

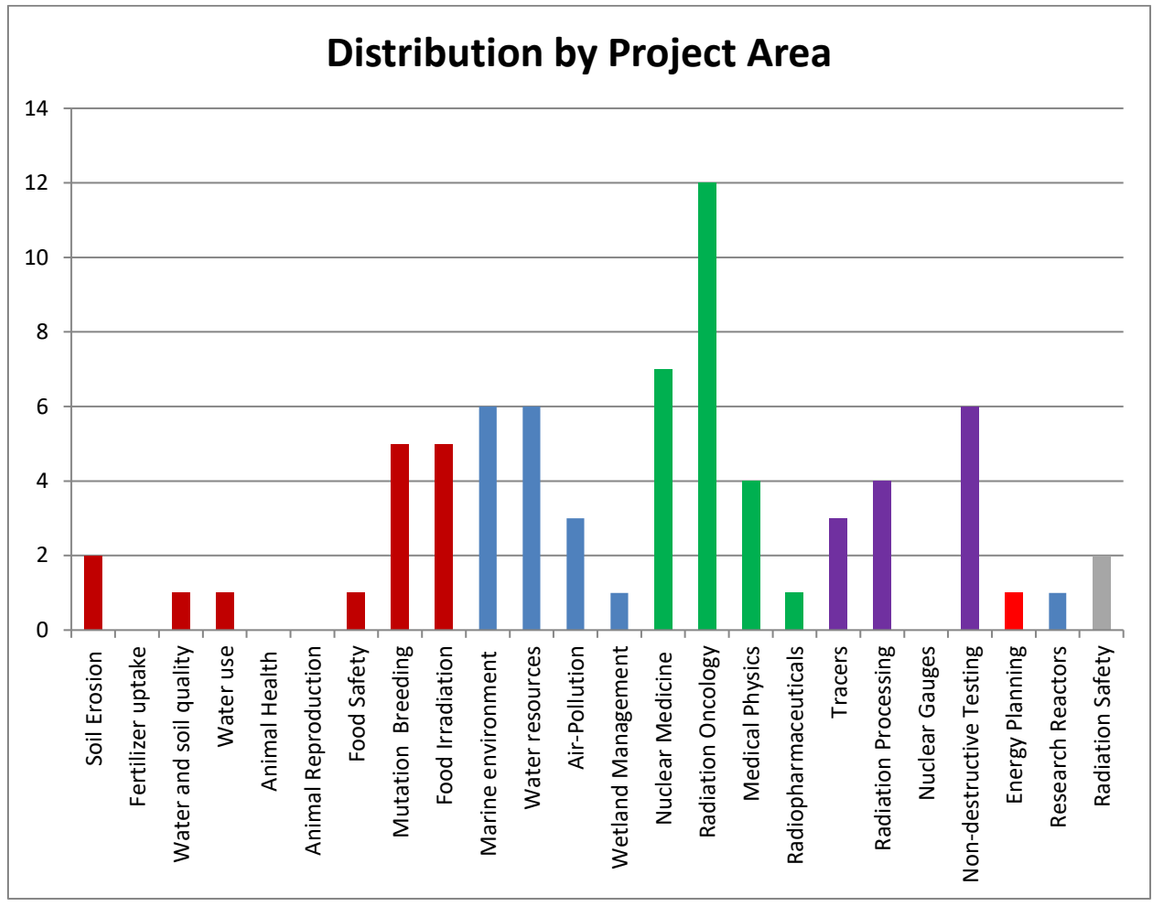
Project Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Tracer Technology	RAS8107		RAS8111			RAS1012														
Radiation Processing	RAS8106		RAS8109													RAS1028				
						RAS1014														
Nuclear Gauges and Nucleonic Control Systems																				
Non-destructive Testing	RAS8105		RAS8110			RAS1013			RAS1020			RAS1022					RAS1029			

Thematic Sector : Radiation Safety

Project Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Radiation Safety	RAS9042													RAS9092						

Thematic Sector: Other areas

Project Area	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Energy Planning	RAS0045																			
Research Reactor Utilization	RAS4026																			


Distribution by Project Area
14
12
10
8
6
4
2
0
Soil Erosion
Fertilizer uptake
Water and soil quality
Water use
Animal Health
Animal Reproduction
Food Safety
Mutation Breeding
Food Irradiation
Marine environment
Water resources
Air-Pollution
Wetland Management
Nuclear Medicine
Radiation Oncology
Medical Physics
Radiopharmaceuticals
Tracers
Radiation Processing
Nuclear Gauges
Non-destructive Testing
Energy Planning
Research Reactors
Radiation Safety

Details of Implemented Projects

Thematic Sector - Agriculture

Project Area – Mutation Plant Breeding

Thematic Sector	Agriculture
Project Area	Mutation Plant Breeding
Project Number	RAS5045
Project Title	Improvement of Crop Quality and Stress Tolerance for Sustainable Crop Production Using Mutation Techniques and Biotechnology (RCA)
Implementation Period	2007-2010
Project Lead Country	China
Budget (Euros)	TCF: 229,722.31 EB: 42,865.50 Total 272,587.81
Objectives	The objectives of this project are to develop and transfer methodologies and technologies for the induction and identification of mutated genes contributing to important crop quality characters and stress tolerance to RCA Member States, and to develop improved breeding material using molecular marker-assisted selection, through: 1) Development and establishment of efficient methodologies for the induction of mutants and the screening of crop germplasm with various and desirable quality characters, including nutrition and process characters, and tolerance to stress; 2) Development of molecular markers for tagging genes for quality characters and enhanced tolerance to stress in induced mutants; 3) Use of molecular markers with the aim of developing improved crop varieties; and 4) Development of improved germplasm with enhanced quality traits and improved resistance to stress.
Participating GPs	AUL,BGD,CPR,IND,INS,ROK,MAL,MON,MYA,PAK,PHI,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • Preparation of training package for a Regional Training Course Preparation of training packages for a Regional Training Course • Representing RCA at the FNCA Workshop on Mutation Breeding • Representation of RCA at the FNCA Workshop on Mutation Breeding • Technical Review and Editing of Manuscript for Publication

	Training Courses • Regional Training Course on "Mutation Breeding Approaches to Improving Salinity, Drought and Heat Stress Tolerance" • Regional Training Course on Mutation Breeding Approaches to Improving Protein and Starch Quality • Regional Training Course on Mutation Breeding Approaches to Improving Disease Resistance • National Training course on TILLING techniques
	Meetings and Workshops • Project Planning Meeting • Expert meeting for quality assurance of training material • Mid-term Progress Review Meeting of the RCA Project on Improvement of Crop Quality and Stress • Consultants Meeting on establishment of Asian Association of Mutagenesis in Crop Plants • Final Progress Review Meeting
Achievements	The Project Outputs had been achieved to a very large extent. The participating GPs have reported the following achievements. AUL • Characterization of Low phytic acid barley mutants, nine candidate genes identified. • Herbicide tolerant barley (Scope) and wheat variety (Impose CL Plus) released. • A gene controlling the semi-dwarf mutant in barley was recently identified. This gene currently exists in more than 80% of European barley varieties and more than 50% of the Australian barley varieties. BGD • Zonal yield trial was carried out with early maturing mutant lines derived through carbon ion beams irradiation. Mutant lines 7-17 days earlier, Grain yield of mutant lines were significantly higher than the check BRRI dhan29**.** CPR • TILLING platform and new mutagenesis approaches established and optimized. • 115 new advanced mutant lines (most from DH) were tested for performance in plot in different locations. • 10 more advanced wheat mutant lines submitted for RMLT, among which Longfumai 19 and LY502 were officially released. • The new dissemination areas of officially released mutant verities in 2011 were about 50,000ha**.** INS • One sorghum mutant line ZH-30, with high yield and good quality of grain was submitted for official release.

	• Ten sorghum mutants were identified as highly tolerant and five mutants as moderately tolerant to acid soils. • These new breeding lines are now being kept at BATAN sorghum germplasm collection for further research. MAL • Two potential lines MR219-4 and MR219-9 were selected with tolerance and improved yield. • Amylose content mutations were screened in M2 of MR219 irradiated by 80 Gray ion beams. • Three potential papaya mutant lines were selected with improved agronomic characters, such as bigger fruit size and weight (800g) and higher total sugar content (14% TSS) MON • Mutant progenies from M1 to M4 generations advanced under the irrigated and non-irrigated condition and 182 mutant lines were selected. • New mutant line Darkhan-172 was submitted for further commercial and ecological test. Mutant lines were used to cross with varieties possessing disease resistant genes to develop new varieties. PAK • Sixty M4 progenies from Bhittai and Kiran-95 varieties were grown for normal, drought and salinity soil conditions PHI • Field experiments were conducted to induce mutations for increased seed protein content in mungbean using gamma radiation and to further identify high yielding mutants of mungbean tolerant to acidic soil condition. ROK • Mutations for 'white-core' endosperm from rice cultivar Suweon472 were induced. The selected mutant lines were evaluated for yield potential and one elite mutant line was designated as 'Suweon551'. The elite line has white-core endosperm. White-core rice could be used to make high quality rice wine THA • 30 promising vegetable soybean mutant lines with high yield were selected. • Soybean population RIL and 218 SSR markers was prepared to map protein content genes in the developed mutants VIE • Three promised lines C71.5.2, C71.5.15 and C71.30.6 were selected from rice cultivar C71, which carries SSR markers genetically linked to root traits favored for drought resistance and showed potential drought tolerance in artificial water stress. • RAPD technique was used to evaluate rice mutant lines

Comments	There should be repository for training material and manuals produced, for future use.

Thematic Sector	Agriculture
Project Area	Mutation Plant Breeding
Project Number	RAS5056
Project Title	Supporting Mutation Breeding Approaches to Develop New Crop Varieties Adaptable to Climate Change (RCA)
Implementation Period	2012-2015
Project Lead Country	China
Budget (Euros)	TCF: 393,584.9, EB: 16,340.25, Total: 409,925.15
Objectives	To enhance people's livelihood through the improvement of crop productivity and food security through the application mutation technique and other nuclear and isotopic techniques under the driver of climate change and variability
Participating GPs	AUL, BGD,CPR,IND,INS,ROK,MAL,MON,NEP,PAK,PHI,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • RCA expert in the FNCA Workshop (WS) on Mutation Breeding • Support of national rice mutation breeding activities in new project member Nepal • RCA expert to the FNCA JFY2013 Workshop on Mutation Breeding Project in Indonesia • HBA for development of AOAPM website
	<u>Training Courses</u> • Regional Training Course on "Application of molecular markers to mutation breeding programme with focus on traits contributing to better adaptation (biotic and abiotic stresses) • Regional Training Course on the use of nuclear and isotopic techniques in assessment of fertilizer and water use efficiency • Regional Training Course on the application of new mutagenesis approaches in crop plants • Regional Training Course on The Use of C-13 in Soil Organic Matter Studies and in Assessment of Plant Tolerance to Abiotic Stress (Drought and Salinity)
	<u>Meetings and Workshops</u> • Project Planning and Coordination Meeting

	• Technical Meeting to exchange expertise in mutation breeding and best fit soil and water management • Mid-Term Project Assessment Meeting • Final Project Review Meeting
Achievements	• More than 4528 advanced mutants with significant improved stress tolerance, quality and yield potential characteristics in cereals, legumes, fruits & vegetables were developed in the participating GPs, among them 351 mutant lines were in the regional multi-location trial for release and 102 well characterized mutants were used to genetic studies. • 28 mutant varieties have been officially released and put into production in the MSs. • Four regional training courses conducted on (1) Application of molecular markers; (2) Use of nuclear and isotopic techniques; (3) Application of new mutagenesis approaches and (4) Use of C-13. • Ten national training courses completed in Malaysia(4), Korea(4) and Pakistan(2). • Four international training materials and 29 national training protocols developed and distributed for mutagenesis technologies and screening methods for heat, drought, lodging, submergence and salinity tolerance, disease resistance, early maturity and photoperiod response from the MS countries. • All of the participating countries had the participation of their target researchers in at least one of the four trainings organized during the implementation of the project. In total, 96 researchers were trained in the international workshops. • In addition, one observer from Cambodia participated in the workshop 'Use of C-13 in soil organic matter studies and in assessment of plant tolerance to abiotic stress. • Malaysia, Korea and Pakistan also provided on-site training for national researchers in a national training course on mutation breeding. Up to 340 researchers were trained in the three countries. • Web-page with a functional URL including contents of Asian and Oceania Association of Plant Mutagenesis (AOAPM) established (*www.plantmutagenesis.net*). The webpage will provide an effective information exchange platform for mutation research
Comments	

Thematic Sector	Agriculture
Project Area	Mutation Plant Breeding
Project Number	RAS5070

Project Title	Developing Bioenergy Crops to Optimize Marginal Land Productivity through Mutation Breeding and Related Techniques (RCA)
Implementation Period	2014-2017
Project Lead Country	Indonesia
Budget (Euros)	TCF: 465,089, EB: 232,485.54, Total: 697,574.55
Objectives	To cultivate improved varieties of bioenergy crops on marginal lands.
Participating GPs	BGD,CPR,IND,INS, CAM,ROK,MAL,MON,NZE,PAK,PHI,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • Expert mission to promote the collaboration between RCA and FNCA on Mutation Breeding • Initiation of Cassava mutation breeding project and training staff • TC Expert Mission on to Institute of Plant and Agricultural Sciences (IPAS) • TC Expert Mission to support and advise CP on sorghum mutation breeding program Home Base Assignment on Best Soil, Nutrient, Water and Crop Management Practices for Marginal Land brochure
	<u>Training Courses</u> • Regional Training Course on Applications of In-vitro Techniques in Mutation Breeding of Bioenergy Crops • Regional Training Course on Water and Nutrient Management for Marginal Land • RTC on Methodologies and Mechanisms for Screening against Abiotic Stresses Using Mutation Breeding and Molecular Markers • Regional Training Course on the Application of Mutation Breeding and Screening of Target Traits in Bioenergy Crops • IAEA/RCA Training Course on Best Practices to Improve Soil Fertility and Crop Productivity under Marginal Lands using Conventional and Isotopic Techniques • RTC on nuclear techniques in soil, water and nutrient management under marginal land • Regional Training Course on Advanced Tissue Culture Techniques combined with Mutagenesis for Crop Improvement
	<u>Meetings and Workshops</u> • Final Regional Coordination Meeting on Developing Bioenergy Crops to Optimize Marginal Land Productivity through Mutation Breeding and Related Techniques • Workshop on Mutation Breeding and Supportive Techniques for Development of Bioenergy • Coordination Meeting on Activities on Soil and Water and Nutrient Management on Bioenergy Crops in Marginal Land • Coordination meeting to review the progress of the field trials
Achievements	LCC Report contains details of the project activities but does not contain enough information on achievement of outputs and outcomes to make an assessment.

Comments	LCC reports should contain details of achievement of outputs and the outcomes of the projects.

Thematic Sector	Agriculture
Project Area	Mutation Plant Breeding
Project Number	RAS5077
Project Title	Promoting the Application of Mutation Techniques and Related Biotechnologies for the Development of Green Crop Varieties (RCA)
Implementation Period	2016-2019
Project Lead Country	China
Budget (Euros)	TCF: 498,311.93, EB: 100,643, Total : 598,954.93
Objectives	To increase environmentally friendly crop productivity through the application of mutation techniques and related biotechnology.
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,CAM,ROK,MAL,MON,MYA,NEP,PAK, PLW,PHI,SRL,THA,VIE
Regional Activities	Expert missions Expert HBA to support development of AOAPM
	Training Courses • RTC on advanced mutation techniques for induction and screening of green traits in crops • Regional Training Course on Methodologies and Mechanisms for Screening against Abiotic Stresses • IAEA/RCA Regional Training Course on Methodology and Mechanisms for Screening of Photosynthetic Efficiency in Crops • IAEA/RCA Regional Training Course on Molecular Approaches for Selection of Desired Green Traits in Crops
	Meetings • Meeting on Assessing Nutrient Use Efficiency in Mutation Breeding • Mid-Term Project Review Meeting • Experts Meeting on Compiling of Screening Protocols for Target Green Traits in Selected Crops • FNCA Workshop on Mutation Breeding • Technical Meeting on photosynthetic physiology and new plant-type for development of green crop varieties • Final Project Review Meeting
Achievements	Trainers trained in the past regional activities in the past 4 years on mutation breeding techniques and related biotechnologies has played important roles

	for dissemination of the expertise learned from the RTC and promoted the mutation breeding work in the national network. New advanced mutant lines with improved target green traits of local selected crops have been developed and are to be released and applied in the farmers' fields. Good achievements have been obtained in most of the GPs who has a long term mutation breeding program in national, and new comers with less background of mutation successfully started their work, promoting the application of irradiation induced mutation techniques in plant breeding in this region. The project counterparts stressed the importance of continuing the project activities to allow further development of mutant lines/varieties to ensure the sustainability of the project.
Comments	

Thematic Sector	Agriculture
Project Area	Mutation Plant Breeding
Project Number	RAS5088
Project Title	Enhancing Crop Productivity and Quality through Mutation by Speed Breeding (RCA)
Implementation Period	2020-2023
Project Lead Country	China
Budget (Euros)	TCF: 318,937.5
Objectives	To improve food security in the Asia Pacific region through faster release of mutant varieties with improved crop productivity and quality.
Participating GPs	AUL,BGD,CPR,JPN,CAM,LAO,MAL,PHI,ROK, SRL
Regional Activities	<u>Expert Missions (planned)</u> Expert missions to assess the status of MbyS capabilities and support MbyS strategy planning in GPs
	<u>Training Courses (planned)</u> • Training Course on Application of Genotyping and Phenotyping in MbyS • Training Course on Application of Double Haploidy for MbyS toward Crop Improvement • Training Course on MbyS for Abiotic Stress Tolerance
	<u>Meetings and Workshops (planned)</u> • Project Planning Meeting • Technical meeting to develop MbyS protocols • Mid-term project review meeting

	• Technical meeting for consultation and verification of MbyS implementation and linkage of mutant lines with AOAPM • Final project review meeting
Achievements	Mutation by Speed Breeding (MbyS) techniques have been utilized in some of the GPs. Speed breeding laboratory using LED light combinations has been established in Malaysia, and data has been collected on the effect of LED light photo-period on the growth and reproduction of tomato; researchers were able to get two generations within one year in Mongolia, and the efficiency is doubled. Mutants and promising lines in diversity crops with improved traits are in the pipeline of multi-location trials.

Project Area – Food Irradiation

Thematic Sector	Agriculture
Project Area	Food Irradiation
Project Number	RAS5046
Project Title	Novel Applications of Food Irradiation Technology for Improving Socioeconomic Development (RCA)
Implementation Period	2007-2010
Project Lead Country	China
Budget (Euros)	TCF: 38,657.13, EB: 2825.33, Total: 41,482.46
Objectives	The overall objective of this project is to focus on the application of technologies related to new uses of irradiation for sanitary and phytosanitary purposes, including technology transfer to participating RCA Member States. The specific objectives are: 1) To elaborate and expand the phytosanitary or quarantine treatment protocols of irradiation technology for up to five identified fruits of the region, with a view to encouraging greater intraregional trade and consumption; 2) To develop process parameters for sanitary application of radiation using electron beam irradiation of selected food items, and other irradiation applications for critical food items such as prepared foods for hospitals; 3) To create awareness of these technologies with the appropriate quarantine and food control authorities in RCA Member States and to assist those involved in drafting application legislation by providing them with technical input.
Participating GPs	AUL,BGD,CPR,IND,INS, ROK,MAL,MON,MYA ,NZE,PAK,PHI,SRL, THA,VIE
Regional Activities	Expert Missions Preparation of protocols for phytosanitary or quarantine irradiation treatment

	Training Courses • IAEA/RCA Regional Training Course on Electron Beam Application on Fruits and Frozen Foods • IAEA/RCA Regional Training Course on the use of Irradiation as a Phytosanitary Application for Economically Important Fruits
	Meetings and Workshops • Project Planning Meeting • Mid-Term Review Meeting Executive Management Seminar on Improving Food Safety and Security Using Irradiation • Final Progress Review Meeting
Achievements	**Sanitary Applications** The total irradiated foods of nine countries was approximately 300,000 tonnes in 2010. The amount treated in 2007 was approximately 200,000 tonnes in seven countries. **Novel Applications** A number of Member States are developing novel products and applications using radiation technology in combination with other techniques and methods. **Regulations** Twelve member states have harmonized regulations to approve the irradiation of foods in place and one is close to having regulations. Ten member states have developed phytosanitary regulations or protocols

Thematic Sector	Agriculture
Project Area	Food Irradiation
Project Number	RAS5050
Project Title	Enhancing Sanitary and Phytosanitary Treatment of Regional Products for Export by Irradiation (RCA)
Implementation Period	2009-2011
Project Lead Country	Australia
Budget (Euros)	TCF: 189875.45, EB: 3975.46 Total: 193850.91
Objectives	To enhance treatment of and trade in irradiated products of economic importance in the Asia Pacific region.
Participating GPs	AUL,BGD,CPR,IND,INS, ROK,MAL,MYA,PAK,PHI,SRL, THA,VIE
Regional Activities	Expert Missions Provide Input to a Technical Meeting in China on the application of food irradiation as a phytosanitary treatment

	Training Courses • Training Course on Train the Trainer for Quarantine Inspectors • Training Course on Commercial Applications of Irradiation Technology for Food Safety, Security and Global Trade
	Meetings and Workshops • Project Planning Meeting • Consultants' meeting for development of guidelines for inspectors and accreditation of food irradiation facilities • Consultants Meeting to review and Adopt Guidelines on Audit and Accreditation of Food Irradiation Facilities • Executive Management Meeting for Quarantine Authorities and Nuclear Institutes Mid-Term Review Meeting
Achievements	• Draft guidelines were developed on the Audit and Accreditation of Irradiation Facilities used for Sanitary and Phytosanitary Treatment of Food and Agricultural Products. • Most MS have amended their quarantine regulations, or are doing so, to include irradiation as a phytosanitary measure. • Increased awareness of irradiation as a phytosanitary treatment has enhanced interest in utilising, developing and further researching its application – transfer and sustainability. • 12 countries are currently undertaking 47 research projects on new commodities. • Training material developed from the project has been used by CPR, PHI and SRL in their national training programs • Since commencement of the project, 5 countries have successfully negotiated with new trading partners for commercial exports of irradiated commodities – demonstrated working policy. • MS have promoted public awareness of the technology - audiovisual materials, brochures, booklets, seminars/ workshops

Thematic Sector	Agriculture
Project Area	Food Irradiation
Project Number	RAS5057
Project Title	Implementing Best Practices of Food Irradiation for Sanitary and Phytosanitary Purposes (RCA)
Implementation Period	2012-2014
Project Lead Country	China
Budget (Euros)	TCF: 281, 551.99, EB 584.67, Total 282,136.66
Objectives	Enhance the effective application of irradiation technologies for sanitary and phytosanitary purpose of agricultural products
Participating GPs	AUL,BGD,CPR,IND,INS, JPN,ROK,MAL,MON, NZE,PAK,PHI,SRL, THA,VIE

Regional Activities	Expert Missions • Writing a draft manual on "Best Practices" for phytosanitary irradiation treatments at commercial scale facilities • Including food quality and sanitary aspects - Writing a draft manual on "Best Practices" for food irradiation Production of an on-line training course for the dissemination of Good Food Irradiation Practices • Completion of the E-Learning Course on Good Food Irradiation Practices
	Training Courses Regional Training Course on Best Practices for the Use of Irradiation as a Phytosanitary Treatment
	Meetings and Workshops • Project Planning Meeting • Workshop on best practice for phytosanitary applications of food irradiation • Workshop on best practice for sanitary applications of food irradiation • Executive Management Meeting on Best Practices for Sanitary Applications of Irradiation as a Sanitary Treatment
Achievements	Bangladesh Plant Quarantine Department of the Ministry of Agriculture agreed to emphasize the use of radiation for sanitary and phytosanitary purpose. Monitoring of IAEA on the food irradiators globally is important with mechanical/dosimetric assistance. China 5 commercial EB machines are under construction and will be used for food irradiation. New national standards were drafted in 2014. A new national TC project is carried out to evaluate the existing national standards related to food irradiation based on the final Best Practice Manual that RAS 5057 developed. The Philippines As a result of the Shanghai Meeting, the PNRI and the Bureau of Food Product Standard (BAFPS), Department of Agriculture agreed to create a technical working group composed of different agencies involved in food irradiation in coming up with a Standard Manual regarding Best Practice on Food irradiation in the Philippines. The said Standard will be based on the final Best Practice Manual that Member States of RAS 5057 developed. New Zealand A project has been initiated to develop a business plan for significant upgrading of radiation facilities at ESR, Christchurch that is expected to provide better facilities for food irradiation trials and training. Sri Lanka With the technical support of IAEA, the first commercial Co-60 irradiator was operated in 2013. Foods including spices will be irradiated.
Comments	

Thematic Sector	Agriculture
Project Area	Food Irradiation
Project Number	RAS5071
Project Title	Strengthening Adaptive Climate Change Strategies for Food Security through the use of Food Irradiation (RCA)
Implementation Period	2014-2016
Project Lead Country	Philippines
Budget (Euros)	TCF: 200,431.41
Objectives	To strengthen adaptive climate change strategies for food security through increased awareness and utilization of food irradiation.
Participating GPs	AUL,BGD,CPR,IND,INS, JPN,KAM,ROK,MAL, MON, MYA,NZE,PHI,SRL, THA,VIE
Regional Activities	Expert Missions Expert mission to promote the awareness of food irradiation technology as a suitable solution in case of calamities Meetings and Workshops • First Coordination Meeting • Regional Workshop on Strategy for Development and Dissemination of Information Material for Regional Stakeholders • Regional Coordination Meeting
Achievements	**Outcome Achievement:** Increased awareness on radiation technology and climate change issues contributed to the following broader outcomes: A joint position paper from nuclear technology and climate change groups that food irradiation should be recognized as one of the adaptive technologies in national and regional climate change strategies to ensure food security. Awareness of food irradiation as a potential means to adapt to climate change impacts had increased among officials and agencies responsible for climate change policies. Linkages and partnerships made between climate change groups and researchers of nuclear technology.

Thematic Sector	Agriculture

Project Area	Food Irradiation
Project Number	RAS5087
Project Title	Promoting Food Irradiation by Electron Beam and X Ray Technology to Enhance Food Safety, Security and Trade (RCA)
Implementation Period	2020-2023
Project Lead Country	New Zealand
Budget (Euros)	TCF: 225,225
Objectives	To enhance food safety and trade in the region through developing and promoting electron beam and X ray technologies for food irradiation.
Participating GPs	AUL,BGD,CPR,FIJ, IND,INS, JPN, NEP, MAL, MON, MYA,NZE, PAK, PHI,SIN, SRL, THA,VIE
Regional Activities	Expert Missions (planned) • HBA to prepare two documents: on Comparison of Gamma, Electron Beam and X-Ray Sources for Use in the Irradiation of Food, and Harmonization of Regional Regulations for the Permitted Maximum Energy of X-Rays for Food Irradiation
	Training Courses Regional Virtual Training Course on Electron Beam/X-Ray Technology and the Future of Food Irradiation in the RCA Region
	Meetings and Workshops (planned) • Project Planning Meeting (held as a virtual meeting) • Regional Workshop on Food Irradiation Using Electron Beam /X-ray Technology • Mid-Term Review Meeting (to be held) • Final Project Meeting (to be held)
Achievements	Number of EB/X-ray facilities operating for food irradiation significantly increased. Up to now, at least, 2 facilities operated and 1 planned to establish in Vietnam. 1 EB/X-ray operated in Thailand, and 1 in India. Indonesia and Philippines also planned to install new facilities for multi-purposes.
Comments	Project implementation was affected by Covid pandemic

Project Area – Soil Fertility

Thematic Sector	Agriculture
Project Area	Soil Fertility
Project Number	RAS5055

Project Title	Improving Soil Fertility, Land Productivity and Land Degradation Mitigation (RCA)
Implementation Period	2012-2015
Project Lead Country	Australia
Budget (Euros)	TCF: 391213.3, EB: 15,000, Total: 406,213.31
Objectives	To assist Member States in the development and effective implementation of area-wide precision conservation to control the impact of land-use practices on land degradation through enhancing capacities in nuclear and isotopic techniques.
Participating GPs	AUL,BGD,CPR,IND,INS,MAL,,MYA,NEP,NZE,PAK,PHI,ROK,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • Enhancing counterparts' ability in soil sampling to assess soil degradation and interpretation of previous 137Cs data (SRL) • To assist in the selection of fallout radionuclide (FRN) reference sites and determine soil redistribution rates (MAL) • Determining soil degradation through distribution of fallout radionuclides and soil fertility across agricultural land (THA) • Preparatory work and organizing training materials for the Workshop on Extrapolation of Soil Fallout Radionuclides • Preparatory work and organising training material for Compound Specific Isotopic Analysis under the project • Enhancing Nepal's ability in soil fallout radionuclide (FRN) and compound specific stable isotope (CSSI) samplings (NEP) • Improving Soil Fertility, Land Productivity and Land Degradation Mitigation (MYA) • Side Event at the at the UNCCD 3rd scientific conference on "Combating desertification, land degradation and drought" • Home based assignment for FRNs and CSSI data from RAS 5055 project • Produce a document "Assessment of soil management practices for mitigating land degradation, using nuclear techniques" • Setting, testing, and calibrating Gamma Spectrometer for Cs-137 analysis in Bangladesh (BGD) • Home based assignment to revise and provide technical inputs to the final project report of RAS 5055
	<u>Training Courses</u> • Regional Training Course on the Use of Compound Specific Isotope Analysis (CSIA) for the Identification of Hot Spots of Land Degradation in the Landscape • Regional Training course (RTC) on integrated soil conservation practices to mitigate soil erosion and the role of Nuclear Techniques
	<u>Meetings and Workshops</u> • First Coordination Meeting • Workshop on Extrapolation of Soil Fallout Radionuclides (FRN) Based Information on Land Degradation Status from Field • The use of participatory tools (WOCAT-LADA) to address the assessment of the efficiency of soil conservation measures

	• Second Project Coordination Meeting, and the development of precision soil conservation strategies at landscape level • Meeting to Agree on the Establishment and Maintenance of the Databases of CSSI and FRN Data of the Region • Regional Workshop on Demonstration of the Role of Nuclear Techniques in Conservation Agriculture & Final Review Meeting
Achievements	**Output 1:** *Functional network using FRN and CSSI* •Linkages and functional teams developed between 'knowledge' organisations and endusers **Output 2:** *Capacity Building* •FRN - focussed on case study design, field sampling, modelling of results (RTCs, expert missions) •CSSI - fingerprinting sources of land degradation and soil erosion - effective networking and support from CAAS provided capacity in some GPs **Output 3:** *Regional database established on isotopic signatures of crop and soil compounds (iso-scapes)* •Established in 2014 - collection ongoing •Will provide a regional overview of land degradation, soil erosion and effectiveness of mitigation measures •Journal publication to test scientific robustness •Need to develop a format more suitable for endusers **Output 4***: Efficient and effective project coordination, networking and knowledge transfer to endusers* •Coordination meetings well-attended •Knowledge transfer to endusers at various levels - KL and Dalat events particularly useful •Networks developed between technique specialists and endusers will ensure sustainability on agricultural practices

Thematic Sector	Agriculture
Project Area	Soil Fertility
Project Number	RAS5084
Project Title	Assessing and Improving Soil and Water Quality to Minimize Land Degradation and Enhance Crop Productivity Using Nuclear Techniques (RCA)
Implementation Period	2018-2021 (under implementation)
Project Lead Country	Australia
Budget (Euros)	TCF: 370242.49, EB: 26,986, Total:397,228.49

Objectives	To enhance the capacity of countries in the Asia-Pacific region to use nuclear techniques to assess and improve soil and water quality, and to implement best agricultural practices to minimize land degradation and enhance crop productivity.
Participating GPs	AUL,BGD,CPR,FIJI, IND,INS, JPN,KAM,LAO,NEP,MAL, MON, MYA,NZE,PAK,PHI,SRL,THA,VIE
Regional Activities	Expert Missions • Expert Mission on Understanding and Improving Skills for Using Nuclear Techniques to Soil and Water Quality Research and Management • Expert Mission to Quantify the sources and loads of N and P pollutants in surface water systems by using stable isotope fingerprint techniques—A case study in a small watershed • Expert Mission on Assessing and Improving Soil and Water Quality to Minimize Land degradation and Enhance Crop Productivity Using Nuclear Techniques • Expert Mission on Soil and Water Sampling Strategy, FRNs and Isotope Analysis, Calculation and Data Processing • Expert Mission to Provide Technical Assistance for Soil and Water Quality Study in Mongolia Using Nuclear Techniques
	<u>Training Courses</u> • Regional Training Course on the Application of FRNs and Stable Isotopes for Soil Quality and Soil Erosion Investigation • Regional Training Course on the Advanced Application of Fallout Radionuclides for Soil and Water Quality Investigations • Regional Training Course on the Application of Stable Isotopes for Soil and Water Quality Investigation • Regional Training Course on the Use of Fallout Radionuclides (FRNS) and Stable Isotopes for Soil Erosion, and Soil and Water Quality Management
	<u>Meetings and Workshops</u> • First Coordination Meeting • Mid-term Coordination Meeting • Final Progress Review Meeting (to be held)
Achievements	• Progression of a regional database on soil erosion, soil quality and water quality based on isotopic signatures in the landscape and disseminated demonstration materials is well underway. • Japan has volunteered to host a database and assist data entry for the NPTs to input data to the database, which greatly helps the regional project. • India had developed a soil organic carbon detection kit for field analysis of soil fertility which has been distributed and is being used by around 25 groups.
Comments	• Due to changes in personnel within NPTs, some new NPCs who attended the project review meeting did not have information from former NPCs regarding the country's established work plan.

	• Improvements should be made with respect to communication within countries to pass on relevant information to new NPCs and NPTs before RTCs and project meetings. • COVID-19 has affected putting into action the training that was completed in 2020. Much of what was planned in 2020 did not proceed due to COVID-19..

Thematic Sector	Agriculture
Project Area	Soil Fertility
Project Number	RAS5091
Project Title	Assessing and Mitigating Agro-Contaminants to Improve Water Quality and Soil Productivity in Catchments Using Integrated Isotopic Approaches (RCA)
Implementation Period	2022-25
Project Lead Country	Australia
Budget (Euros)	TCF: 306,350.00
Objective	To improve agricultural catchment, water, and soil management practices in the Asia–Pacific region by enhancing the capacity of countries to assess and mitigate agricultural contaminants.
Participating GPs	AUL, BGD,CAM, CPR, IND, INS, LAO, JPN, MAL, MON,MYA, NEP, PAK, PAL, PHI, SRL, THA,VIE
Regional Activities	<u>Expert Missions</u> • Expert missions on use of SI, FRN and complementary techniques, and application of integrated isotopic approaches. • Expert mission to develop mitigation measures for agro-contaminants related to catchment management practices. • Expert missions for assisting national studies that develop mitigation measures and to engage with beneficiaries and end-users.
	<u>Training Courses</u> • RTC on Fallout Radionuclides • RTC on Stable Isotopes • RTC on Data Analysis
	<u>Meetings and Workshops (planned)</u> • First Coordination Meeting (held as a virtual meeting) • Mid-term Review Meeting • Final Review Meeting
Achievements	The project is under implementation
Comments	

Project Area – Food Safety

Thematic Sector	Agriculture
Project Area	Food Safety
Project Number	RAS5081
Project Title	Enhancing Food Safety and Supporting Regional Authentication of Foodstuffs through Implementation of Nuclear Techniques (RCA)
Implementation Period	2018-2021
Project Lead Country	New Zealand
Budget (Euros)	TCF: 584,100, EB: 29,265.16, Total: 613,365.16
Objectives	To improve food safety, enhance consumer confidence and increase trade by establishing a robust and independent means of verification of origin of foodstuffs.
Participating GPs	AUL,BGD,CPR,FIJI, IND,INS, JPN,KAM,LAO,NEP,MAL, MON, MYA,NZE,PAK,PHI,ROK, SIN,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • Expert Mission to Enhance Awareness of Food Adulteration and Fraud (KAM) • Expert Mission on Food Fraud Awareness Raising Expert Mission (MYA) • Expert Mission to Raise Awareness of Food Adulteration and Fraud and Its Potential Impact on Food Safety (FIJ)
	<u>Training Courses</u> • Regional Training Course on the Fundamentals of Using Nuclear Techniques for Verifying Food • Regional Training Course on Multivariate Data Analysis Using the Chemometrics Add-in for Microsoft Excel including DD-SIMCA • Regional Training Course on the Use of Advanced Nuclear Techniques for Verifying Food Authenticity (Train the Trainer Course) • Regional Training Course on the Fundamentals of Using Nuclear Techniques for Verifying Food Authenticity (Part II) • Regional Training Course on Data Handling, QA/QC and Database Management (*To be held)*
	<u>Meetings and Workshops</u> First Coordination meeting
Achievements	• **Establishment of a self-sustained network of laboratories.** Twelve of the participating countries have laboratories that are contributing to a network. Two more have equipment in progress that was facilitated through this project. The train-the-trainers approach has enabled countries with the more established capability to take the lead and sustain the network. • **Increased awareness within the analytical labs, regulators, producers, policy-makers, decision-makers; interest raised among countries outside the network**. COVID limited the opportunity for meetings and presentations. However, at least fifteen of the participating

	countries engaged with their Government agencies, including regulators and Ministries. More than forty meetings and presentations were conducted to stakeholders through this project. • **Increased capacity through equipment purchases:** Seven participating countries have received support for equipment purchases through this project. • **Increased analytical capability through staff training in stable isotope, trace elements and other complementary techniques:** Training has been a significant focus within this project. COVID curtailed face to face training, but the statistics training was expanded to enable greater participation. Almost 200 persons were trained across the analytical (IRMS, ICP-MS) and data handling (multi-variate statistics). In addition, twelve participants received advanced training as trainers for the network. • **Development of training resources:** A wealth of resources have been developed through this project. These resources are available for the network through the IAEA NUCLUES RAS5081 Project SharePoint site (https://nucleus.iaea.org/sites/nafa-projects/RAS5081/SitePages/Home.aspx). The resources available include 82 lectures, 10 SOPs, several tutorials and two complete lab manuals with teaching experiments. The Excel add-ins for the multivariate statistics using excel are also available with complete tutorials. Training and other resources were made available on the web through the SharePoint, RCA and CLP4NET platforms. • **Post-graduate/undergraduate student involvement:** At least five post-graduate student projects have been supported through the activity of this project. • **Success in attracting external and matching funding for research:** Four countries were successful in attracting external funding to continue the work of this project. Confirmed funding exceeds USD$1.5 M. • **Libraries of authentic samples and datasets:** Over 2,500 authentic-origin samples have been collected and are available to the participants. Approximately one-third of these have had data collected from them using nuclear techniques. • **Technology transfer through the extension of applications to other commodities:** The project was focused on a few commodities (rice, honey, milk). Participants have successfully transferred the technology to a wide range of additional commodities, including yoghurt, cheese, tea, turmeric, oregano, water, soy, ketchup, and vinegar. In five countries, the national regulators have adopted the technology and are now in use as an enforcement tool.

Thematic Sector - Environment

Project Area: Marine and coastal environment

Thematic Sector	Environment

Project Area	Marine and coastal environment
Project Number	RAS7016
Project Title	Establishing a Benchmark for Assessing the Radiological Impact of Nuclear Power Activities on the Marine Environment in the Asia-Pacific Region (RCA)
Implementation Period	2007-2010
Project Lead Country	Australia
Budget (Euros)	TCF: 374,486.64, EB: 78,728.92, Total: 453,215.56
Objectives	1) To assist RCA Member States to develop and strengthen coordinated regional marine radioactivity monitoring programmes designed to yield results that are useful, verifiable, and transferable (i.e., harmonized) to meet regional objectives; 2) To refine assessments of risks involved in eating seafoods by establishing dose responses and transfer factors specific and appropriate to the marine biota found in the region; 3) To update and sustainably maintain the regional database as an ongoing repository for new data generated from monitoring programmes, and to enhance the utility of this regional resource for analysing trends and understanding the fate and behaviour of key radionuclides in the marine environment; and 4) To establish a documented quality management system for regional marine radioactivity monitoring programmes and for data generated by Member States.
Participating GPs	AUL, BGD, CPR, IND,INS, MAL,MYA, PAK, PHI,ROK, SIN,THA,VIE
Regional Activities	<u>Expert Missions</u> • Development of Quality Management System Guidelines for Monitoring Nuclear Impacts in the Marine Environment • Assistance for stable isotope analysis (sample preparation) and data interpretation (MAL) Assistance for Radioecological Studies (MAL) • Expert assistance for nuclear and isotope applications in marine environment fingerprint studies (INS) Expert Mission on Gammaspectrometry (PHI) • Experimental radioecological study of metal accumulation in tropical corals (THA)
	<u>Training Courses</u> • IAEA/RCA Regional Training Course on Establishment of Transfer Factors and Dose Assessment for Marine Organisms from Contaminants released from Nuclear Activities • IAEA/RCA Regional Training Course on Application of Agreed Nuclear Techniques to Measurement of Nuclear Contaminants in Marine Systems

	• IAEA/RCA Regional Training Course on Application of Nuclear & Stable Isotope Tracers to Determine the Fate & Behavior of Nuclear Contaminants in Marine Systems • IAEA/RCA Regional Training Course on Establishment of Dose Response and Risk Assessment for Marine Organisms from Contaminants Released from Nuclear Activities
	<u>Meetings and Workshops</u> • Project Planning Meeting • Mid-Term Progress Review Meeting • Technical Meeting on Implementation of Total Quality Management System Guidelines for Monitoring the Impacts • Technical Meeting on Integration of Tools & Concepts for Site-specific Marine Ecosystem Radiological Impact Analysis • Final Progress Assessment Meeting
Achievements	Output 1 • National Work Plan activities successfully accomplished in all participating MS. • QMS Guidelines for *Monitoring the Impacts of Nuclear Activities in the Marine Environment* adopted by MS. • Seven MS have acquired QMS accreditation – CPR, IND, INS, MAL, MYA, PAK, PHI; and another in progress – VIE. • National Project Teams developed effective collaborations with local agencies and end-users. Output 2 • Coordinated regional approach to execution of marine radioactivity monitoring programs. • MS formulated environmental protection policies and environmental quality guidelines, and developed strategic plans for future research and environmental monitoring. • Scientific papers and reports published in national and international journals. • Use of developing MS scientists in expert missions. • RCA Success Story currently under development

Thematic Sector	Environment
Project Area	Marine and coastal environment
Project Number	RAS7019
Project Title	Harmonizing Nuclear and Isotopic Techniques for Marine Pollution Management at the Regional Level (RCA)
Implementation Period	2009-2011
Project Lead Country	The Philippines

Budget (Euros)	TCF:315,929.8, EB: 1,522, Total: 317,451.8
Objectives	To further develop regional capacities and capabilities, and application of nuclear and isotopic techniques to support marine and coastal zone studies on land-based sources of pollution.
Participating GPs	AUL, BGD, CPR, IND,INS, MAL,MYA, NZE, PAK, PHI, ROK, SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • Management of coastal pollution at Map Ta Phut Industrial Estate, Pradoe Bay (THA) • Development of a guideline/manual and syllabi for training courses for the application of nuclear and isotopic technique (3 experts) • Coastal Marine Pollution Studies along Sorsogon Bay (PHI) • National Workshop on The Application of Nuclear and Isotopic Techniques for marine pollution studies (MAL) • Demonstration of the use of environmental isotope techniques in identifying Pollution Sources (SRL)
	<u>Training Courses</u> • Regional Training Course on Application of Natural Radioisotopes in Studies of Land-based Pollutants in Marine Environments • Regional Training Course on Application of Isotope Techniques to Study Marine Coastal Pollution Issues • Regional Training course on Application of Nuclear Instrumental Techniques in Identifying Sources of Land Based Pollutants in the Marine Coastal Environment
	<u>Meetings and Workshops</u> • Project Planning Meeting • Mid-term Progress Review Meeting • Executive Management Meeting for Environmental Agencies and National Nuclear Institutes • Final Progress Assessment Meeting
Achievements	1. Validated Training Modules/Guidelines/Manual of Selected Procedures for the Applications of Nuclear and Isotopic Techniques in Studying the Transport and Fate of Land-based Sources of Marine Pollution (Harmonized Protocols), prepared by experts from AUL, ROK, and PHI 2. Trained manpower in nuclear and isotopic techniques in fingerprinting and identifying land-based sources of marine pollution 3. Trained manpower in the application of U-series radionuclides in estimating the flux, transport, and fate of land-based sources 4. Collaborations have been established with end-users (policy makers, academe, etc.) 5. Utilization of nuclear and isotopic techniques applications to address land-based sources of pollutants has been demonstrated in national study sites.

	6. The results of the inter-calibration exercise on the analysis of Pb-210, Ra-226, Po-210 and Cs-137 in sediment sample: three MSs showed satisfactory results; one MS showed satisfactory results in three radionuclides measured, and the remaining 8 MSs need to reevaluate their procedures and repeat measurements. 7. Harmonization of protocols was achieved through the use of same training modules in regional and national training courses, use of validated manual of procedures in R & D, and the conduct of inter-calibration exercises.

Thematic Sector	Environment
Project Area	Marine and coastal environment
Project Number	RAS7021
Project Title	Marine benchmark study on the possible impact of the Fukushima radioactive releases in the Asia-Pacific Region (RCA)
Implementation Period	2011-2014
Project Lead Country	Australia
Budget (Euros)	EB: 1,132,651.12
Objectives	To enable RCA Member States to evaluate the extent and the possible impact of the releases of radioactivity from the Fukushima Daiichi nuclear power plant into the marine environment and make scientific assessments of the data.
Participating GPs	AUL, BGD, CPR, FIJ, IND,INS, JPN,KAM,MAL,MON,MYA, NEP,NZE,PAK, PLW, PHI,ROK, SIN,SRL,THA,VIE Non-RCA MSs – Cook Island, Kiribati, Marshall Islands, Solomon Islands, Samoa
Regional Activities	Expert Missions Expert Mission to Assist National Project Team in Sri Lanka to Plan and Conduct a National Marine Radioactivity Monitor (SRL) Expert Mission on Radiochemical Analytical Methods in relation to Marine Environmental Radioactivity (THA) Risk analysis and radioanalytical procedures (INS) Expert Mission on Radio-Analytical Procedures on Marine Environmental Samples and Bioaccumulation Laboratory Experiments (MAL) Expert Mission on Dose Assessment including Dose Calculations and Risk Analysis Related to Ingestion of Seafood (PHI) Radioecology study & Laboratory QMS (CPR) Radioecology study (Part 1) & Laboratory QMS (Part 2) –(CPR) Expert Mission on Asia-Pacific Marine Radioactivity Database (ASPAMARD) Updating

	Training Courses Regional Training Course on Use of Quality Management System for New Entrants Regional Training Course on Assessment of Radiological Risks at Basic Level Regional Training Course on the Analysis of Marine Radioactivity with Application of Radio-Analytical Procedures on Environmental Marine Samples Regional Training Course on Basic Ocean Sampling Practices in Member States Regional Training Course for those with Limited QMS Experience Regional Training Course on Establishment of Transfer Factors and Dose Assessment for Marine Organisms from Contaminants released from Nuclear Activities Regional Training Course on Monitoring the Radiological Impacts of Nuclear Discharges to Pacific Island Marine Ecosystems
	Meetings and Workshops Project Planning Meeting Meeting on Quality Management System Documentation and Utilization of Regional/Global Marine Databases 1st Annual Review Meeting 2nd Annual Project Review Meeting 3rd Annual Project Review Meeting Workshop to Review Implementation of QMS Programme Meeting to review data, discuss and agree on the necessary activities toward the completion of the project Meeting to review data, discuss and agree on the necessary activities toward the completion of the project
Achievements	• No impact from Fukushima accident releases detected in territorial waters of GPs beyond Japan • No spatial or temporal trends observed in territorial waters of GPs • Radionuclide levels in seawater are low and stable around Fukushima Daiichi NPS • Increased capacity and expertise in marine monitoring in GPs • PSIDS are now monitoring marine radioactivity • Increased partnerships - international and bilateral • ASPAMARD database revived and updated - 118965 data; on-line data submission • Quality Assurance: 16 GPs certified to ISO9001, ISO17025 and/or ISO14001 • Proficiency Test Exercises: four exercises - Cs-134/137 in all; Sr-90 in three; H-3 in two. Overall acceptance rates lower than expected. • New laboratory facilities: marine radiochemistry and/or radioecology in 12 GPs

	• Radiological dose/risk analysis: range of local marine biota in 13 GPs • Marine radiological laboratories: active in 5 GPs

Thematic Sector	Environment
Project Area	Marine and coastal environment
Project Number	RAS7024
Project Title	Supporting Nuclear and Isotopic Techniques to Assess Climate Change for Sustainable Marine Ecosystem Management (RCA)
Implementation Period	2012-2014
Project Lead Country	The Philippines
Budget (Euros)	TCF:266,522.61, EB:53,140, Total: 319,662.61
Objectives	To enhance regional capabilities for utilization and application of nuclear and isotopic techniques to assess climate change impacts on marine and coastal resources.
Participating GPs	AUL, BGD,CPR,IND,INS,MAL,MON, MYA,NZE,PAK,PHI, SRl,THA,VIE
Regional Activities	<u>Expert Missions</u> • Preparation of documents, materials and coordination of lecture and practical session for the first RTC • Expert mission for planning, preparation, conduct and reporting of coral radiotracer experiments (THA) • Expert mission for analysis of stable isotope data and interpretation of results of in climate change studies (SRL) • Expert mission for analysis of trace metal data and interpretation of results in climate change studies (BGD) • Expert mission for sample strategy, collection and analysis of water, sediment & biota by NAA, AAS & Gamma Spectrometry. (MYA) • Expert mission for sample collection and analysis and data interpretation of sediments and mangroves (MAL) Sediment chronology modelling and data interpretation of Po-210 and Pb-210 and biotic C/N isotope analysis in (VIE) • HBA Mission to support the dissemination of project information to RCA stakeholders on climate change impacts.
	<u>Training Courses</u> • Regional Training Course on Application of Stable Isotopes (Carbon-13, Nitrogen-15 and Oxygen-18) and trace elements as tracers of biogeochemical change in the marine environment • Regional Training Course on Interpretation and Statistical Analysis of Nuclear and Isotopic Data in Addressing Climate Change Issues

	Meetings and Workshops • Project Planning Meeting • Mid-Term Progress Review Meeting • Workshop on integration of nuclear and isotopic data on climate change and marine ecosystem regional impacts • Final Assessment Meeting
Achievements	Outcomes Improved understanding of the impact of climate change in the marine ecosystem and accumulation of elements and contaminants/pollutants through the effective utilization and application of nuclear techniques. The participating Member States identified the marine issues and concerns in their respective countries and selected the appropriate nuclear and isotopic techniques to elucidate the processes occurring in the marine ecosystems relating to climate change issues. AUL Enhanced capacity of MSs in the applications nuclear and isotopic tec a resource country. BGD Capacity to measure radionuclide and trace elements in sediments, w change issues. CPR Proficiency in the conduct of analysis for - ^{224}Ra, ^{226}Ra, ^{228}Ra, NO_3^- IND Enhanced capacity to utilize nuclear and isotopic techniques: Radionu INS Capacity to conduct climate change related studies thru deep sea samp temperatures. MAL Enhanced awareness and capacity on the usage of isotopic technique NZE Enhanced capacity of MSs in the applications nuclear and isotopic tec services as a resource country PAK Enhanced capacity for processing and isotopic analysis of biota and s PHI Enhanced awareness and capability on the usage of isotopic technique SRL Enhanced awareness on the usage of isotopic techniques specifically THA Capacity to conduct climate change related studies thru the implem impacts to coastal aquaculture. VIE Enhanced awareness on the usage of isotopic techniques to address m

Thematic Sector	Environment
Project Area	Marine and coastal environment
Project Number	RAS7028
Project Title	Enhancing Regional Capabilities for Marine Radioactivity Monitoring and Assessment of the Potential Impact of Radioactive Releases from Nuclear Facilities in Asia-Pacific Marine Ecosystems (RCA)
Implementation Period	2016-2019
Project Lead Country	Indonesia
Budget (Euros)	TCF:841,503.17, EB:9,972.74, Total: 851,475.91
Objectives	To improve the integrated regional quality-assured capabilities for marine radioactivity monitoring and for impact assessment of routine and accidental releases of radioactivity into the marine environment
Participating GPs	AUL, BGD,CPR,FIJ,IND,INS,JPN,KAM,MAL,MON,MYA,NZE,PAK,PLW,PHI, ROK,SIN,SRL,THA,VIE
Regional Activities	Expert Missions • Review status of methodological guidelines and technical content of training course on sampling and basic analytics • Expert Mission on Marine Environmental Radiological Risk Assessment (CPR) • Expert mission to provide training and advice in the area of marine radioecology research and applications (INS)
	Training Courses • Regional Training Course on Sampling and Basic Analytical Techniques • Regional Training Course on Analysis of Strontium-90 and Tritium in Seawater • Regional Training Course on Radiochemical Analysis of Marine Environmental Samples\ • Regional Training Course on Rapid Assessment of Radionuclides in the Marine Environment • Regional Training Course on Gamma-Ray Spectrometry • Regional Training Course on Dose Assessment and Risk Analysis Modelling • Regional Training Course on Radioecology Laboratory Studies
	Meetings and Workshops • Project Coordination Meeting • Mid-Term Review Meeting • Workshop on Implementation of Quality Management Systems in Radioanalytical Laboratories involved in Marine Radioactivity Studies • Participation in the 16th Coordination meeting of the ALMERA network of Analytical Laboratories for the Measurement of Environmental Radioactivity Participation in 9th International Symposium on Naturally Occurring Radioactive Material

	• Regional Workshop on Marine Environments Monitoring Guidelines Workshop on Radiological Dose Assessment
Achievements	Regional skills in the marine environmental sampling were also interpreted by the number of data submitted to the ASPAMARD (Asia-Pacific Marine Radioactivity Database). The database covers the three main sample types: seawater, sediment, and biota and includes many radionuclides (Cs-137, Cs-134, Po-210, C-14, Sr-90, Th-232, Ra-226, Pb-210, K-40, U-238, and Pu-239/240). In 2019 approximately 3.200 data were submitted to the group and in 2020 more than 37.000 data points were included. Currently, the total number of data stands at 40.689. One of the aims of this project was to have an opportunity to share data across the region, by ASPAMARD submitted data will be shared with MARIS and will be available to scientists and researchers, and will enable future scientists, to look for changes and dynamics in the marine system. Improvement regional skills in marine radiochemistry are greatly helped by the existence of Document Guidelines for the Sampling, Preparation, and Radio-analysis of Marine Matrices. The guideline was prepared in collaboration of all members of the project and use for their laboratory needs. Radio analytical methods in the guideline cover the main radionuclides: Cs-17, Sr-90, Pu isotopes, Po-210, and H-3. Most of the methods listed have been used in various regional training courses during the lifetime of the project. The document also lists the common sampling categories (sample matrices) in addition to providing a list of suggested biota, based on what could be reasonably sourced within the region. The aim of this project is to produce quality-assured data by the adoption of basic quality requirements and internal and external quality control. Therefore, not only for radiochemistry analysis purposes, this document also provides some guidance on the determination of uncertainties. In addition, quality management is an important aspect of sample monitoring and analysis. The document provides some guidance to quality the establishment of a quality system. By the existence of the document guideline hope that quality-assured marine radioactive contamination monitoring data are very well to perform. The latest draft for the Guidelines document has been reviewed and there were some suggested editorial changes. It is anticipated that the Guidelines document could be finalized and published by the end of the project. IAEA proficiency testing activities also have been supporting the regional skill in marine radiochemistry of the RAS7028 laboratories. The number of participants from Asia-Pacific has increased over the last few years: 9 in 2017, 12 in 2018, and 14 in 2019 with the positive progress of accepted result among participated laboratories, which means the skills in radiochemistry analysis were improved. RWS on Radiological Dose Assessment in Philippines on February 2020 was held to enhance regional capabilities in dose assessment associated with the radioactive contamination in the marine environment. The main

	outcomes of the workshop were coordination of approaches, training, and development of a trial run of a cooperative seafood dose assessment that spans the range of RCA Project RAS/7/028 countries. Each country has improved their marine environmental monitoring date in recent years. Each country also has varying seafood diet habits/consumption rates as well as some differences in their measured radionuclide activity concentrations. The workshop was successful in coordinating data and approaches for biota and human consumer dose assessments. The workshop increased confidence by the countries in implementing valid dose assessments and increased ongoing connection and communication among countries on this topic. With regards to enhancing regional capabilities in risk modeling, RTC in China was performed in2019 on Dose Assessment and Risk Analysis Modelling in China.

Thematic Sector	Environment
Project Area	Marine and coastal environment
Project Number	RAS7031
Project Title	Assessing the Vulnerability of Coastal Landscapes and Ecosystems to Sea-Level Rise and Climate Change (RCA)
Implementation Period	2018-2021
Project Lead Country	Australia
Budget (Euros)	TCF: 359,000
Objectives	Improve capacity of coastal countries in the Asia-Pacific region to use radiometric and isotopic techniques to ascertain coastal vulnerability and resilience to climate change in the 21st century.
Participating GPs	AUL, BGD,CPR,FIJ,IND,INS,JPN, CAM,MAL, MYA,NZE,PAK,PLW,PHI, SRL,THA,VIE
Regional Activities	Expert Missions Expert assistance to develop user manual and compilation of existing data throughout the region
	Training Courses • Regional Training Course on the Use of Isotopic Techniques in Assessing Coastal Geomorphic Change • Regional Training Course on collection and preparation of samples Pandemic related risk should be considered in the risk matrix and achievements. • Virtual platform for conducting meetings and training yielded better results, and it may be considered as an alternative for pandemic like situations (to be held)

	• Regional Training Course on measurement of radioactivity and stable isotope fractionation of sediments and organic material (to be held) • Regional Training Course on data analysis and interpretation of information from radiometric and isotopic analysis
	Meetings and Workshops • First Project Coordination Meeting • Mid-Term Project Review Meeting • Final Project Review Meeting (to be held)
Achievements	• The progress review meeting discussed and reviewed the status of each member state in relation to the establishment of a national program, sampling design, sample collection and analyses. • Based on the progress reports submitted by the countries, it is evident that all participating countries have established national programs, and progress is being made to some extent towards study site selection, sampling, and analyses despite COVID-19 pandemic travel restrictions. • The project will continue to identify appropriate information that can be incorporated into a training manual. The training manual is anticipated to consist of resources adapted from IAEA and ANSTO, with project specific information included.
Comments	• Pandemic related risk should be considered in the risk matrix and achievements. • Virtual platform for conducting meetings and training yielded better results, and it may be considered as an alternative for pandemic like situations.

Project Area: Water Resources

Thematic Sector	Environment
Project Area	Water Resources
Project Number	RAS8104
Project Title	Assessment of Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management (RCA)
Implementation Period	2007-2008
Project Lead Country	Pakistan
Lead Country Coordinator	Manzoor Ahmed Choudhary
Budget (Euros)	Not known

Objectives	The general objective of the project is to promote the utilization of isotope techniques for improving freshwater resources management in the region. The specific objectives are: 1) To establish a regional database of water-quality parameters for ground waters and surface waters, comprising isotope and chemical constituents (including the data generated under the project RAS/8/097), for use by the wider community involved in water resources management; 2) To provide a suitable scientific basis for improving the understanding of surface water-groundwater and inter-aquifer hydraulic interactions, and for delineating pathways of contaminant migration in surface waters and ground waters; and 3) To identify the government departments responsible for water resources management policy, preventive measures and mitigation, and to provide them with information and recommendations gleaned from using the environmental isotope and chemical techniques.
Participating GPs	AUL, BGD,CPR ,IND,INS, MAL, MON,MYA,NZE,PAK ,PHI, ROK, SIN, SRL,THA,VIE
Regional Activities	Expert Missions
	Training Courses Regional Training Course on Application of Isotope and Geochemical Techniques to Surface Water-Groundwater Interactions and Contaminant Transport
	Meetings and Workshops Project Planning Meeting Mid-Term Review Meeting
Achievements	**Australia** has completed an isotope hydrograph separation study in the NSW Southern Highlands identify the flow pathways contributing to streamflow generation during rainfall events, in particular to identify the contribution from baseflow and the impact of farm dams. ^{14}C correction modelling to provide groundwater residence times for palaeowaters from the Glen Villa area in the Darling River Drainage Basin has been completed. **Bangladesh** identified two sub-surface water systems in the Singair area on the basis chemical analysis, especially the spatial distribution of arsenic concentration. Baseline data on isotope and pollutant levels including metals at trace level have been developed. **China**: The isotope techniques and conventional methods applied in Huaibei area have been useful for identifying the sources of recharge and contaminations. **India** finalised the sampling locations in consultation with end user. Samples have been collected and analysed for water quality parameters like Cl, SO4, NO3, F, hardness, TDS, Na, K, Ca, Mg etc. and tace elements like Cu, Ni, Co, Zn, Fe, Mn and tritium, while analysis for stable isotopes is in progress. **Indonesia** collected and analysed many samples and interpretation is in progress. **Korea** investigated causes of high fluoride level in gneiss and granite in northern part of the Yuseong area and hydrogeological and hydrochemical condition of the KURT extension up to 500m depth. **Malaysia** gathered initial information on recharge of groundwater, interconnection within the water resources and level of pollution in ground water.

	Myanmar collected hydrogeological and geological information in the area of Inle Lake and investigated chemical and biological quality of surface water and groundwater. **New Zealand:** Tritium measurements with high sensitivity method were made in various regions of the country for assessment of age distribution, which will eventually be used to assess landuse impacts on groundwater quality. **Pakistan** investigated that groundwater in the proposed Kalabagh Dam area is mainly recharged by rainwater and the pockets having significant recharge from the river Indus were marked. Isotope and chemical data of previously completed national studies were gathered for contribution to regional database. The end-user (WAPDA) has referred three more studies and proposals are expected to be finalized soon. **Philippines** analysed tritium and major ion concentrations. **Singapore**: The National Environment Agency (NEA) of Singapore has an on-going comprehensive water quality monitoring programme for inland and coastal waters in Singapore. **Sri Lanka** has identified two field studies, which will be carried out under this RCA project. **Thailand:** As a result of close collaboration between TINT and end-users (Directorate of Groundwater Resources), isotope techniques have been used in groundwater resources management in different basins of the country, especially Ching Mai Basin**.** Several papers were presented at scientific conferences**.** **Vietnam** analysed samples for isotopes and set up two field tracer experiments at recharge area for assessing the vertical infiltration rate of rain water and nitrogen fertilizer using artificial radioactive isotope and urea enriched in ^{15}N

Thematic Sector	Environment
Project Area	Water Resources
Project Number	RAS8108
Project Title	Assessing Trends in Freshwater Quality Using Environmental Isotopes and Chemical Techniques for Improved Resource Management (RCA)
Implementation Period	2009-2011
Project Lead Country	Pakistan
Budget (Euros)	TCF:107,000
Objectives	The overall objective of the project is to improve freshwater resources management in the region through utilization of isotope techniques. The specific objectives are (i) to establish a regional database of water-quality parameters for ground waters and surface waters, comprising isotope and chemical constituents for use by the wider community involved in water resources management; (ii) to provide a suitable scientific basis for improving the understanding of surface water-groundwater and inter-aquifer hydraulic interactions, and for delineating pathways of contaminant migration in surface waters and ground waters; and (iii) to provide the

	Government departments responsible for water resources management policies, preventive measures and mitigation, information and recommendations gleaned from using environmental isotope and chemical techniques.
Participating GPs	AUL, BGD,CPR ,IND,INS, MAL, MON,MYA,NZE,PAK ,PHI, ROK, SIN, SRL,THA,VIE
Regional Activities	Expert Missions • Assistance in data interpretation, revision of sampling plans and conducting awareness program (SRL) • Lecture and field training on isotope hydrology (BGD) Assistance in data interpretation and conducting awareness program (THA) • Evaluation of data and planning of new hydrological project (SRL) • Evaluation of data and planning of new hydrological project (PHI)
	Training Courses Training Course on Advanced Techniques for Isotope and Related Applications in Water Resources Management
	Meetings and Workshops • Executive Meeting on Application of Isotope Techniques to Solve Hydrological Problems • Mid-term Review Meeting • Final Progress Review Meeting
Achievements	• The project progressed as per national work plans • Studies were carried out involving end-users at national level • NPCs of the Project except Mongolia, Singapore and Sri Lanka participated in the Project Review Meeting • Nineteen participants from 10 countries attended RTC in Mumbai • The MSs Collected hydro-geological information and collected/ analysed water samples • Philippines and Pakistan organized National Executive Management Seminars in the end-user departments

Thematic Sector	Environment
Project Area	Water Resources
Project Number	RAS7022
Project Title	Applying Isotope Techniques to Investigate Groundwater Dynamics and Recharge Rate for Sustainable Groundwater Resource Management (RCA)
Implementation Period	2012-2015
Project Lead Country	Pakistan
Budget (Euros)	TCF: 350,000
Objectives	To improve the capability for efficient and effective development and management of groundwater resources.
Participating GPs	AUL, BGD,CPR,INS, MAL,MON, NEP, NZE,PAK ,PHI, ROK, SRL,THA,VIE

Regional Activities	Expert Missions Application of isotope techniques to investigate groundwater dynamics and recharge rate (MAL) Installation of isotope ratio mass spectrometer (INS) Expert service for investigation of groundwater dynamic in karstic aquifer (THA) Expert mission to assist in investigation of groundwater dynamics and recharge rate (MON) Assistance in data interpretation and field sampling (SRL)
	Training Courses Regional Training Course on Environmental Isotope Techniques Applicable to Groundwater Studies Regional Training Course on Groundwater Dynamics Using Isotopes and Other Tools
	Meetings and Workshops Project Planning Meeting Meeting on Processing, Analysis, and Interpretation of Isotopic and Hydro-geochemical Data for Groundwater Dynamics Mid-term Progress Review Meeting Final Project Assessment Meeting
Achievements	• NPCs of the Project except Korea, participated in the First Project Planning Meeting 16-19 July Vienna Austria, Technical Meeting, 4-9 Nov 2013, Beijing, China and Mid-term progress review meeting 28 June-04 July, Manila, Philippines. • 24 participants from BGD, CPR, INS, IND, MAL, MON, MYA, PAK, PHI, ROK, THA, VIE and ten local participants from SRL, attended first RTC, 3-7 Dec 2012 Philippines. . • 22 participants from BGD, CPR, INS, IND, MAL, MON, MYA, PAK, PHI, ROK, THA, VIE and ten local participants from SRL, attended the second RTC, 5-9 August 2013, Sri Lanka. • The project progressed as per national work plans, each MS established working group and selected study area. • National studies were initiated/carried out involving end users. • The MSs Collected hydrogeological, Meteorological information, and collected/ analysed water samples**.**

Thematic Sector	Environment
Project Area	Water Resources
Project Number	RAS7030
Project Title	Assessing Deep Groundwater Resources for Sustainable Management Through the Utilization of Isotopic Techniques (RCA)
Implementation Period	2016-2019

Project Lead Country	Pakistan
Budget (Euros)	TCF:557,038.21, EB:96,605, Total: 653,643.21
Objectives	To improve the capability for efficient and effective planning for sustainable management of deeper groundwater resources.
Participating GPs	AUL, BGD,CPR,INS, CAM,LAO,MAL,MON, MYA,NEP, NZE,PAK, PLW,PHI, ,SRL,THA,VIE
Regional Activities	Expert Missions Designing of sampling programs and research methodology for groundwater assessment (SRL) Expert Mission to Review and Guide National Project (PHI) Fieldwork for Water Resources Assessment (PLW) Designing of sampling programs and research methodology for groundwater assessment (SRL) Isotope data interpretation (MON) Expert missions for field work designing and data interpretation (PHI) Expert Mission on Basic principles of isotope hydrology and data interpretation (MAL)
	Training Courses Regional Training Course on the Assessment of Groundwater by Using Isotope and Related Techniques Regional training course on the use of isotope techniques for groundwater dating Regional Training Course on the Use of Isotope Techniques in Assessing Groundwater Quality Regional Training Course on Isotopic Data Processing and Interpretation – Hands on Exercises
	Workshops and Meetings First Project Coordination Meeting Technical Workshop on Ground Water Recharge and Dynamics Using Isotopic Techniques Mid-Term Progress Review Meeting Final Project Assessment Meeting
Achievements	The project is proceeding as per regional and national work plans agreed in the first coordination meeting.
Comment	The project is under implementation

Thematic Sector	Environment
Project Area	Water Resources
Project Number	RAS7035
Project Title	Enhancing Regional Capability for the Effective Management of Ground Water Resources Using Isotopic Techniques (RCA)

Implementation Period	2020-2023
Project Lead Country	Pakistan
Budget (Euros)	TCF: 303,168.75, EB: 5,000, Total: 308,168.75
Objectives	To enhance management of ground water pollution using isotopic techniques.
Participating GPs	AUL,BGD,IND,JPN, CAM,LOA,MAL,NZE, PAK,PHI,ROK, SRL
Regional Activities	Expert Missions Expert mission to support participating countries (planned)
	Training Courses Regional Training Course on Basic Principles of Isotopic Techniques in Groundwater Study (planned) Regional Training Course on advanced isotopic techniques and application to determine the source and fate of ground water pollution (planned) Regional Training Course on advanced isotopic techniques (planned)
	Meetings and Workshops First Project Coordination Meeting Mid-Term Progress Review Meeting Final Progress Review Meeting
Achievements	The Project is under implementation

Thematic Sector	Agriculture
Project Area	Water Resources
Project Number	RAS7040
Project Title	Improving Water Resources Management Practices by Enhancing the Regional Collaboration in Environmental Isotope Analysis and Applications (RCA)
Implementation Period	2022-205
Project Lead Country	Vietnam
Budget (Euros)	TCF: 473,081
Objective	To enhance the regional capability in water quality and water resource monitoring for effective development and management of surface water and groundwater.
Participating GPs	AUL, BGD, CAM, CPR, ,FIJI, IND, INS, JPN, LAO,MAL,MON, MYA, NEP, PAK, PAL, PHI, SRL,THA,VIE

Regional Activities	Expert Missions • Development of guidelines on precipitation sampling and analysis • Development of guidelines related to natural contamination and anthropogenic pollution of water resources
	Training Courses • RTC on N-O analyses • RTC on isotopic calibrated models for surface and ground water • RTC on isotopic calibrated models for surface water
	Meetings and Workshops • Kick-off meeting • Regional meeting on N species analyses • Mid-Term Progress Review Meeting • Regional meeting for establishment of isotope, chemical and hydrogeological database • Regional meeting on integrated water isotopic monitoring networks for the region • Final Progress Review Meeting
Achievements	The project is under implementation
Comments	

Project Area: Air-Pollution Monitoring

Thematic Sector	Environment
Project Area	Air-Pollution Monitoring
Project Number	RAS7015
Project Title	Characterization and Source Identification of Particulate Air Pollution in the Asian Region (RCA)
Implementation Period	2007-2010
Project Lead Country	New Zealand
Budget (Euros)	TCF:457,792.13, EB:32,130.48, Total: 489,922.61
Objectives	The overall objective of this project is to contribute to the improvement of air quality in the RCA region by applying advanced NATs to the assessment of APM pollution. The specific objectives are: 1) To obtain sufficient long-term data on fine and coarse APM to identify the anthropogenic and natural

	pollution sources and to assess the extent of their impact; 2) To obtain sufficient high-quality data from a sufficient number of Member States within the region covering the same time frame to facilitate a study of larger-scale trans-boundary pollution and transportation sources; and 3) To create a reliable high-quality region wide data base that will enable government air-quality managers to make informed decisions on pollution abatement and control strategies.
Participating GPs	AUL, BGD,CPR,IND,INS,MAL,MON, MYA, NZE,PAK,PHI, ROK, SIN,SRL,THA,VIE
Regional Activities	Expert Missions Application of PMF including Back Trajectory Models Application of PMF including Back Trajectory Models (INS) Support for Mongolia in interpretation of analytical data for APM Support for Mongolia in interpretation of analytical data for APM (MON) Nat Seminar on the role current status and trends of NATs especially PIXE and its applications in environment and health (INS)
	Training Courses Regional Training Course on Harmonization of Data and Source Components Regional Training Course on Source Components and Visibility and Introduction to Back Trajectories Regional Training Course on Using Back Trajectory Schemes to Link Pollution Transport Across the Region and Beyond
	Meetings and Workshops Project Planning Meeting Technical Meeting on Review and Optimization of the Regional Database Executive Technical Meeting on Asia Dust Events and Source Progress Review Meeting Final Progress Review Meeting
Achievements	• Sampling of air particulate matter, nuclear elemental analysis (XRF, IBA and NAA) source identification and apportionment analysis and long range transport analysis were completed successfully. • High publication output confirming the leading role of the participants in air particulate matter research in Australasia. • First database of fine and coarse air particulate matter in Australasia

Thematic Sector	Environment
Project Area	Air-Pollution Monitoring
Project Number	RAS7023
Project Title	Supporting Sustainable Air Pollution Monitoring Using Nuclear Analytical Technology (RCA)

Implementation Period	2012-2015
Project Lead Country	New Zealand
Budget (Euros)	TCF:512,477.95, EB:12,287.67, Total: 524,765.62
Objectives	To enhance regional capabilities in source apportionment and fingerprinting of air particulate matter pollution in urban areas of RCA Member States through the use of nuclear analytical techniques (NATs).
Participating GPs	AUL, BGD,CPR,IND,INS ,MAL,MON, MYA,NZE,PAK,PHI, ROK, SIN,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • EM to establish the EDXRF with the secondary targets (Al, Ca, Ti, Fe and Zr) in air filter analysis.(SRL) Support to the Air Pollution Monitoring program of Mongolia (MON) • Review and regularly update the Air Particulate Matter elemental and source fingerprint regional databases • 3rd National Workshop on Monitoring Data Interpretation on |Source Appointment of Air Pollution. (PAK) • Technical Manual for X-Ray Fluorescence Analysis of Air Particulate Matter: Home based assignment • To prepare a technical manual on the application of XRF technique for the analysis of air particulate matter samples
	<u>Training Courses</u> • Regional Training Course on Quality Assurance of Fingerprint and Source Apportionment Data. • Regional Training Course on QA Source Apportionment to Complete Data for Fingerprint Database • Regional Group Training on the Effective Utilization of XRF Spectrometers for an Optimized and Accurate Air Particulate Matter (APM) Analysis • Regional Group Training on the Effective Utilization of XRF Spectrometers for an Optimized and Accurate Air Particulate Matter (APM) Analysis • Regional Group Training on the utilization of Synchrotron Radiation Techniques for Advanced Analytical Studies on Air Pollution • Regional Training Course on Quality Assurance of Fingerprint and Source Apportionment of Air Particulate Matter (APM)
	<u>Meetings and Workshops</u> • Project Planning Meeting • Mid-Term Review Meeting • Regional workshop on impact of APM concentrations and sources on cultural heritage objects • Final Project Review Meeting • Regional Workshop on Aerosol and Pollution Source Fingerprint Databases
Achievements	• Smooth sampling across the Member States as demonstrated by reports.

	• NATs are now mostly available in Member States. New systems in Mongolia and Indonesia helped the project. Mongolia undertook RRU service for China. • World-first elemental and source fingerprint databases have been completed. They are available for participating Member States to download. • Very good uptake of results from end-users in many countries. Good end-user support for managing project activities. • Good refocus of tasks during project as evidenced by new synchrotron workshop and revising visibility objective.

Thematic Sector	Environment
Project Area	Air-Pollution Monitoring
Project Number	RAS7029
Project Title	Assessing the Impact of Urban Air Particulate Matter on Air Quality (RCA)
Implementation Period	2016-2018
Project Lead Country	New Zealand
Budget (Euros)	TCF: 360,724.05
Objectives	To enhance capacity using Nuclear Analytical Techniques in assessing the impact of fine particulate matter on human health, visibility and historic monuments.
Participating GPs	AUL, BGD,CPR,IND,INS,JPN,MAL,MON, MYA,NZE,PAK,PHI, ROK, SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> • HBA to Compile, evaluate and assess analytical results on gaseous pollutants from Member states Cultural Heritage sites • Review of the X-ray Fluorescence Technical Manual • Expert Mission to provide technical advice and training on atmospheric aerosol sampling and analysis (NEP) • Home Based Assignment: Draft an IAEA document on the socio-economic aspects, success and impacts of the RCA air particulate matter studies in the Asia-Pacific region 2002-2018 • Home Based Assignment to Draft an IAEA document on the scientific activities, procedures, protocols, databases and results of air particulate matter studies in the Asia-Pacific region within the RCA
	<u>Training Courses</u>
	<u>Meetings and Workshops</u> • Mid-Term Project Review Meeting combined with technical workshop • Final Project Review Meeting • TC sponsored participation - 2018 International Aerosol Conference

	• Regional Workshop on Long Range Transport of Atmospheric Aerosols in the Asia-Pacific Region • Regional Workshop on Identifying Trans-boundary Air Pollution Events across Asia-Pacific • Workshop for Supporting Operational Procedures and Developing Capability for New Participating GPs to expand regional sampling • Participation in the World Clean Air Congress and Better Air Quality Conference • Workshop on Cultural Heritage and Applicability of Nuclear Analytical Techniques
Achievements	• Success stories on leadership development have been submitted. • Smooth sampling across the Member States demonstrated by reports. • NATs are now mostly available in Member States. • World-first elemental and source fingerprint databases have been completed and published. • Feedback from workshop and review meetings was excellent • Very good uptake of results from 37 end-users (overall 88 stakeholder engagements) in RCA countries demonstrating relevance of data and results for policy decision making processes. • Newcomer countries have been introduced to programme.

Thematic Sector	Environment
Project Area	Wetland Management
Project Number	RAS7037
Project Title	Enhancing Wetland Management and Sustainable Conservation Planning (RCA)
Implementation Period	2020-2023
Project Lead Country	Australia
Budget (Euros)	TCF: 292,556.25
Objectives	To enhance the sustainable development of wetlands and their ecosystem services in the Asia Pacific region.
Participating GPs	AUL, BGD, JPN,KAM.PHI,ROK,SRL
Regional Activities	<u>Expert Missions</u> • To assist with development of user manual and compilation of existing data throughout the region through field expert missions (planned) • To provide support to GPs to undertake sample analysis at own laboratory or RGP laboratory under co-ordination of LCCs (planned)
	<u>Training Courses</u> • Regional Training Course on Experimental Design, Field Sampling and Sample Preparation • Virtual Regional Training Course on Design and Implementation of Wetland Isotope Programs

	• Virtual Regional Training Course on Sample preparation and analyses of stables isotopes in wetland samples Prospectus
	Meetings and Workshops • First Coordination Meeting (held as a virtual meeting) • Mid-project review meeting (planned) • Final project review meeting, (planned)
Achievements	• Several countries (Bangladesh, China, Sri Lanka, Malaysia) reported on progress in the establishment of domestic networks supporting project objectives. • Funds from the meeting underspend were made available to member states in support of small equipment purchases. These included |Freeze dryers (Philippines, Vietnam), Gryding CryoMill (Sri Lanka), NCS Detector (Indonesia), Microbalances (Pakistan, Myanmar, Bangladesh) • The LCC is very conscious and committed to achieve the major goals of the project which concerns the preparation of a training manual for the application of stable isotopes in wetland management followed by different virtual and on-hands trainings on sampling and measurement procedures for stable isotope analysis using EA-IRMS, as well as training in the application of stable isotopes source mixing models
Comments	• Lack of face-to-face meetings made casual conversation, partnership building and capacity sharing difficult. • The pandemic has delayed the implementation of field programs in some cases and pushed back the 1st Project Coordination meeting scheduled for April 2020

Thematic Sector - Human Health

Project Area: Nuclear Medicine

Thematic Sector	Human Health
Project Area	Nuclear Medicine
Project Number	RAS6049
Project Title	Strengthening Clinical Applications of PET in RCA Member States (RCA)
Implementation Period	2007-2008
Project Lead Country	India
Budget (Euros)	TCF: 304,203.33, EB: 127,300.77, Total: 431,504.1
Objectives	Overall objective: to improve patients' prognosis and QOL through the more effective and precise diagnostic techniques that come from the clinical application of PET technology. Specific objectives: 1) to enable RCA Member States to understand the physiological and biochemical aspects of PET images for more effective image interpretation and diagnosis, and to

	understand the role of PET in decision-making for therapeutic strategies, especially in cancer patients; and 2) to provide nuclear physicians in RCA Member States with regionally harmonized training on the effective operation of PET/PET-CT scanners, with guidance on harmonized QA/QC programmes.
Participating GPs	AUL,BDG,CPR,IND,INS,JPN,MAL,MON,MYA,NZE,PAK,PHI,ROK,SIN, SRL,THA,VIE
Regional Activities	Expert missions • To support the delivery of the RTC and finalize the electronic library of Clinical applications of PET
	Training Courses • Regional Training Course on Fundamental Clinical Applications of PET • Regional Training Course on Advanced Clinical Applications of PET • Regional Training Course on Quality Management of Positron Emission Tomography (PET) • Regional Training Course on Advanced Clinical Applications of PET • Regional Training Course on Reporting in Advanced Clinical Applications of Positron Emission • Regional Training Course on Improving the Quality of Reporting in Positron Emission Tomography (PET)
	Meetings and Workshops • Project Planning Meeting • Consultants Meeting to draft Guidelines on clinical applications of PET • Finalize Guidelines on clinical applications of PET and PET/CT • Mid-term Progress Review Meeting • Consultant Meeting on Establishing a teaching library for PET/CT studies • Consultant Meeting on finalizing a teaching library for PET/CT studies • Final Progress Assessment Meeting
Achievements	Preparation of • A guideline on clinical applications of PET • A guideline on establishment of PET facilities • A pamphlet for end user- physicians on the appropriate use of PET for clinical problems • A document for stakeholder/government on the planning of a PET facility

Thematic Sector	Human Health
Project Area	Nuclear Medicine
Project Number	RAS6061
Project Title	Improving Cancer Management with Hybrid Nuclear Medicine Imaging (RCA)

Implementation Period	2012-2014
Project Lead Country	India
Budget (Euros)	TCF: 262,786.06, EB: 43,254.84, Total: 306,040.90
Objectives	To improve professional knowledge and reporting skills of nuclear medicine practioners and increase clinical impact of hybrid imaging
Participating GPs	AUL, BGD, CPR, IND, INS, ROK, JPN, MAL, MON, MYA, NEP, PAK, PHI, SIN, SRL, THA, VIE
Regional Activities	Expert Missions
	Training Courses • Regional Training Course on Quality Reporting of Hybrid Imaging Procedures (SPECT/CT and PET/CT) in Oncology • Regional Training Course on "Advances on Hybrid Imaging in Oncology • Regional Training Course on Essentials of Hybrid Nuclear Medicine Imaging in Oncology • Regional Training Course on Clinical Applications of PET/CT for Nuclear Medicine Physicians • Regional Training Course on Advanced Hybrid Nuclear Medicine Reporting in Oncology • Regional Training Course on Essentials of Hybrid Nuclear Medicine Imaging
	Meetings and Workshops • Project Planning Meeting • Consultant's meeting on Drafting Guidelines for Clinical Applications of SPECT/CT
Achievements	Insufficient information

Thematic Sector	Human Health
Project Area	Nuclear Medicine
Project Number	RAS6063
Project Title	Strengthening the Application of Nuclear Medicine in the Management of Cardiovascular Diseases
Implementation Period	2012-2014
Project Lead Country	Philippines
Budget (Euros)	TCF:254,749.5, EB:4,262, Total: 259,011.5
Objectives	To strengthen and improve the application of nuclear medicine in the Asian region, mostly of SPECT, in the management of cardiovascular diseases.
Participating GPs	AUL, BGD, CPR, IND, MAL, MYA, PAK, PHI, SIN, SRL, THA, VIE

Regional Activities	Expert Missions HBA for creation of two E-Learning modules on Nuclear Cardiology Migration of Storyboard into E-learning modules using ARTICULATE software
	Training Courses Regional Training Course on Imaging in ischemic heart disease and cardiac failure • Regional Training Course on Multi-Modality Approaches in the Diagnosis of Cardiovascular Diseases • Regional Training Course on Functional Radionuclide Imaging in the Management of Cardiovascular Disorders • Regional Training Course on Improving Nuclear Cardiology Services in Evaluation of IHD and Left Ventricular Failure
	Meetings and Workshops Project Coordination Meeting and Task Force Meeting Final Coordinating Meeting
Achievements	▪ Countries have received training through the IAEA RAS 6063 and were very grateful for the transfer of knowledge. ▪ Many lectures and National Training Courses on state of the art Nuclear Medicine/ Cardiology were done by those involved in the project and for people who have attended the RTC. ▪ Technology transfer to NM consultants and residents. Project has enriched the scope and knowlege of nuclear cardiology in the new generation of nuclear medicine specialists. ▪ Installation of new machines, new Gamma Cameras, SPECT CTs and PET CTs. ▪ Project has enriched the scope and knowlege of nuclear cardiology in the new generation of nuclear medicine specialists. ▪ Installation of new machines, new Gamma Cameras, SPECT CTs and PET CTs.
Comment	The list of particpating GPs may not be complete.

Thematic Sector	Human Health
Project Area	Nuclear Medicine
Project Number	RAS6064
Project Title	Building Capacity with Distance Assisted Training for Nuclear Medicine Professionals
Implementation Period	2012-2013
Project Lead Country	Australia

Budget (Euros)	TCF: 63,538.62
Objectives	To develop the competencies and capabilities of individuals, groups, or countries in the safe and efficient practice of nuclear medicine through a harmonized web-based distance learning programme that would support Continuing Professional Development of nuclear medicine technologists.
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,MAL,MON,MYA,NZE,PAK,PHI,ROK,SIN, THA, VIE
Regional Activities	Expert Missions DATOL Training - Website use and National Programme Management To formulate an approach for sustainability of implementation and content development of DATOL
	Training Courses
	Meetings and Workshops Final Coordination Meeting
Achievements	• The LCC and DATOL management continue to liaise with IAEA's Nuclear Knowledge Management section and on transfer of all DATOL website materials in preparation of program delivery through Human Health Campus. • Open Access of DATOL through HHC officially launched at IAEA General Conference, September 2014, Vienna • Protected Access should be available through HHC during 2nd quarter 2015 - DATOL website will continue delivery to active countries until current courses are completed. - New countries to commence through IAEA Protected Access when available - Current countries to eventually join IAEA Protected Access when commencing with new groups of students • Outreach: - The DAT program is active in: o RCA in 11 MS with ~240 students; o ARCAL in 14 MS with ~350 students; o AFRA in South Africa with 15 students; o UK 13 students; o Estonia 4 students - Total ~ 618 students - Continuing inquiries from countries in other regions. - There are ongoing requests from IAEA Fellowship supervisors to provide Fellows with access to DATOL learning materials.

Thematic Sector	Human Health
Project Area	Nuclear Medicine

Project Number	RAS6076
Project Title	Improving Cancer Management Through Strengthening the Computed Tomography Cancer Staging Process (RCA)
Implementation Period	2014-2016
Project Lead Country	Republic of Korea
Lead Country Coordinator	Mr KIEHWAN KIM Korea Cancer Center Hospital; Korea Institute of Radiological and Medical Sciences (KIRAMS)215-4 Gongneung-dong, Nowon-gu 139-706 Seoul Korea, Republic of Email: khkim@kcch.re.kr
Budget (Euros)	TCF: 336,327.21, EB:61,611.66, Total: 397,938.87
Objectives	To optimize cancer management through the improvement of professional knowledge in CT scanning and staging.
Participating GPs	AUL,BGD,CPR,CPR,IND,INS,CAM,MAL,MON,MYA,NEP,PAK,PHI, ROK, SIN,SRL, THA,VIE
Regional Activities	Expert Missions • To support national training on CT Cancer Staging (MAL) • Workshop on TNM staging in Gynaecological Malignancies (IND) • Home based assignment for preparatory work to develop a smartphone application on TNM Cancer staging • Home based assignment to develop a smartphone application on TNM Cancer staging (Phase 2) • National training in CT for Cancer Staging in Viet Nam-Head&Neck/Urogenital (VIE) • Lectures at National Radiology Conference in Singapore (SIN) • Expert Mission on TNM staging of head and neck, abdomen and chest malignancies (PHI) • National training in CT for Cancer Staging in Cambodia (KAM) National training Course in CT for Cancer Staging in Lao PDR (focus on Thoracic Imaging) (LAO) National training in CT for Cancer Staging (Genito-urinary) in Bangladesh (BGD) • Expert mission on dissemination appropriateness in cancer staging with CT-scan examination (INS) • National training in CT for Cancer Staging in Nepal (NEP) National training in CT/MR in Neuro-Oncology in Sri Lanka (SRL) • HBA to develop a smartphone application on FIGO staging for gynaecologic cancers • HBA to finalize contents/software for smartphone application on FIGO staging for gynaecologic cancers National training in CT for Cancer Staging (Abdomen) in Mongolia (MON) • National training in CT for Cancer Staging in Fiji (FIJ)

	Training Courses • Regional Training Course on CT Cancer Staging for Abdomen and Urogenital System • Regional Training Course on CT Cancer Staging: Thorax and Musculoskeletal System • Regional Training Course on Cancer Staging for Head and Neck
	Meetings and Workshops • Regional Workshop on Resource and Training Materials for Computed Tomography Cancer Staging • Mid term review meeting • Final Project Review Meeting
Achievements	RAS6076 enhanced regional capacity of Radiology in terms of CT diagnosis of cancer for better treatment • 82 local trainers trained at the 3 Regional Training Courses • Dissemination of expertise in the RCA region by the RTC participants • Enhanced knowledge by outreaching local experts through 13 EMs • Strong regional expert network established for TCDC • Mobile application of cancer staging to support LMI countries with limited access • IAEA's support acknowledged and appreciated in the field of Radiology • Promotion of awareness of the importance of CT cancer diagnosis for effective treatment

Thematic Sector	Human Health
Project Area	Nuclear Medicine
Project Number	RAS6083
Project Title	Improving Patient Care and Enhancing Government Parties Capacity in Nuclear Medicine programmes in RCA Region (RCA)
Implementation Period	2016-2018
Project Lead Country	Republic of Korea
Budget (Euros)	TCF:110,283.81, EB:358,762.31, Total: 469,046.12
Objectives	To improve health in non-communicable diseases in the RCA region.
Participating GPs	AUL, BGD, KAM, CPR, IND, INS, JPN, ROK, LAO, MAL, MON, MYA, NEP, PAK, PHI, SIN, THA, SRL, VIE
Regional Activities	Expert Missions • EM for National training course in diagnostic imaging for cardiology, oncology and neurology • EM on NET and Prostate Cancer Theranostics (INS) • EM for NTC on NM techniques in Thyroid Diseases (CPR) • EM on Nuclear Medicine (PAK)

	• EM on Theranostics, Hybrid imaging and SIRT (VIE) • EM on Enhancing Access & Affordability of Nuclear Medicine Procedures in Various Clinical Situations (PHI) • EM for NTC on Statistical Parametric Mapping (THA) • EM on Improving Patient Care and Enhancing Government Parties Capacity in Nuclear Medicine Programmes (MON) • EM for National Training Course on Nuclear Medicine Techniques in Thyroid Diseases(PAK) • Home based assignment to produce E-learning module on Theranostics • EM to finalize the E-learning modules • EM for NTC on NM techniques in Thyroid Diseases and Oncology (BGD) • EM on Enhancing Access & Affordability of Nuclear Medicine Procedures in Nuclear Neurology (INS) • EM for NTC on NM techniques in Oncology/ Neurology (PHI) • EM for NTC on NM techniques in Neurology (MAL) • EM for NTC on NM techniques in Neurology (THA)
	Training Courses Regional Training Course on Theragnostics and Dementia
	Meetings and Workshops Project Planning Meeting Final Review Meeting and Workshop on Nuclear Medicine Techniques Review Meeting and Workshop on Updates on Theranostics Workshop on Leadership Skills for Emerging Challenges in Nuclear Medicine Review Meeting and Workshop on Therapy and Paediatric NM Review Meeting in Theranostics
Achievements	• For information sharing and expert network, a project platform was developed on the RCA website (http://www.rcaro.org/undp_s11) - Access IDs & PWs were provided to the project participants • Over the 3 years, there has been 728 visits to the platform by the participating countries (as of 12 Dec. 2018) • In cooperation with TO, and regional experts, an e-learning module on "Peptide Receptors Radionuclide Therapy for Neuroendocrine Tumors" was developed and installed on the RCA website and IAEA • Human Health Campus • In comparison to 2016 a total of 2,774 NM Professionals were trained and networked in oncology, cardiology and neurology during the project, thus representing an increase of 140% • An increase of 20% (116,750 new NM procedures of non-communicable diseases in 2018 - Vietnam showed a three-fold increase of oncologic applications - Thailand showed a 60% increase of neurologic applications just one year after the initiation of the project. • A remarkable increase in the communication and downloads of educational materials was achieved. An increase of forty-two-fold was achieved in 2018.

	• This was possible from using the SNS platform (Wechat) and RCARO website. • The project has contributed in establishing expert network and promotion of the application of nuclear medicine for non-communicable diseases in the RCA Region

Thematic Sector	Human Health
Project Area	Nuclear Medicine
Project Number	RAS6093
Project Title	Strengthening Capacity to Manage Non-Communicable Diseases Using Imaging Modalities in Radiology and Nuclear Medicine (RCA)
Implementation Period	2018-2021
Project Lead Country	Republic of Korea
Budget (Euros)	TCF: 384,977.65, EB:171,150, Total: 556,127.65
Objectives	To implement better management and control of non-communicable diseases (NCDs) in the RCA region in line with UN SDGs and WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020.
Participating GPs	AUL, BGD,CPR,IND,INS ,CAM,MAL,MON, MYA,NZE,PAK,PLW,PHI, ROK, SRL,THA,VIE
Regional Activities	Expert Missions 8 Expert Missions (planned)
	Training Courses • Regional Training Course on Diagnosis and Treatment of NCDs for Radiologists and Nuclear Medicine Physicians • Regional Training Course on Diagnosis of Cardiovascular & Pulmonary Disease • Regional Training Course (RTC) on Paediatric Nuclear Medicine and Theranostics
	Meetings and Workshops First Project Coordination Meeting Workshop on curriculum, teaching materials, E-learning module with coordinated approach of Radiology & Nuclear Medicine) Mid-Term Review Meeting Final Review Meeting (To be held)
Achievements	The project was significantly disrupted due to the outbreak of the COVID-19 pandemic in early 2020, leading to the cancellation or postponement of many of the originally planned project activities. However, despite the numerous challenges posed by the pandemic, the project management team showed great resilience and adapted to these unique challenges, ultimately delivering on the majority of objectives, especially the development of the E-learning modules, set out during the project design phase and the First Coordination Meeting.

	The project was ultimately able to deliver 4 RTCs (including one with 70 and one with more than 250 participants) and 7 EMs, most of which were performed within the last 12 months of the project. This spirited "sprint" to the finish line is a wonderful testament of the commitment of all project participants and an encouraging sign for future capacity building activities in this field. Aside from the professionals trained as part of project activities, the E-learning modules are the most significant project output and their addition to the IAEA's E-learning portals is expected to aid in the education and professional training of radiologists, oncologist and NM physicians across the RCA region and the wider world. Finally, several member states have reported an increased interest in the improvement of diagnostic capabilities in their domestic nuclear medicine communities as well as rising demand for specialized (national) training courses in the wake of this project.
Comments	Project implementation was affected by the Covid pandemic

Project Area: Radiation Oncology

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6048
Project Title	Application of High-Precision 3D Radiotherapy for Predominant Cancers in the RCA region (RCA)
Implementation Period	2007-2008
Project Lead Country	Japan
Lead Country Coordinator	Takashi Nakano
Budget (US Dollars)	284,264.85
Objectives	To improve the knowledge and skill of radiation oncologists and medical physicists in 3D conformal radiotherapy for the predominant cancers in the RCA region by implementing relevant IAEA documents.
Participating GPs	AUL, BGD,CPR,IND,INS ,JPN,MAL,MON, MYA,NEP,PAK, PHI, ROK, SRL,THA,VIE
Regional Activities	Expert Missions

	Training Courses Regional Training Course on 3D Conformal Radiotherapy and QA (Imaging and Treatment Planning) - for Radiation Oncologists Regional Training Course on 3D Conformal Radiotherapy and QA - Part I (for Radiation Oncologists) Regional Training Course on 3D Conformal Radiotherapy and QA - for Medical Physicists Regional Training course on 3D Conformal Radiotherapy -QA for Imaging and Treatment Planning (with focus on gastrointestinal, genitor-urinary and cervix cancer)
	Meetings and Workshops Project Planning Meeting Final Progress Review Meeting
Achievements	**Outcome 1** - Regional and national utilization of technical documents for the optimum and efficient use of 3D conformal radiotherapy and QA **Achievement** All participating MSs but one have implemented, to various degrees, the IAEA technical documents related to the QA/QC of 3D CRT and found the documents useful. **Outcome 2** - Increase in the number of radiotherapy facilities implementing QA /QC programmes 3D conformal radiotherapy according to accepted protocols. **Achievement** The project has contributed to increase in the number of equipment, trained personnel, and the clinical application of 3D CRT in the region. The relevant statistics are given below. Centers using 3D Treatment Planning System: 49 (2007); 72 (2009) Radiation Oncologists (ROs) trained in 3D CRT: 837 (2007); 1347 (2009) Medical Physicists (MPs) trained in 3D CRT: 366 (2007); 689 (2009) Radiation Therapy Technologists (RTTs) trained in 3D CRT: 452 (2007); 822 (2009) Patients treated with 3D CRT: 126255(2007);181741(2009)

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6053

Project Title	Improving Image Based Radiation Therapy for Common Cancers in the RCA Region (RCA)
Implementation Period	2009-2013
Project Lead Country	Japan
Budget (Euros)	TCF: 332,928.46, EB:94,998.12, Total: 427,926.58
Objectives	To improve radiation therapy practice in the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA) region by enhancing applications of evidence-based approaches and quality standards.
Participating GPs	BGD,CPR,IND,INS ,JPN,MAL,MON, MYA,NEP,PAK, PHI, ROK, SRL,THA,VIE
Regional Activities	Expert Missions Participation in the FNCA Workshop on Radiation Oncology (2010) Participation in the FNCA Workshop on Radiation Oncology (2011) Participation in the FNCA Workshop on Radiation Oncology (2012) Participation in the FNCA Workshop on Radiation Oncology (2013)
	Training Courses Regional Training Course on Introduction to Image Based Radiotherapy (For Radiation Oncologists and Medical Physicists) Regional Training Course on Modern Radiotherapy and Therapeutic Radiological Physics Regional Training Course on Image Based Radiotherapy (Uro-genital) Regional Training Course on Image Based RT for Head & Neck and Breast Cancers Regional Training Course on image based radiotherapy and QA for Lung and Gastrointestinal Cancer Regional Training Course on Overview of 3D-CRT and Site Specific Radiotherapy Planning Refresher Course on 3D Techniques in Simulation-Treatment in Radiotherapy
	Meetings and Workshops Project Planning Meeting Expert Steering Meeting on Developing Training Programmes Midterm Review Meeting Final Project Meeting

Achievements

Status of Project Outcomes

Outcome Statement	Outcome Indicator(s)	Status
1. The optimum and efficient use of image based radiotherapy and its QA through utilization of technical documents and standardized teaching materials	Number of Member States effectively using the documents or standardized teaching materials	All the 16 MSs are using the IAEA technical documents and standardized teaching materials.
2. The capability of the Member States to conduct national training courses on image based radiotherapy and its QA	2.1 Number of national training course on image based radiotherapy and QA implemented in MSs 2.2 Number of MSs where national training course on image based radiotherapy was implemented	The National Project Teams of all the MSs have conducted the national training courses on image-based radiotherapy. At least 40 NTCs were conducted in the project
3. Increase in the number of radiotherapy facilities implementing QA /QC programmes for image based radiotherapy according to accepted protocol	Number of facilities Implementing QA /QC programmes for image based radiotherapy	The number of radiotherapy facilities implementing QA/QC programmes for image based radiotherapy has increased, as reported by the NPCs. The substantial increase has been reported: the exact numbers of such facilities have been reported by some NPCs; For example, Indonesia – from 9 centers (2009) to 20 centers (2014)

	4. Establishment of formal relationships between IAEA/RCA, national Rad. Oncology Associations.	Number of participated national Rad. Oncologists. Number of Rad. Oncology Association assisting National Training Course	Cooperation with national Radiation Oncology societies has been achieved. National professional societies such as BSRO (Bangladesh), CSRO (China), AROI/AMPI (India), IROS (Indonesia), MOS (Malaysia), CRS/SRS (Singapore), KOSRO/KSMP (Korea), PROS/POMP (Philippines), VSC (Vietnam), THASTRO (Thailand), and SEAROG (South East Asia) have assisted in the implentation of National Training Courses and propagating the objectives of the project. These societies and other societies such as JASTRO (Japan) and ASTRO (USA) have assisted the implementation of Regional Training Courses.
	5. Increase in the cooperation between IAEA/RCA, FNCA and other regional bodies.	Number of lectures /Contents of the cooperation among IAEA/RCA, FNCA and other regional bodies.	Cooperation with FNCA has been achieved through the participation of RCA experts in the FNCA workshop in Radiation Oncology.
		Number of participating Rad.	

	6. Contribution to the regional Rad. Oncology and evidence based radiotherapy.	Oncologists/lectures in activities of this project	Cooperation with national Radiation Oncology societies have been achieved. National professional societies such as BSRO (Bangladesh), CSRO (China), AROI/AMPI (India), IROS (Indonesia), MOS (Malaysia), CRS/SRS (Singapore), KOSRO/KSMP (Korea), PROS/POMP (Philippines), VSC (Vietnam), THASTRO (Thailand), and SEAROG (South East Asia) have assisted in the implantation of National Training Courses and propagating the objectives of the project. These societies and other societies such as JASTRO (Japan) and ASTRO (USA) have assisted the implementation of Regional Training Courses.	

	7. Capability of applying the technical documents for clinical application of image based radiotherapy	Number of member States developing the capability of applying the technical documents	The number of radiotherapy facilities implementing image based radiotherapy has increased, as reported by the NPCs. The substantial increase has been reported: the exact numbers of such facilities have been reported by some NPCs; submitted in the final report of Final Review Meeting.
	8.Sustainability of progress in image based radiation therapy	Organization or systems which provide sustainable progress in image based radiation therapy Number of centres applying image based radiotherapy	Activities of NPTs and the cooperation with national professional societies are fomalized and will continue in the future for sustainability of project outcomes. The sustainability is expected to be strengthened with the implementation of a future RCA project in radiation oncology field.

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6062
Project Title	Supporting 3D Image-Guided Brachytherapy Services (RCA)
Implementation Period	2012-2015

Project Lead Country	Japan
Budget (Euros)	TCF: 299636.22, EB:69332.67, Total: 368968.89
Objectives	To Improve regional and national capacities for effective brachytherapy services by implementing 3D image-guided brachytherapy
Participating GPs	AUL, BGD, CPR, IND, INS, JPN, MAL, MON,MYA, NEP, ROK, PAK, SIN, THA, VIE
Regional Activities	Expert Missions National Workshop on 3D IGBT for cervical cancer (PHI) Home-based-assignment for development of Moodle website for RAS6062 To initiate interstitial 3D IGBT programme for gynaecological malignancies (MAL)
	Training Courses Regional Training Course on Basic Concepts of 3D Image-Guided Brachytherapy for Cervical Cancer Regional Trainig Course on Basic Concepts of 3D Image-Guided Brachytherapy (IGBT) for Cervical Cancer Regional Training Course on 3D Image-Guided Brachytherapy for Cervical Cancer Regional Training Course on 3D Image-Guided Brachytherapy for Cervical Cancer (Advanced Course)
	Meetings and Workshops Project Planning Meeting Workshop on Transitioning from 2D to 3D Image-Guided Brachytherapy Services Final Project Assessment Meeting
Achievements	• **Outcome Statement:** 3D image-guided brachytherapy (IGBT) implemented and practiced in RCA Member States • **Outcome Indicator(s)**: All participating countries have increased understanding and awareness of 3D IGBT. • **Achievement:** A total of **114 professionals** have been trained on 3D IGBT in the 4 RTCs in this project. The RTC participants have conducted **a total of 24 National Training Courses** in their own countries with a participation of **1320 national participants**. During the period of the project, **53 new institutions** have started the implementation of 3D IGBT in the participating GPs. This project has contributed greatly to the education and training of radiation oncologists and medical physicists involved in the 3D IGBT and further promoted the improvement of brachytherapy practice in the RCA region.

Thematic Sector	Human Health
Project Area	Radiotherapy
Project Number	RAS6065

Project Title	Strengthening the Application of Stereotactic Body Radiation Therapy to Improve Cancer Treatment (RCA)
Implementation Period	2012-2015
Project Lead Country	Republic of Korea
Budget (Euros)	TCF: 397,247.95, EB:466,57.23, Total: 443,905.18
Objectives	To improve cancer treatment in the RCA region through strengthening the application of Stereotactic Body Radiation Therapy (SBRT).
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,CAM,MAL,MON,MYA,NEP,PAK,PHI, ROK,SIN,SRL,THA,VIE
Regional Activities	Expert Missions
	Training Courses Regional Training Course on Stereotactic Body Radiotherapy: Basic Concepts and Early Implementation Regional Training Course on Clinical Application of Stereotactic Body Radiation Therapy Regional Training Course on Clinical Applications of Stereotactic Body Radiotherapy (SBRT) in Head and Neck, Spinal and Liver Cancers Regional Training Course: An update on Advanced Technologies in Radiotherapy Regional Training Course on Clinical Application of SBRT in Spine and Genitourinary Cancers
	Meetings and Workshops Project Planning Meeting Midterm Review Meeting Participation in the FNCA Meeting on Radiation Oncology (2014) Final Project Assessment Meeting
Achievements	**Increase of centers conducting SBRT** • 10 centers in 9 recipient countries in 2010 => 30 centers in 2015 (AUL 3 to 9, BGD 0 to 1, MAL 1 to 2, MYA 0 to 1, PHI 1 to 4, SRL 0 to 1, SIN 3 to 4, THA 2 to 7, VIE 0 to 1) • 4 countries newly introduced SBRT (BGD, MYA, SRL, VIE) • Expansion of clinical SBRT programs to other indications in 10 countries (BGD, CPR, IND, INS, MAL, PAK, PHI, SIN, THA, VIE) SIN : new SBRT services for prostate, liver, oligometastases THA : initiated SBRT for liver cancer in 2014, more than 10 cases in 2015 **Increase in physical infrastructure for implementation of SBRT** • Increase identified in 13 countries through the efforts of promoting the awareness of the benefits of SBRT (BGD, CPR, IND, INS, JPN, MAL, PAK, PHI, ROK, SIN, SRL, THA, VIE) • 3 countries have plans to acquire the equipment for SBRT (MON, MYA, NEP **Human Resource Development**

	• 111 local trainers were trained : distribution of expertise at national level (Radiation oncologists, medical physicists, radiation therapists) **6 Regional Training Hubs developed for sustainable network** • ROK : Korea Institute of Radiological & Medical Sciences (Coordinator) • AUL : Central Coast Cancer Care Centre • CPR : Peking University Cancer Hospital • IND : Tata Memorial Hospital • JPN : Tokyo Metropolitan Komagome Hospital • SIN : National Cancer Centre

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6066
Project Title	Reducing the Shortage of Oncology Professionals through an Applied Sciences of Oncology Course (ASOC)
Implementation Period	2012
Project Lead Country	Australia
Budget (Euros)	TCF: 86,491.43
Objectives	To reduce the shortage of oncology professionals in the face of the massive increase in cancer throughout the world.
Participating GPs	The project did not have any regional activities. The training material could be used by all GPs.
Regional Activities	Expert Missions Training Courses Meetings and Workshops Procurement Applied Sciences of Oncology Course (ASOC): Upgrade development software (convert 5000 screens to Moodle compatible format)
Achievements	Objective • Update of current CD-based program so can be run from a hard drive. • Conversion of existing training material to a web-based content management system (Moodle). • Greater accessibility for even more trainee radiation oncologists in developing countries. Achievement • All modules converted to CMS (Content Management System) • Cross-checking and QA completed • Delivered to IAEA

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6071
Project Title	Strengthening Radionuclide Therapy for High Impact Cancer Treatment Strategy in Member States of the Regional Cooperative Agreement (RCA)
Implementation Period	2014-2016
Project Lead Country	India
Lead Country Coordinator	Dr. Sudeep Gupta, Advanced Centre for Treatment, Research & Education in Cancer (ACTREC), Navi Mumbai, INDIA
Budget (Euros)	TCF: 230,476, EB: 50,000, Total: 280,476
Objectives	To reduce mortality and morbidity and improve the quality of life of cancer patients in the Member States of the region.
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,CAM,MAL,MON,MYA,NEP,PAK,PHI, ROK,SIN,SRL,THA,VIE
Regional Activities	Expert Missions
	Training Courses • Regional Training Course on Nuclear Medicine Techniques Thyroid Cancer, Bone Pain Palliation and Peptide Receptor Radioisotope Therapy for Neuro Endocrine Tumors • Regional Training Course on Radionuclide Therapies with special emphasis on Iodine 131 and Rhenium 188 • Regional Training Course on Treatment of Lymphoma • Regional Training Course on Principles and Practice on the Use of Radiopharmaceuticals for Bone Pain Palliation and Treatment of Other Malignancies
	Meetings and Workshops • Mid-Term Review Meeting • Final Review Meeting
Achievements	Insufficient information

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6072
Project Title	Strengthening Intensity Modulated Radiation Therapy Capability in the Region (RCA)
Implementation Period	2014-2016

Project Lead Country	Japan		
Lead Country Coordinator	Prof. Takashi Nakano (Gunma University)		
Budget (Euros)	TCF: 516,983.91		
Objectives	To strengthen the practice of radiotherapy by adding the capability and safe practices of intensity modulated radiation therapy (IMRT) in the RCA region.		
Participating GPs	AUL,BGD,CPR,CPR,IND,INS,JPN,CAM,MAL,MON,MYA,NEP,PAK,PHI, ROK, SIN,SRL, THA,VIE		
Regional Activities	Expert Missions Expert mission to support national training course on IMRT for head and neck cancers (MAL) Expert Mission to support national training course on IMRT for lung and oesophagus cancers (MAL)		
	Training Courses • Regional Training Course on Basics of IMRT • Regional Training Course on Intensity Modulated Radiation Therapy for Head and Neck Cancers and Brain Tumors • Second Regional Training Course on the Basics of Intensity Modulated Radiotherapy • Regional Training Course on Intensity Modulated Radiation Therapy for Prostate Cancer and other Urological Cancers • Regional Training Course on Intensity Modulated Radiotherapy for Breast Cancer, Pancreas Cancer, and Anorectal Cancer		
	Meetings and Workshops Expert Steering Meeting to Develop Training Course Materials and Methods in IMRT Mid-Term Review Meeting Final Review Meeting		
Achievements	Outcome		
	Design Element	Indicator	Progress
	To ensure that GPs are capable of implementing IMRT in a safe and effective manner.	70 % of all participating GPs implement IMRT by the end of the project (2017)	**16** countries of 19 countries have been implementing IMRT by 2017. Implementing Rate was increased from **68%** in 2015 to **84%** in 2017

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6085

Project Title	Enhancing Stereotactic Body Radiation Therapy for Frequent Cancers in the RCA Region (RCA)
Implementation Period	2016-2019
Project Lead Country	Republic of Korea
Budget (Euros)	TCF: 553,510.54, EB:13,000, Total:566,510.54
Objectives	To improve clinical outcomes in cancer patients treated with Stereotactic Body Radiation Therapy (SBRT).
Participating GPs	AUL,BGD,CPR,CPR,IND,INS,JPN,CAM,MAL,MON,MYA,NEP,PLW,PAK,PHI, ROK, SIN,SRL, THA,VIE
Regional Activities	<u>Expert Missions</u> • Expert mission to review and develop the radiotherapy training hubs in Asia -Pacific region within the framework of RAS6065 and RAS6085 • Expert mission to enhance the application of Stereotactic Body Radiation Therapy (VIE) • Expert Mission to Support Viet Nam in Medical Physics (VIE)
	<u>Training Courses</u> • Regional Training Course on Clinical Applications of Stereotactic Body Radiotherapy (SBRT) in Oligometastasis, Pancreatic, and Recurrent cancers needing Re-irradiation • Regional Training Course on Clinical Applications of Stereotactic Body Radiotherapy (SBRT) in Lung and Liver cancers • Regional Training Course on Clinical Applications of Stereotactic Body Radiotherapy (SBRT) in Lung, Liver and Spine Cancer with Emphasis on QA and QC • Regional Training Course on Advanced Radiotherapy Techniques (including IMRT, IGRT, SRS and SBRT) • Regional Training Course on Stereotactic Body Radiation Therapy for Spine and Prostate Carcinoma
	<u>Meetings and Workshops</u> • Mid-Term Review Meeting • Final Review Meeting
Achievements	Information not available

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6086
Project Title	Strengthening Cancer Management Programmes in RCA States Parties through Collaboration with National and Regional Radiation Oncology Societies (RCA)
Implementation Period	2018-2021
Project Lead Country	Japan

Lead Country Coordinator	Prof. Takashi Nakano
Budget (Euros)	TCF: 531,137.51
Objectives	To improve the cancer management of RCA States Parties by training radiation oncology professionals in collaboration with RCA and Asia Pacific national/regional radiation oncology societies.
Participating GPs	AUL,BGD,CPR,CPR,FIJ,IND,INS,JPN,CAM,LAO,MAL,MON,MYA,NEP, PAK,PHI, SIN,SRL, THA,VIE
Regional Activities	Expert Missions Expert Mission for Intensity-modulated radiotherapy (IMRT) in Head and Neck Cancer (MYA) Expert Mission on Advanced Radiotherapy techniques in the management of Head and Neck cancers (PAK) Expert Mission to teach in a NTC on Radiotherapy techniques using IMRT (VIE) Expert Mission for Intensity-Modulated Radiotherapy (IMRT) in Head and Neck Cancer (BGD) Expert Mission on National Image-Guided Brachytherapy Workshop on Gynaecologic Malignancy (THA) Expert Mission on Pediatric Radiotherapy (INS)
	Training Courses Regional Training Course on Image Guided Brachytherapy Regional Training Course on Multidisciplinary Management and Modern RT Techniques for Head and Neck Cancers Regional Training Course on Palliative Radiotherapy in Cancer Management Regional Training Course on Quality Assurance in Radiotherapy
	Meetings and Workshops Project Planning Meeting Mid-Term Review Meeting Final Project Review Meeting
Achievements	• FARO webinars for ROs were initiated and total of 12 webinars were held from Sep 2020 to Dec 2021. RANZCR educational activities have continued to be carried out in Australia and New Zealand, as they were before RAS6086. • In 16 of the 18 countries, national radiation oncology societies have conducted periodic educational activities for the professions. New professional oncology society was planned in Cambodia. • FARO collaborated with ESTRO to conduct "ESTRO meets Asia 2019" on 6-8 Dec 2019 in Singapore. FARO will continue to collaborate with ESTRO in the future. • More than 90% (17/18) GPs have increased the number of radiation oncologists with a median increase of 26.7%. For medical physicists, 17 out of 18 GPs have increased numbers with a median of 23.6%. For radiation therapy technologists, 13 of 17 GPs have increased numbers with a median of 23.0%. • More than half of GPs have increased the number of radiation therapy institutions with a median increase of 11.2%.

	• More than 70% (11/14) of GPs have increased the number of patients who received radiotherapy with a median increase of 12.1%, although it decreased in several GPs due to the pandemic of COVID-19. • There was a large increase in IMRT, SBRT, and SRT or SRS for brain metastases in most countries. The median increase was 87.8% for IMRT, 102.0% for SBRT, and 37.2% for SRT/SRS for brain metastases in GPs for which data are available for comparison. • Collaborating with IAEA/RCA, THASTRO have conducted the T-QUATRO project to improve the quality of RT treatment from 2018. • Federation of Asian Organizations for Radiation Oncology (FARO) webinars for radiation oncologists were initiated with continuous supports of IAEA/RCA and a total of 12 webinars were held from Sep 2020 to Dec 2021. • Budgets for a remote Radiation Treatment Planning System and training materials for hybrid brachytherapy have been prepared for the development of radiation therapy in the region.
Comments	The project implementation was affected by the Covid pandemic

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6096
Project Title	Empowering Regional Collaboration among Radiotherapy Professionals through Online Clinical Networks (RCA)
Implementation Period	2020-2023
Project Lead Country	New Zealand
Budget (Euros)	TCF: 150,750
Objectives	To ensure that cancers in regional cooperative agreement (RCA) low and middle income countries (LMICs) are treated in line with internationally accepted standards of care and tailored to the individual patient and to local resources to improve survival and quality of life of cancer patients.
Participating GPs	AUL,BGD,JPN,CAM, LAO,NZE, PHI,ROK,SRL (the list may not be complete)
Regional Activities	<u>Expert Missions (planed)</u> Expert Mission to Train additional organizer sites for VTB coordination tasks (2 missions) Expert missions for Increasing awareness of VTBs through outreach to national societies (2missions) A radiation oncologist and a medical physicist / RTT to present about the project at a regional / major medical physics / RTT societies meeting.
	<u>Training Courses</u>

	Meetings and Workshops First Project Coordination Meeting Second Project Coordination Meeting
	Procurements (planned) A platform allowing improved presentation of radiological and radiotherapy planning images is required to facilitate effective exchanges during the VTBs Web-conferencing software annual licenses
Achievements	Establishment of a regular virtual tumour board meetings Establishment of a programme of regular educational sessions for RTTs and radiation oncology medical physicists.
Comments	Project implementation was affected by Covid pandemic.

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6098
Project Title	Standardizing Radiotherapy in Palliative Care (RCA)
Implementation Period	2022-2025
Project Lead Country	Japan
Budget (Euros)	TCF: 478,050.00
Objective	To improve quality of life for cancer patients in the RCA region.
Participating GPs	AUL, BGD, CAM, CPR, IND, INS, JPN, ROK, LAO, MAL,MON,NEP, NZE, PAK, PAL, PHI, SIN, SRL, THA, VIE
Regional Activities	Expert Missions (planned) • Expert missions to assist national training programs • Experts missions in support of regional training courses
	Training Courses (planned) • RTC on a basic palliative radiation therapy for bone and brain metastases • RTC on high-precision radiation therapy in palliative care: stereotactic radiation therapy for liver, lung, brain and spinal metastases, and case studies for palliative radiotherapy. • RTC on the guidelines for palliative radiotherapy • RTC on standardization of palliative radiotherapy in the RCA GP
	Meetings and Workshops (planned) • First Coordination Meeting (held as a virtual meeting)

	• Annual Review Meetings (online) • Technical meetings for preparation of case studies for RTCs • Final Progress Review Meeting
Achievements	Project is under implementation
Comments	

Thematic Sector	Human Health
Project Area	Radiation Oncology
Project Number	RAS6100
Project Title	Strengthening Clinical Application of Hypofractionated Radiotherapy (RCA)
Implementation Period	2022-2025
Project Lead Country	Republic of Korea
Budget (Euros)	TCF:367,500.00
Objective	To enhance cancer treatment in the RCA region through the application of hypofractionated radiotherapy.
Participating GPs	AUL, BGD, CAM, CPR,IND, INS, JPN, ROK, LAO, MAL,MON, MYA, NEP,NZE, PAK, PAL, PHI, THA,VIE
Regional Activities	<u>Expert Missions</u> • Expert Missions to support implementation of hypofractionated radiotherapy, training of staff and dosimetry audit in GPs
	<u>Training Courses</u> • RTC for national trainers of Radiation Oncologists and Medical Physicists • RTC for medical physicists and radiation therapists • RTC for radiation oncologists and medical physicists • RTC for radiation oncologists and medical physicists
	<u>Meetings and Workshops</u> • First Coordination Meeting (held as a virtual meeting) • Mid-term Review Meeting • Final Progress Review Meeting
Achievements	The project is under implementation
Comments	

Project Area: Medical Physics

Thematic Sector	Human Health
Project Area	Medical Physics
Project Number	RAS6038
Project Title	Strengthening Medical Physics through Education and Training (RCA)
Implementation Period	2003-2016
Project Lead Country	Australia
Budget (Euros)	TCF: 1,011,376.74, EB: 31,816.1, Total:1,043,192.84
Objectives	To improve capability and capacity in medical physics in the region through the establishment of regional approaches on education and training of medical physicists; and to improve and upgrade safe operating practices and technical standards in the region through the establishment of a common quality assurance/quality control (QA/QC) programme.
Participating GPs	AUL,BGD,CPR,CPR,IND,INS,JPN,MAL,MON,MYA,NEP, PAK,PHI, SIN,SRL, THA,VIE
Regional Activities	Expert Missions • Experts Steering Group Meeting • Presentation of RAS6038 to AFOMP • Developing of training modules • Create modules for clinical training in Medical Physics - radiation therapy - including external beam therapy • Orientation meeting to establish Clinical Training in Diagnostic Radiology Physics • Create modules for clinical training in Medical Physics - radiation therapy - including Brachytherapy • Create modules for clinical training in Medical Physics - radiation therapy • Create supporting documentation for clinical training in Medical Physics - radiation therapy • Create modules for clinical training in Medical Physics - radiation therapy • Develop assessment strategies and create supporting documentation for clinical training in Medical Physics First review of pilot training site and preparation for another • Pilot testing of a new quality audit process for diagnostic radiology including a medical physics focus • Support for National Training Programme on Clinical Training of Radiation Oncology Medical Physicists • Review of clinical training in Thailand Create modules for clinical training in Medical Physics - diagnostic radiology – 1

	• Promoting Postgraduate Education for medical physics in Asia Pacific - Thailand & Vietnam • Promoting Postgraduate Education for medical physics in Asia Pacific - Sri Lanka Create modules for clinical training in Medical Physics - nuclear medicine - 1 Create modules for clinical training in Medical Physics - nuclear medicine - 2 Create modules for clinical training in Medical Physics - nuclear medicine - 3 • Create modules for clinical training in Medical Physics - nuclear medicine - 4 • Support of clinical training for the Thailand pilot Create modules for clinical training in Medical Physics - nuclear medicine – 5 • Create modules for clinical training in Medical Physics - nuclear medicine - 6 • Clinical supervision and seminar • Launch of clinical training for medical physicists in radiotherapy for India Orientation programme for Philippines clinical training for diagnostic radiology physicists • Initiation of clinical training for medical physicists specializing in diagnostic radiology in Thailand • Framework agreement SSA for Brian Thomas for his work as coordinator of clinical training pilot • Initiation of clinical training for medical physicists specializing in radiation oncology in Malaysia • Mammography lectures in Malaysia • Revise modules for clinical training for medical physicists specialized in radiation oncology - 1 • Revise modules for clinical training for medical physicists specialized in radiation oncology - 2 • Revise modules for clinical training for medical physicists specialized in radiation oncology - 3 • Revise modules for clinical training for medical physicists specialized in radiation oncology - 4 • Revise modules for clinical training for medical physicists specialized in radiation oncology - 5 • Revise modules for clinical training for medical physicists specialized in radiation oncology - 6 • Clinical training mission to instruct supervisor • Clinical training mission for Bangladesh • Support of clinical training - DR - for the Thailand pilot • Support of clinical training - DR - for the Philippines pilot • Initiation of clincal training for medical physicists specializing in nuclear medicine in Thailand • Support of clinical training for MPs in RO - the Philippines pilot • Support of clinical training for MPs in RO - Malaysia pilot • Organisational review of clincal training programme in diagnostic radiology

	• Revise TPS module for RT MP clinical training and create a discussion document on regional support for MPs • Clinical training mission for Bangladesh • Initiation of Training Workshop • Assessment of Residents for Pilot Project on Clinical Training of Radiation Oncology Medical Physicist (ROMP) • Assessment of Residents for Pilot Project on Clinical Training of Radiation Oncology Medical Physicist (ROMP) • Assessment of Residents in Diagnostic Radiology Physics • Assessment of Nuclear Medicine Medical Physicists in Thailand • Pilot Implementation of the IAEA Clinical Residency Training Guide for Diagnostic Radiology Medical Physics (DRMP) • Expert Mission to review– teaching –assessment of RT and NM programmes in Vietrnam • EM to review -teaching - assessment of DR programme in Malaysia Expert Mission to review - teaching - assessment of radiotherapy and Nuclear Medicine
	• <u>Training Courses</u> • Regional Training Workshop on the Implementation of the International Code of Practice for Radiotherapy Dosimetry, IAEA TRS-398 • Regional Training Course on Train the Trainer Course in Medical Radiation Physics • Regional Training Course on the Implementation of IAEA TRS430 in Quality Assurance for Radiotherapy Treatment Planning Systems • Regional Training Course on the Implementation of the International Code of Practice for Radiotherapy Dosimetry, IAEA TRS-398 • Regional Training Course on Medical Physics in Diagnostic Radiology • Regional Training Course on Quality Assurance in Nuclear Medicine for Medical Physicists • Regional Training Course on Medical Physics Aspects in Low and High Dose Rate Brachytherapy • Regional Training Course on Radiotherapy Techniques with Emphasis on Imaging and Treatment Planning
	<u>Meetings and Workshops</u> • Project Co-ordination Meeting on Strengthening Medical Physics in the Asia and Pacific Region • Meeting of Experts Steering Committee • Expert Steering Committee meeting to finalise implementation of clinical training program Regional Meeting for National Trainers to Initiate Trialing of the Programme for Radiotherapy Specialty • Expert meeting to begin drafting of competencies for diagnostic radiology physicists • Assistance in workshop for TPS training in Manila • National Project Coordinators' Meeting to Review the Status of Medical Physics in the Region • Meeting to Review Modules and Organize Trialing for clinical training in diagnostic radiology Drafting of clinical training modules for medical physicists specializing

	in nuclear medicine ESG (NM) Meeting to Review Modules and Organize Trialing • Regional Meeting of National Trainers to Initiate Trialing of the DR Specialty Clinical Training • ESG Meeting to review and revise the modules in Light of Trialing (RT) • Regional Meeting for National Trainers to Initiate Trialing of the Nuclear Medicine Specialty • Progress Review Meeting
Achievements	• This project produced three guidelines, namely, "Clinical Training of Medical Physicists Specializing in Radiation Oncology (IAEA Training Course Series 37)", "Clinical Training of Medical Physicists Specializing in Nuclear Medicine (IAEA Training Course Series 50)", "Clinical Training of Medical Physicists Specializing in Diagnostic Radiology (IAEA Training Course Series 47)". • These guidelines have: ➢ Helped initiate clinical training programs in IAEA Member States of all regions ➢ Developed confidence in the abilities of MPs and supported stakeholders in the certification/registration of MPs • Encouraged the coordination between academic institutions and clinical education. Links already established in AUL, NZE and IND, and emerging in THA, MAL and PHI.

Thematic Sector	Human Health
Project Area	Medical Physics
Project Number	RAS6077
Project Title	Strengthening the Effectiveness and Extent of Medical Physics Education and Training (RCA)
Implementation Period	2014-2017
Project Lead Country	Australia
Lead Country Coordinator	Dr. Donald McLean
Budget (Euros)	TCF: 271,796.8, EB: 10,100, Total:281,896.80
Objectives	To improve the quality of health care and patient safety in areas related to radiation medicine through the delivery of medical physics services.
Participating GPs	AUL,BGD,CPR,CPR,IND,INS,CAM, JPN,MAL,MON,MYA,NEP, PAK,PHI, SIN,SRL, THA,VIE
Regional Activities	<u>Expert Missions</u> • Home Based Assignment • Home based assignment • Home based assignment for updates to the AMPLE e-learning course. Home based assignment for AMPLE e-learning course administration.

	Expert Mission on review of Bangladesh medical physics clinical training (BGD) • Home based assignment • Home based assignment on update of analysis of medical physics workforce surveys • Development of e-learning structure in clinical training of medical physicists in radiotherapy and diagnostic radiology • Expert mission for review of radiotherapy medical physics training: RAS6077 and Expert mission for review of radiotherapy medical physics training (BGD) • Develop guidelines for accreditation of academic and clinical institutions for medical physics education and training (MAL) • Development of e-learning structure in clinical training of medical physicists in nuclear medicine Home based assignment • Home-based-assignment for development of Moodle website • Home based assignment for analysis of workforce survey and education & training survey • Home based assignment for further development of the AMPLE Moodle learning environment • Develop guidelines for assessment and certification of medical physics trainees • Home-based-assignment for enhancements to AMPLE e-learning environment • Home based assignment for management of the AMPLE e-learning environment • Initiation of Philippines pilot clinical training in medical physics using AMPLE e-learning software (PHI) Initiation of Indonesia pilot clinical training in medical physics using AMPLE e-learning software (INS) • Initiation of Bangladesh pilot clinical training in medical physics using AMPLE e-learning software (BGD) Review of academic medical physics program at Chulalongkorn University and review of medical physics residents (THA) • Home based assignment for upgrade of the assessment feature of the AMPLE e-learning environment • Home based assignment for international coordination of clinical training pilots • Home based assignment for enhancements to AMPLE e-learning environment
	<u>Training Courses</u> • Virtual Regional Training Course for Supervisors of Clinical Training Programmes in Medical Physics
	<u>Meetings and Workshops</u> • Meeting on E-learning in the Education and Clinical Training of Medical Physicists • Technical meeting on Moodle website development to support medical physics clinical training Mid-term review meeting on"Strengthening the Effectiveness and Extent of Medical Physics Education and Training"

	• Expert mission to initiate the editorial board of the AMPLE e-learning course for medical physics clinical training • Technical meeting on e-learning resource AMPLE for medical physics clinical training • Final Project Review Meeting on "Strengthening the Effectiveness and Extent of Medical Physics Education and Training
Achievements	• Developed e-learning platform AMPLE (Advanced Medical Physics Learning Environment), running on the IAEA's CLP4NET platform. • AMPLE tested through pilot training programs (2-3 years duration) for all medical physics specialities in BGD, THA, PHI, SIN, IND, INS. • Guideline document for the complex issues of accreditation of educational institutions and clinical training facilities. • Guideline document for the certification of professionals in medical physics in the Asian region. • Surveys undertaken, and gap analysis performed, to determine needs and resources for clinical practice in GPs benchmarked against IAEA standards: − Education and training infrastructure available in the active GPs. − Assessment of the equipment available for radiation medicine. − Number of medical physicists in the associated GPs. • Example - proportion of employed staff to required staff to adequately staff current equipment for RT in GPs - **96% to 25%.** • Results available on the IAEA Human Health Campus web site. • An editorial board was established to support access to the latest training material provided through AMPLE Partnerships and collaboration • THA - has provided remote supervision in RO and NM to a number of regional neighbours (MYA, VIE, NEP). • IND - senior partner with neighbours (e.g. NEP) in ROMP. • SIN - assisted MPs from CPR in nuclear medicine medical physics. TCDC • AUL partnered with FIJ, MYA and VIE in ROMP. • ROK assisted VIE in ROMP. • AMPLE platform will assist these partnering arrangements through more effective administration, communication and resourcing.

Thematic Sector	Human Health
Project Area	Medical Physics
Project Number	RAS6087

Project Title	Enhancing Medical Physics Services in Developing Standards, Education and Training through Regional Cooperation (RCA)
Implementation Period	2018-2021
Project Lead Country	Australia
Lead Country Coordinator	Dr. Donald McLean
Budget (Euros)	354,525.06
Objectives	To improve health care to patients in the region through the application of appropriate, effective and safe radiation medicine, utilizing competent medical physicists, consistent with IAEA requirements and guidelines.
Participating GPs	AUL,BGD,CPR,CPR,FIJ, IND,INS,CAM, JPN,LAO, MAL,MON,MYA,NEP, PAK,PHI, SIN,SRL, THA,VIE
Regional Activities	Expert Missions • HBA for international coordination of medical physics clinical training pilots • Home Based Assignment under RAS6087 • Home Based Assignment (HBA) - Drafting the Assessment Guide for Clinical Training for Medical Physicists Under RAS6087 • Expert Mission on reviewing radiotherapy resources and references for an online platform • Expert Mission on RAS6087 and Assessment of Clinical residents and conducting orientation program • HBA to enhance the AMPLE resource on CLP4NET for medical physics clinical training • Expert Mission to Conduct Final Assessment of Medical Physics Residents in Indonesia (INS) • Expert Mission on support to final examinations in medical physics (BGD) • Expert mission to conduct a workshop for Clinical training (MAL)
	Training Courses
	Meetings and Workshops • First Coordination Meeting and Workshop • Mid-term Project Review Meeting • Meeting to Review of AMPLE E-learning Resources • Meeting on Drafting the Assessment Guidelines for Clinical Training in Medical Physics
Achievements	• The number of available medical physics educational programs has increased notably in the region – and was particularly evident from the Philippines, Indonesia, Japan, Korea, Thailand and India, with increases in enrolments as noted by the Philippines. • New clinical training including all specialties was initiated in Malaysia • Clinical training programs have been sustained during COVID and are continuing in Bangladesh, Thailand, Indonesia, Malaysia, Philippines, Singapore

	• After much preparation, Pakistan and Vietnam have been accepted to begin clinical training programs in 2022 • A virtual clinical training review process has been developed successfully • A supervisors clinical training course was developed successfully • Special regional procurement of equipment useful in assisting in clinical training was conducted in 2020 and 2021. This was most welcome – particularly in countries where resources were scarce. • AMPLE software was improved to include the tracking of resident progress to assist coordinators in progress review. • Although not widely used to the full potential of it design, there was a growing recognition of the usefulness of AMPLE as a basis for clinical training. • Many countries and single users use AMPLE as a quick guide and resource provider • The radiation oncology medical physicists (ROMP) resources were reviewed at an expert meeting. • The editorial board for ROMP has operated throughout the project improving the quality of the resources available on AMPLE • Developed and emerging countries are supporting developing countries in the area of medical physics MSc education eg Thailand (MYA, LAO); Indonesia (Syria, Palestine) - Malaysia (CAM) • Clinical training coordinated in Bangkok for 1 MP in RT from Lao DRP [support international RT equipment company] • Clinical training coordinated in Bangkok for 3 MPS using AMPLE (2 in NM and 1 in RT) from Myanmar [support for travel and accommodation from participant hospital (private)] • Certification in exists for MPs in Australia / New Zealand, Korea, Philippines, Japan, India, Indonesia and its associated developments such as registration or licencing are also evolving to better meet the needs of medical physicists in those countries. In most cases work is still in progress to obtain necessary improvements. • Indonesia has achieved a two level system of certification designed to meet their unique national health requirements. Manpower planning has been established at a national level projected to achieve longer term sustainability • Vietnam recognises the work title of medical physicist and has an official decree mandating that from 2026 a trained medical physicist is needed for radiotherapy and nuclear medicine department
Comments	• Review of the AMPLE learning platform was largely successful however a number of lower priority modules were not completed due to the size of the document. • Recommendation that the project be granted a 12-month extension to enable completion of activities that are not able to be conducted virtually and due to COVID-19. • No support missions for training, orientation or assessment were possible

Thematic Sector	Human Health
Project Area	Medical Physics
Project Number	RAS6101
Project Title	Improving the Quality and Safety of Radiation Medicine through Medical Physicist Education and Training (RCA)
Implementation Period	2022-25
Project Lead Country	People's Republic of China
Budget (Euros)	TCF: 462,750.00
Objectives	To improve the quality and safety of radiation medicine in the Asia–Pacific region through medical physicist education, training, and certification.
Participating GPs	AUL, BGD,CAM, CPR,IND,INS, JPN, ROK, LAO, MAL,MON, MYA, NEP, NZE, PAK, PAL, PHI, SIN, SRL,THA,VIE
Regional Activities	Expert Missions • Expert missions in support of national training courses • Expert missions for sustaining AMPLE system
	Training Courses • RTC on quality management and QA in radiotherapy medical physics, train the trainers • RTC for dissemination of HHS 25 and academic guidelines • RTC on quality management and QA in nuclear medicine, diagnostic radiology medical physics • RTC on QUATRO methodology • RTC for Clinical Training of Trainers
	Meetings and Workshops • First Coordination Meeting • Mid-Term Review Meeting • Final Progress Review Meeting
Achievements	The project is under implementation
Comments	

Project Area: Radiopharmaceuticals

Thematic Sector	Human Health

Project Area	Radiopharmaceuticals
Project Number	RAS6097
Project Title	Enhancing Capacity and Capability for the Production of Cyclotron-Based Radiopharmaceuticals (RCA)
Implementation Period	2020-2023
Project Lead Country	Republic of Korea
Budget (Euros)	TCF: 333,900.00
Objectives	To enhance disease control in the Asia Pacific region through strengthening capacity and capability for qualified cyclotron produced radiopharmaceuticals for imaging and treatment.
Participating GPs	AUL,BGD,JPN,CAM,LAO,PHI,ROK (the list may not be complete)
Regional Activities	Expert Missions Expert Missions to support introduction of new radiopharmaceuticals (10 missions) – To be implemented
	• Training Courses • RTC on a set-up of cyclotron facility for radiopharmaceutical production for 7 basic level GPs • RTC on the production of commercially available cyclotron-based radiopharmaceuticals (to be held) • RTC on GMP and radiation safety for cyclotron-based radiopharmaceuticals • RTC on production of preclinical research purpose cyclotron-based radiopharmaceuticals (to be held)
	Meetings and Workshops • Workshop for New Drug Approval /Project Planning Meeting • Workshop for New Drug Approval / Project Mid-term review Meeting • Final Project Review Meeting (to be held)
Achievements	While the project faced significant disruptions from 2020 onwards due to the COVID-19 pandemic, the project management team, in close coordination with NPCs from participating member states and the IAEA, was ultimately able to perform planned project activities or find suitable alternatives. During the pandemic, much of this was enabled by the prolific use of virtual or hybrid events and without tools like MS Teams to allow for large-scale virtual meetings, many of the project outputs likely would not have been accomplished. Therefore, despite the pandemic coming to an end, the use of virtual/hybrid RTCs, EMs, etc. is likely to continue, as they offer a cost-effective and time-saving alternative to face-to-face meetings.
Comments	Project implementation was affected by Covid pandemic

Thematic Sector - Industry

Project area: Industrial applications of nuclear tracers and sealed sources

Thematic Sector	Industry
Project Area	Industrial applications of nuclear tracers and sealed sources
Project Number	RAS8107
Project Title	Raising Productivity in the Coal, Minerals and Petrochemical Industries by using Nucleonic Analysis Systems and Radiotracers (RCA)
Implementation Period	2007-2008
Project Lead Country	Australia
Lead Country Coordinator	Jacek Charbucinski
Budget (US Dollars)	547,028.64
Objectives	The overall objective of the project is to advance the region's capability to apply and routinely use nuclear techniques to solve complex problems in the coal, solid minerals, and oil and gas industries. The specific objectives are: to promote and transfer the NAS technology for the coal and solid minerals industries through regional demonstrations, training and related activities; and to promote and transfer the radiotracer and sealed source techniques for investigation of industrial multiphase systems through regional demonstrations, training and related activities.
Participating GPs	AUL, BGD, CPR, IND, INS, ROK, MAL, MON,MYA, NZE, PAK, PHI, SRL, THA, VIE
Regional Activities	Expert Missions To repair the PGNAA probe of well logging system (CPR) Updating of technical documents on leak detection and residence time distribution using radiotracers Preparation of "Training Guidebook for Utilisation of NAS in RTDCs " (home base assignment) Implementation of radiotracer and sealed source applications in Myanmar (MYA)
	Training Courses Regional Training Course on In-situ Analysis of Coal Quality Regional Training Course on Off-belt Analysis of Metalliferous Ores and Cement Quality by NAS Regional Training Course on Validation of CFD Models of Multiphase Systems Using Radiotracers
	Meetings and Workshops (planned) Technical Meeting on New Developments of Radiotracer and Sealed Source Technical Meeting on Marketing and Quality Management of Radiotracer and Sealed Source Techniques REMM on Benefits of Industrial Applications of NAS in Exploration and Mine Development in Mineral Industry

	Mid-term Progress Review Meeting Final Progress Review Meeting
Achievements	**Outcomes** Outcome 1: Acceptance of the promoted technologies by the decision-makers and executives of the industry This was achieved to an appreciable level in all participating Member States except Myanmar. Outcome 2: Increased uptake and utilization of radiotracer and sealed source techniques in industrial multiphase systems. The uptake and utilization of radiotracer and sealed source techniques in industrial multiphase systems increased in most of the Member States. The increase was up to 30%. Outcome 3: Extended uptake and use of NAS in Coal and Metalliferous Mining industries The uptake and use of NAS in Coal and Metalliferous Mining industries was increased in some of the participating member states. Outcome 4: Increased awareness of the benefits and the utilization of the available radioisotope technologies among RCA Member States Action was taken to increase awareness of the benefits and the utilization of the available radioisotope technologies among all participating Member States. Main Achievements of participating Member States ▪ More end user organizations like Bangladesh Oil gas and Mineral Corporation, Barapukuria Coal Mining Company, Aqua Consultants, Institute of Water Modelling, Premier Minerals Limited (International Mineral Development Company) have come forward for collaborative work for borehole logging, coal & ore characterisation and related services from BAEC **(Bangladesh)** ▪ Satisfactory progress has been made to develop more facilities through the IAEA and BAEC. New radioactive source, resistivity tool, gamma probe etc. have been procured from the USA which is utilised for providing services and to carry out mineral exploration programmes effectively. BAEC authority has provided these facilities in recognition of the RCA project RAS/8/107 **(Bangladesh)** ▪ Significant income was generated by providing services to the different end user organisations who are engaged in coal exploration programs, mineral resource and water resource development programmes. A number of proposals have been received from different end users with the request to provide borehole logging, ore minerals/coal delineation & characterisation, aquifer boundary determination and analytical services involving NAS and radiotracers **(Bangladesh)** ▪ Obtaining a grant from the Commission of Science & Technology and Industry for National Defense for research and implementation of the sub-

	project "Development of Advanced Radiotracer Technologies for Petroleum Industries" 2008-2010 **(China)** ▪ Conducted research and development on $^{137}Cs/^{137m}Ba$ and $^{68}Ge/^{68}Ga$ radionuclide generators for industrial radiotracer applications. The generators have been delivered internationally via the IAEA for evaluation **(China)** ▪ Conducted off-belt PGNAA research on coal analysis using both ^{252}Cf and Deuterium-Deuterium (D-D) neutron generator. Encouraging results have been obtained **(China)** ▪ Measurement of solid circulation rate for the optimisation of design of coal gasifier **(India)** ▪ Development of a 32-channel data acquisition system for radiotracer and particle tracking experiments and started development of single radioactive particle tracking techniques **(India)** ▪ Conducted several sediment transport investigations using radiotracer **(India)** ▪ The pilot project of tomography for pipe scanning inspection has commenced. The tomography apparatus has been constructed and a data acquisition system has been developed. The tomography equipment was tested for visualization of scale deposited on inner walls of geothermal and petrochemical pipes. **(Indonesia)** ▪ A flow simulation pilot system has been built in order to simulate flow patterns that are met in diverse industries. The pilot system is utilized for residence time distribution (RTD) studies as well as for industrial computed tomography (SPECT) study that can visualize dynamic flow distribution of industrial process media by means of radioactive materials **(Korea)** ▪ An attempt was made to produce nano-size gold particles coated with silica for chemical and physical integrity in a harsh environment of refinery and petrochemical plants. Their stability was evaluated under high temperature in an ionization radiation environment for industrial application **(Korea)** ▪ Two interwell tracing projects in oilfield have been completed with very useful results for the end-users. Two international conference papers were also produced through this work **(Pakistan)** ▪ Two field projects related to feasibility studies of a power plant site were completed. This involved radiotracer application for investigation of dilution factors and the extent of activity dispersion in river system and R&D studies related to determination of Equilibrium Distribution Coefficient (K_d) of various radionuclides in soil-water environment **(Pakistan)** ▪ Cooperation with mineral industry was strengthened. Close working relationship with Directorate General (Minerals), Ministry of Petroleum and Natural Resources, Government of Pakistan and Directorate of Mines and Minerals, Government of Punjab. Engineers from end-users were actively involved in national/regional project activities **(Pakistan)** ▪ A 'National TC Project' was prepared, submitted to IAEA, approved and is expected to commence in 2009. This project will be carried out with active participation of end-users and policy making institutions. This project will introduce practical demonstration and implementation of NAS

	technology for mineral resources exploration/exploitation in Pakistan **(Pakistan)** ▪ Successful research work on multiphase flow using radiotracers was carried out on a pilot scale plant. The results of this work were shared with peers through two international conference presentations and two international journal publications **(Pakistan)** ▪ In connection with industrial process investigation and trouble shooting using nuclear techniques, services were extended to Pakistan Oilfield Ltd., for gamma scanning of two propane packages at a petroleum plant on commercial basis. Twenty six scans of various units were carried out **(Pakistan)** ▪ Close working relationships with petroleum industry were established. As a result a custom made automatic gamma scanner for one of the refineries was ordered from the Project Group. In-house fabrication of the scanner was almost completed **(Sri Lanka)** ▪ Establishment of Nuclear Technology Services Center to provide technical services to the end users and in-house training on tracer experiments and RDT software. **(Thailand)** ▪ Introduction of the final-development version of M-DORT Data Logging Software for Gamma Scanning and the first-development version of DOZEN Data Logging Software for Radiotracer 12 chennel Multi-detection System **(Thailand)** ▪ Trouble shooting and process optimization in petrochemical industries including PTTAR, PTTCHEM, PTTPHENOLS, IRPC, and SCG (40 process units in 2008) **(Thailand)** ▪ Development of High Efficiency $^{137}Cs/^{137m}Ba$ Radionuclide Generator **(Thailand)** ▪ Success in obtaining support from the National Fund to build PGNAA equipment for coal and solid ores analysis utilizing the neutron generator from RCA/IAEA **(Vietnam)** ▪ Recruitment of new, young members for the Project Team **(Vietnam)**

Thematic Sector	Industry
Project Area	Industrial applications of nuclear tracers and sealed sources
Project Number	RAS8111
Project Title	Diagnosing Industrial Multiphase Systems by Process Visualization using Radiotracers and Sealed Sources (RCA)
Implementation Period	2009-2011
Project Lead Country	China
Budget	TCF: 438,114.64 Euros EB: 13,116.60 Euros
Objectives	To improve the performance of the region's industries, reduce pollution and make optimum use of natural resources and energy by promoting and

	transferring the technologies for process gamma tomography and radiotracer studies incorporated with computer modelling and simulation technologies in a sustainable manner so that they can be used to improve the performance of multiphase systems in the region's chemical, petrochemical and petroleum industries and associated wastewater treatment processes and to promote use of the technologies by industrial end users.
Participating GPs	BGD, CPR, IND, INS, ROK, MAL, MYA, NZE, PAK, PHI, SRL, THA, VIE
Regional Activities	<u>Expert Missions</u> • Radiotracers experiments in FCCU and CFD Modeling (MAL) • Development of Training Material on Gamma Tomography for Multi-phase Process Investigation of Petrochemical Plants • Development of the neutron/gamma transmission method for multiphase investigation (VIE) • Development of Training Material on Radiotracers Incorporation with Computer Modelling & Simulation • Development of Training Material on Radioactive Particle Tracking Technique • Preparation of Promotional Materials on Radiotracers in Corporation with Computer Modelling • Preparation of Promotional Materials on Industrial Process Tomography • Development of RPT techniques for multiphase flows in industry
	<u>Training Courses</u> • Regional Training Course on Multiphase Flow Characterization in Petroleum and Chemical Industries Using Radiotracers and Computer Modeling • Regional Training Course on Industrial Process Gamma Tomography for Multi-phase Process Investigation of Petrochemical Plants • Regional Training Course on Gamma Transmission Computed Tomography System and Image Reconstruction for Pipe Inspection • Regional Training Course on Diagnosis of Multi-phase Systems of Petrochemical Plants and Waste Water Treatment Systems Using Radiotracers Incorporation with Computer Models • Regional Training Course on Radioactive Particle Tracking Techniques for Investigating Process Hydrodynamics • Regional Training Course on Capacity Building for Enhanced Gamma Scanning of Industrial Process Columns
	<u>Meetings and Workshops</u> • Project Planning Meeting • Technical Meeting on Industrial Compatibility, Maintenance and Calibration of Equipment for Industrial Radiotracer • AGM on New Developments and Adoption of Protocols and Procedures for Industrial Radiotracer and Sealed Source Technology • Mid-Term Progress Review Meeting on Diagnosing Industrial Multiphase Systems by Process Visualization using Radiotracers • Expert Group Meeting (EGM) for Finalization and Adoption of Promotional Materials, Guideline and Protocols • Final Progress Review Meeting

Achievements	• Different types of Gamma tomography systems had been set up. These progresses will enhance the capability of Process Visualization using Radiotracers and Sealed Sources in Diagnosing Industrial Multiphase Systems. (MAL, ROK, INS, CPR, VIE, etc.)
	• Development and implementation of Radioactive Particle Tracking Technique (RPTT) for flow visualization and design evaluation. (IND)
	• Services to industry and transfer of tracer technology to end-user are continued.
	• More and more industries such as petroleum, petrochemical, chemical and sewage plants accepted the utilizing the Industrial process gamma CT technologies and radiotracer studies. (CPR, ROK, INS, VIE)
	• All applications of radiotracer & sealed source techniques are carried out under strict observations & compliance of the rules & regulations conforming to national/international safety regulations and national quality control/quality assurance standards.
	• The following four protocols prepared by specialists or experts from Member States were discussed and finalized
	  • Protocol on Inter-well Radiotracer Test for the oil field
	  • Protocol on Gamma Scanning of Industrial Process Columns
	  • Protocol for On-line Leak Detection in Heat Exchangers using Radiotracers.
	  • Protocol for Maintenance and Calibration of Data Acquisition System for Radiotracer and Sealed Source Applications

Thematic Sector	Industry
Project Area	Industrial applications of nuclear tracers and sealed sources
Project Number	RAS1012
Project Title	Characterizing and Optimizing Process Dynamics in Complex Industrial Systems Using Radiotracer and Sealed Source Techniques
Implementation Period	2012 – 2016 (Planned for 2012-2014)
Project Lead Country	Pakistan
Budget (Euros)	TCF: 291,970.41
Objectives	To enhance the regional capability in using innovative radiotracers and sealed source techniques for investigation of complex industrial systems
Participating GPs	BGD, CPR, IND, INS, ROK, MAL, MON, NEP,NZE, PAK, PHI, SRL, THA, VIE
Regional Activities	Expert Missions • Home based assignment for preparation of training material on Monte Carlo Simulation for CT, CARPT • Expert Mission for Training on column scanning (PHI) • Expert Mission for Training on SPECT (Single Photon Emission Computed Tomography) (INS)

	• Home based assignment for the preparation of draft protocols for the production of gaseous tracers and Gold in chloride • Home based assignment for the preparation of draft protocols for blockage/buildup detection in pipeline • Home based assignment for the preparation of protocols on radioactive particle tracking
	<u>Training Courses</u> • Regional Training Course on Monte Carlo Simulations for CT, RPT, SPECT and Design of Radiotracer Experiments • Regional Training Course on Industrial Process Single Photon Emission Computed Tomography • Regional Training Course on Industrial Radioactive Particle Tracking (RPT) and SPECT for Multi-phase Process Investigation
	<u>Meetings</u> • Project Planning Meeting • Regional Meeting on RTD-CFD for Radiotracer Applications in Multi-Phase Reactors Mid-term coordination meeting • Expert Group to participate in 7th Intl Radiotracer Conference and prepare Protocols on selected techniques for QA/QC
Achievements	LCC Report to 37th NRM (2015) report on work carried out under National Work Plans by BGD, CPR, IND, INS, MAL, MYA, NZE, PAK, PHI, ROK, THA, VIE.

Project Area : Radiation Processing

Thematic Sector	Industry
Project Area	Radiation Processing
Project Number	RAS8106
Project Title	Radiation Processing Applications for Health and the Environment (RCA)
Implementation Period	2007-2008
Project Lead Country	The Philippines
Lead Country Coordinator	Lucille V. Abad
Budget (Euros)	Not known
Objectives	To apply radiation processing to natural polymers for use in the health and environment sectors. To establish radiation processing technology for

	environmental purposes. To transfer radiation processing technology to end users and promote its use in the health and environment sectors.
Participating GPs	BGD,CPR,IND,INS,JPN,MAL,MON,MYA,PHI,SRL,THA,VIE
Regional Activities	Expert Missions Participation in the FNCA Workshop on "Radiation Processing of Natural Polymers" Participation in the FNCA Workshop on "Radiation Processing of Natural Polymers"
	Training Courses Regional Training Course on the Promotion of Radiation Technology Utilization Regional Training Course on Radiation Processing for Basic and Medium Level Personnel Regional Training Course on Applications of Nanotechnology
	Meetings and Workshops (planned) Project Planning Meeting Mid-Term Progress Review Meeting Regional Executive Management Meeting for Policy Makers and Entrepreneurs
Achievements	**Project Outcome:** **Outcome 1: Newly developed and price competitive novel products from the radiation processed natural polymers for health and environmental applications will become available.** *Indicator:* at least eight new price competitive products developed within the five years. *Achievement:* The following countries have developed new products: Bangladesh, China, India, Indonesia, Rep. of Korea, Japan, Malaysia, Philippines, Pakistan, Sri Lanka, Thailand, and Vietnam. Bangladesh has developed hydrogel wound dressing that can be used to treat a variety of clinical complications following burns. China has developed the technology of using irradiated oligo chitosans, a waste product, for fish feed. The product is being tested by the end-users for anti virus test of fish and shrimp, before commencement of commercial production. China also has developed polysaccharide based hydrogels for wound dressing and the technology is being transferred to a private company. Nano silver particles have been prepared by electron beam irradiation with a low melting point (128ºC) compared to metallic silver (980ºC). Discussions are in progress with a semiconductor factory to test the properties of the products. Approximately 600 tons of irradiated, hygienised, enriched sludge were supplied to farmers in India for actual field trails under a programme to promote radiation technology in hygienizing sewage sludge and its utilization as useful manure. India also has developed PVA based hydrogel and the technology has been transferred to a private company. A Memorandum of Understanding (MoU) has been signed between the National Atomic Energy Agency of Indonesia (CAIR-BATAN) and a private

	industry (PT. Eracita Astamida) for the development and eventual commercialization of hydrogel for wound dressing. Indonesia was also engaged in synthesis and characterization of Hydroxyapatite-polymers (HA) composites for bone substitute application for periodontal purposes. Japan has developed a hydrogel from polysaccharides can be used as Japanese traditional paper and as metal ion adsorbents. It is in the process of developing 2 new products and a third product was transferred to a private company (Wakayoshi Optical Industry Co.Ltd.) Republic of Korea has developed a hydrogel patch with natural herbal extracts (NHEB-02) using gamma irradiation, as a remedy for atopic dermatitis (AD) which is a chronic inflammatory skin disease that affects a large number of children and adults in industrialized countries. This technology was transferred to a private company (Agabang Co.) Malaysia has developed hydrogels in sheet and paste from biomedical grade chitosan derivatives for wound dressing. These products have been evaluated through in-vitro and in-vivo animal models methods and were found to be non-toxic, biocompatible and efficacious in the treatment of wounds. Pre-commercial trials which involved pilot scale production and market acceptance tests have been carried out. Pakistan was also engaged in modification of indigenously extracted chitin / chitosan using gamma radiation for medical and environmental applications. The hydrogel developed shows pH responsive behaviour and can be used as drug delivery application. It also can be used as adsorbent for the removal of toxic metals. The PVP-carrageenan hydrogel for wound dressing developed in the Philippines has been patented by the Philippine Patent Office (Patent No. 1-2000-2471 issued on October 28, 2008 for 20 years.) Sri Lanka has completed the development of PVP based hydrogel wound dressing and has commenced clinical trials. Thailand has developed a PVA/Thai silk fibroin hydrogel wound dressing, which is expected to be patented. Several other products are under development at research level. Vietnam has produced a plant growth promoter named “T&D” and plant protector “OLICIDE” which have been commercialized with a production capacity of 20 to 30 tons/ year. 28 tons of super water absorbents are being produced per year for domestic use and export. A graft copolymer has been prepared for application in enhancement of oil recovery. The techno-economic feasibility of application in oilfields has been completed. Pilot scale production of this product is planned in collaboration with a Joint Venture Company. **Outcome2: Higher utilization of available radiation processing facilities for health and environmental control process**

	Indicator: Increase of the throughput of the irradiation facilities: *Achievement:* This is linked to the first outcome. The through put of the irradiation facilities of almost all the countries have increased as a result of the development of new products. **Outcome 3: Increased investment in radiation technology.** *Indicator:* Increase in the capital investment in radiation facilities. *Achievements*: The following countries increased the capital investment in radiation facilities: Bangladesh, India, Indonesia, Malaysia, Philippines, Sri Lanka, Thailand, and Vietnam. A multipurpose radiation facility of 350 kCi is being constructed under financial support of Government of Bangladesh which will also be used for irradiation of Chitosan for hydrogel production. Pilot scale production of chitosan/chitin is being carried out in using indigenous prawn/shrimp shell. India has increased the Co-60 sources activity of the irradiator used for irradiation of natural polymers from 160 kCi to 375 kCi and the plant is being run on round the clock basis. Daily 2.5 tons of dry sludge is being hygeinized. India has also installed 3 new multipurpose irradiation facilities which will be also used for irradiation of natural polymers. . Indonesia also has invested in increasing the Co-60 sources activity Malaysia has increased the investment in gamma and EB facilities and in the production of sago hydrogel. A pilot plant has been installed in the Philippines for the production of hydrogel for wound dressing which is to be marketed in collaboration with the Private Company (Biotecos**).** The Philippines has also upgraded the irradiation facility and increased the Co-60 source activity. The Government of Sri Lanka has allocated funds to establish a Multipurpose Gamma Irradiation Facility that will be used for medical products sterilization, food irradiation and large-scale production of products such as hydrogels. Thailand has installed a new gamma cell for R&D and one industrial gamma irradiation facility. Vietnam has increased the activity of Co-60 sources in the gamma irradiation facility and installed a new Electron Beam machine.

Thematic Sector	Industry
Project Area	Radiation Processing
Project Number	RAS8109

Project Title	Supporting Radiation Processing of Polymeric Materials for Agricultural Applications and Environmental Remediation (RCA)
Implementation Period	2009-2012
Project Lead Country	Malaysia
Lead Country Coordinator	Khairul Zaman Haji Mohd. Dahlan
Budget (Euros)	TCF: 345,469.28, EB: 79,393.85, Total:424,863.13
Objectives	To enhance agricultural production and mitigate environmental pollution using radiation technology. The specific objectives are to enhance agricultural production through the use of radiation-processed products such as superwater absorbent, toxic-metal absorbent and plant-growth promoter; and to mitigate environmental pollution using radiation technology for recycling industrial polymeric waste.
Participating GPs	BGD,CPR,IND,INS,JPN,ROK,MAL,MYA,PAK,PHI,SIN,SRL,THA,VIE
Regional Activities	Expert Missions • Assisting in carrying out field test trials with irradiated chitosan (SRL) • Participation in the FNCA Workshop on Radiation Processing of Natural Polymers • Expert on Radiation Modification of Polymer for Agriculture Applications (INS) • Radiation Grafting of Super Water Absorbent (SWA) and Its Applications (MAL) • Assisting in developing Super Water Absorbent(SWA) using radiation processed natural polymers (SRL)
	Training Courses • Regional Training Course on Basic Applications of Radiation Modification of Polymers for Agriculture • Regional Training Course on Quality Control and Quality Assurances of Radiation Facility Operation and Dosimetry • Regional Training Course and Demonstration on Up-scaling of Radiation Modification of Polymers for Agriculture Applications • Regional Training Course on Technology Transfer of Radiation Processed Products to Industry: Case Study • Regional Training Course on Basic Radiation Processing of Polymer and Recycling of Polymeric Waste by Using Radiation Technology • Regional Training Course on Advanced Applications of Radiation Processing for Recycling of Polymeric Waste • Regional Training Course and Demonstration on Up scaling of Radiation Modification of Polymer for Agricultural Applications: Plant Growth Promoters and Plant Elicitors
	Meetings and Workshops • Project Planning Meeting • Mid-term Progress Review Meeting • Regional Executive Management Meeting for policy makers and end users on agriculture applications

	• Regional Executive Management Meeting for Policy Makers and End-users on Green Radiation Processing for Agricultural applications • FNCA Workshop on Radiation Processing of Natural Polymers Final Progress Review Meeting
Achievements	Plant Growth Promoter (PGP) • 18 plant growth promoters • Type – oligo-chitosan, oligo-alginate (IND), oligo-carrageenan (PHI), Low Mw Chitosan (CPR), • Potential application – growth promoter, elicitor, post-harvest fruit preservative, chitosan fungicide, animal and aquaculture feed • Increase yield from 15 to 40% Super Water Absorbent • 13 super water absorbents • Type- CMC/Acrylamide (BGD), acrylic acid-g-CMC (IND), cassava starch-g-acrylic acid (INS, THA & VIE), CMC/CA gel (ROK), acrylic acid-g-sago waste (MAL) , corn starch-g-acrylic acid (MYA), carboxy methyl carrageenan (CMκC) (PHI), • Potential application – soil conditioner, water- retention , slow release fertilizer. Toxic Metal Adsorbent • 10 toxic metal adsorbents • Type – Based on silica, cellulose and graphene, polysaccharide hydrogels, amphiphilic gels (CPR), crosslinking chitosan (IND), metal adsorbents filter, metal adsorbent gel and metal analysis gel (JPN) • Potential application – recovery of precious metal, purification of industrial effluent by removing toxic metal, uptake radionuclide

Thematic Sector	Industry
Project Area	Radiation Processing
Project Number	RAS1014
Project Title	Supporting Radiation Processing for the Development of Advanced Grafted Materials for Industrial Applications and Environmental Preservation
Implementation Period	2012-2014
Project Lead Country	Malaysia
Lead Country Coordinator	Zulkifli Ghazali
Budget (Euros)	TCF: 329,365.18, EB: 61,742.87, Total: 391,108.05
Objectives	To produce advanced grafted products for industrial applications and for mitigating environmental pollution by using radiation processing Specific Objectives To mitigate environmental pollution by the removal of toxic elements and harmful compounds using radiation grafted products. To

	produce advanced radiation grafted products for industrial applications in the form of membrane, gel, fiber, hybrid coating, etc.
Participating GPs	BGD,CPR,IND,INS,JPN,ROK,MAL,MYA,PAK,PHI,SIN,SRL,THA,VIE
Regional Activities	Expert Missions Radiation Grafting of Polymeric Matrices for Environmental and Industrial Applications (INS) Introduction to radiation-induced grafting (SRL) Expert mission to assist researchers concerning radiation-induced grafting (THA) FNCA Workshop on Radiation Processing
	Training Courses Regional Training Course on Basic Radiation Processing of Polymer Focusing on Radiation Grafting Regional Training Course on Advanced Radiation Grafting of Polymeric Matrices for Environmental and Industrial Applications Regional Training Course on Advanced Characterization Methods of Grafted Polymeric Matrices Regional Training Course on Application and Up Scaling of Radiation Grafting for Environmental and Industrial Applications Regional Training Course on Advanced Characterization Methods of Grafted Polymeric Matrices, Designing and Up-Scaling of Radiation Grafting for Environmental and Industrial Applications
	Meetings and Workshops Project Planning Meeting Regional Executive Meeting for End-user and Policy Makers on Radiation Grafting Workshop on Harmonized Radiation Graft Protocol Project Review Meeting Regional Executive Meeting for policy makers and end-user on radiation grafting Final Project Assessment Meeting
Achievements	• Under this project, about 55 advanced radiation grafted materials were developed in various categories namely : (1) Adsorbents (2) Ion exchange membranes (3) Catalysts (4) Bioactive carriers (5) Tissue scaffold (6) Evaporator membranes (7) Active packaging • Two of the products namely Cesium adsorbents for water purification and adsorbent for silicon wafer cleaning waste have already been commercialised and other two products are at pre commercialisation stage. Other developed products are at different stages of upscaling. • More than 100 participants were trained during various regional training courses through the help of host GPs and experts from local and other participating GPs.

Thematic Sector	Industry
Project Area	Radiation Processing
Project Number	RAS1028
Project Title	Improving the Quality Management Practices in Radiation Processing Facilities for Better Performance and Applications (RCA)
Implementation Period	2022-2025
Project Lead Country	Malaysia
Budget (Euros)	TCF:410,863 , EB:4450, Total: 415,313
Objective	To improve the level of competitiveness and customer satisfaction of radiation processing facilities of RCA GPs.
Participating GPs	AUL,BGD, CAM, CPR , IND, INS, ROK, LAO, MAL, MON, MYA, PAK, PHI, SRL, THA,VIE
Regional Activities	<u>Expert Missions (planned)</u> • expert missions to GPs requiring assistance on establishing the Quality Management System manual for radiation processing facilities • expert missions to GPs requiring assistance on establishing the Quality Management System of ISO 13485 for radiation processing facilities • expert mission to GPs requiring assistance to prepare documentation for obtaining the certification as per national certification bodies' requirement. • expert mission to GPs requiring assistance on establishment or upgrading the laboratories to meet the requirements of the quality manual.
	<u>Training Courses ((Planned)</u> • on Quality Management System of ISO 9001 with guidelines for radiation processing facilities prepared by experts. • RTC2 on QMS of ISO 13485 with the implementation of ISO 11137 for related radiation processing facilities. • RTC on managing the QMS implementation for radiation processing activities • RTC on dosimetry inter-comparison and its relevancy to the radiation processing activities
	<u>Meetings and Workshops (planned)</u> • First Coordination Meeting of the Project (held as a virtual meeting) • Expert group meeting to prepare a guidelines containing quality management procedures towards improving the quality management practice • Expert group meeting to prepare and produce the training course materials • Mid-term review meeting • Final Review Meeting
Achievements	The project is under implementation
Comments	

Thematic Sector: Industry

Project Area: Non-Destructive Testing

Thematic Sector	Industry
Project Area	Non-Destructive Testing
Project Number	RAS8105
Project Title	Development and Application of Advanced Industrial Radiography and Tomography Techniques (RCA)
Implementation Period	2007-2008
Project Lead Country	India
Lead Country Coordinator	Gursharan Singh
Budget (Euros)	Not known
Objectives	The overall objective of the project is to improve the capability of RCA Member States to apply and routinely use advanced industrial radiography and tomography techniques to improve production quality and safety. The specific objectives are: 1) to extend the utilization of portable digital industrial radiography (DIR) systems; 2) to establish quality management systems (QMS) in accord with ISO standards; 3) to extend application of portable gamma tomography systems for in situ applications in process and petrochemical industries; and 4) to facilitate the implementation of harmonization schemes for non-destructive testing (NDT) certification in accord with ISO 17024.
Participating GPs	AUL,BGD,CPR,IND,INS ,ROK,MAL,MON, MYA,PAK,PHI,SIN,SRL, THA,VIE
Regional Activities	Expert Missions Home based assignment for production of training materials on quality management system
	Training Courses Regional Training Course on Quality Management Systems and Strategic Planning Regional Training Course on Portable Digital Industrial Radiography (DIR) and Tomography Systems
	Meetings and Workshops (planned) Project Planning Meeting Consultants Meeting on Guidelines for Implementation of Harmonization Scheme for Regional NDT Certification Mid-Term Progress Review Meeting of the RCA Project

	Compile IAEA TCS book on Eddy Current Testing Level 2 in accordance with syllabus of IAEA TECDOC 628 Rev 2 (2008)
Achievements	Project Outcomes: This project and other related RCA projects were instrumental in assisting participating Member States in the utilization of NDT techniques including DIR and harmonization of NDT training and certification schemes to the extent possible. As a result, technology advancement in the area of NDT as well as improvement in the safety, quality, reliability and productivity in key industries such as oil and gas, power generation, chemical and petrochemical, automobile, aviation and construction, including many of the manufacturing industries are reported in some participating RCA Member States. On a general note, Member States have achieved considerable progress as a result of their sustained effort in establishing national projects and established excellent linkages with end user industries under the broad objectives of this project. As the RCA Member States comprise developed, developing and less developed, the resource availability varies widely in the MSs. Therefore, the progress of the project is not uniform in all Member States. Furthermore, the equipment for DIR an CT are expensive and technology is relatively new and complex for RCA region. Hence, all MSs may not be able to set up their own DIR and CT facilities in the immediate future. Nevertheless, the project provided the spadework towards that endeavour. In continuing this effort, a new RCA project entitled 'RAS/8/110 on Applying Digital Industrial Radiology and Computed Tomography in Industry and Civil Engineering' was approved for the 2009-2011 TC cycle. The overall achievements of the project based on the reports of 16 RCA participating member states are listed below in accordance with the following groups of activities: 1) Utilization of portable DIR system: Eight countries with national activities; seven possess essential infrastructure and three countries have initiated procurement actions. India has developed self sufficient DIR imaging facility. 2) Establishment of quality management system (QMS) in accordance with ISO standards: Thirteen countries have national activities and Australia and China have established QMS and the remaining MSs are at different stages of completion. 3) Extension of applications of portable gamma tomography for in-situ applications in process and petro-chemical industries: All countries have national activities. Australia, China, India, Malaysia and Republic of Korea have national resources in the field. 4) Implementation of harmonization schemes for NDT certification in accordance with ISO 17024: All countries have national activities. It is envisaged that by 2010, 4 out of 16 participating countries would be ready for implementing the Multilateral Recognition Agreement (MRA). 5) Number of NDT Trained Personnel in the region (2003-2008): 228,465 personnel were trained during the year 2003 as compared to 303,603 in the year 2008. This gives an increase of 32.9% in the training of personnel. China reported about 90% of the reported figures.

	6) Number of NDT companies: All participating MSs reported to have a base of NDT companies in their respective countries. In 2003, there were about 20,592 companies involved directly with NDT business or having NDT as one of their business and this number increased by 11.2% to 22,898 in the year 2008. 7) Number of institutions involved in DIR and CT activities: All fifteen participating MSs reported to have some of this activity either progressing well or being initiated by institutions in the field of DIR and CT in their respective countries. 41 institutions were reported to have DIR and CT activities in 2003 and this increased by 429% to a total of 217 institutions in 2008.

Thematic Sector	Industry
Project Area	Non-Destructive Testing
Project Number	RAS8110
Project Title	Applying Advanced Digital Industrial Radiology and Computed Tomography in Industry and Civil Engineering (RCA)
Implementation Period	2009-2011
Project Lead Country	India
Lead Country Coordinator	Gurusharan Sinh
Budget (Euros)	TCF: 130,000
Objectives	To demonstrate, promote and transfer the applications of advanced digital radiography and planar and volume imaging techniques for non-destructive testing and examination of industrial specimens.
Participating GPs	AUL,BGD,CPR,IND,INS,ROK,MAL,MYA,NZE,PAK,PHI,SIN,SRL,THA,VIE
Regional Activities	<u>Expert Missions</u> To develop training modules for RTC in Digital Industrial Radiology (DIR) and Computed Tomography To draft guidelines on Training/Examination & Certification of candidates in the DIR and CT Technologies Establishing National Center for NDT in Sri Lanka (SRL) Strengthening of Center for NDT, Mongolia University for Science and Technology (MON)
	<u>Training Courses</u> Regional Training Course on Digital Industrial Radiography and Computed Tomography Applications in Industry Regional Training Course on Digital Industrial Radiography and Computed Tomography for Specific Industry Sectors

	Regional Training Course on the Use of ISee and aRTist Software for DIR Image Analysis and Interpretation
	<u>Meetings and Workshops</u> Project Planning Meeting Mid-Term Progress Review Meeting Technical Meeting on Guidelines for Training/Examination & Certification of candidates in the DIR and CT Techniques Final Progress Review Meeting
Achievements	• The participating MSs were able to enhance their technical capacities in DIR and CT. These applications have now been expanded and promoted in various industries. The follow up action plans have also been developed to ensure the sustainability. • The project was able to enhance awareness and understanding of the end-users/policy makers on the usefulness of advanced NDT techniques in addressing quality control and assurance in aerospace, oil and gas, power generation, building construction and automotive industries. Most of the participating MSs have introduced DIR and initiated CT in their routine monitoring programs. • National NPC meetings have been useful in enhancing the networking and sharing the knowledge and experience among MSs. • MS participation in the RCA project served as the catalyst for gaining government support for effective implementation of the national activities. Most participating MSs obtained additional funding support to conduct national activities. This has resulted in recognition of the project at national and regional levels. • MSs acknowledged the importance of the advanced NDT methods by end-users/policy makers/collaborators. This has significantly enhanced dissemination of the project outputs for implementation at the national level to improve industrial development in a sustainable manner. • The project successfully promoted the Technical Cooperation among Developing Countries (TCDC) concept for exchange of expertise and networking within the RCA region and improving QA/QC at national level. The use of experts from the Region signified advancement of regional technical capability. The continuation of this regional cooperation would further enhance and sustain technical capability of MSs. • The draft document on Guidelines for training, examination and certification in DIR testing was prepared during this project cycle. Availability and adoption of the document by all participating MSs would provide harmonisation for these applications in the RCA region.

Thematic Sector	Industry
Project Area	Non-Destructive Testing
Project Number	RAS1013

Project Title	Supporting Advanced Non-Destructive Examination for Enhanced Industrial Safety, Product Quality and Productivity
Implementation Period	2012-2014
Project Lead Country	India
Budget (Euros)	TCF : 204,624.07
Objectives	To enhance capacities for effective applications of nuclear radiation based Advanced Non-Destructive Evaluation technologies for enhancing industrial safety, product quality, productivity, extension of plant lives and services provided.
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,ROK,MAL,MYA,PAK,PHI,SIN,SRL,THA,VIE
Regional Activities	Expert Missions EM for conducting training on RT level 3 (MYA) EM to conduct training on radiography testing at level 3 (VIE) EM to support MS in the development of their capacities in NDT and radiation technologies (MYA) HBA to prepare a training document on Radiographic testing at levels 1, 2 and 3 under TecDOC 628 Rev. 3 (ISO9712-2012) HBA to prepare a document on Ultrasonic testing / NDT for managers
	Training Courses Regional Training Course on Application of Digital Radiography and Computed Tomography to Metal, Automotive, Aviation, oil and Chemical Industries Regional Training Course on Use of High Energy Radiation Sources and Advanced Supplementary Techniques for NDT Applications Regional Training Course on Use of Advanced NDE Techniques for In-Service Inspection of NPP and Other Civil Engineering Structures for Life Prediction and Extension
	Meetings and Workshops Final Project Review Meeting
Achievements	Most of the participating RCA GPs have proactively taken up technology upgrading and end-user awareness programmes in DIR and CT in their respective countries. The successful implementation of major activities envisaged in the project during 2013 had been a result of the keen interest shown by the GPs. The stimulation is clearly visible in the region.

Thematic Sector	Industry
Project Area	Non-Destructive Testing
Project Number	RAS1020
Project Title	Building Capacity for Applications of Advanced Non-Destructive Evaluation Technologies for Enhancing Industrial Productivity (RCA)

Implementation Period	2014-2016
Project Lead Country	India
Budget (Euros)	TCF : 324,636.47
Objectives	To develop a pool of trained technologists and technology practitioners in industrial digital radiography (DR) and computed tomography (CT) for applications in metal casting, rubber and plastic moulding, industrial prototyping, reverse engineering and routine non-destructive examination (NDE) of industrial components in the RCA region. To impart specialised training to key stakeholder members, which will in turn act as catalyst in their Member States for technology propagation. To provide for productivity enhancement in the industrial quality assurance (QA) processes through process automation.
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,ROK,MAL,MYA,PAK,PHI,SIN,SRL,THA,VIE
Regional Activities	• Expert Missions • HBA to prepare protocol and manual/guidebook for gamma/X-ray industrial tomography for use by Member States • Expert group consultancy to deliberate on development of computed tomography for indsutrial applications • Expert mission to evaluate the situation of NDT in Lao PDR and prepare future activities (LAO) • To evaluate the situation of NDT in Mongolia and assist counterpart for strengthening the activities in the field (MON)
	• Training Courses • Regional Training Course RTC on DIR and industrial CT for trainers • Regional Training Course on applications of DR and CT to metal, non-metal and composite materials • Regional Training Course on X-ray and Gamma Ray Based DIR for Specialized NDT Requirement in Industry • Regional Training Course on Digital Industrial Radiography and industrial Computed Tomography • Regional Training Course on Capacity Building in Computed Tomography (CT) for NDT in MSs
	• Meetings and Workshops • Mid term coordination meeting • Expert group meeting on computed tomography and digital radiography • Expert Group Meeting (EGM) on Fluoroscopy: Improvement of Quality, Optimization and Technology Transfer Final Progress Review and Coordination Meeting
Achievements	Insufficient information

Thematic Sector	Industry
Project Area	Non-Destructive Testing

Project Number	RAS1022
Project Title	Strengthening Regional Capacity in Non-Destructive Testing and Examination Using Nuclear and Related Techniques for Safer, Reliable, More Efficient and Sustainable Industries Including Civil Engineering (RCA)
Implementation Period	2018-2021
Project Lead Country	Malaysia
Budget (Euros)	TCF: 483,727, EB: 17,283, Total: 501,010
Objectives	To improve regional capabilities in the application of NDT/E to support the requirements of industries, including civil engineering for sustainable industrial development.
Participating GPs	AUL,BGD,CPR,FIJ,IND,INS,CAM,JPN,ROK,LAO,MAL,MYA,NEP,NZE,PAK,PHI SIN,SRL,THA,VIE
Regional Activities	Expert Missions
	Training Courses Training Course on Radiographic Testing RT-D Level 2 for Personnel Certified to Radiographic Testing RT-F Level 2
	Meetings and Workshops Mid-Term Review Meeting Expert Group Meeting to Review the Draft Document on Phased Array Ultrasonic Testing Regional Workshop on Non-Destructive Testing (NDT) Examination Qualification and Certification Scheme Requirements in Accordance with the Latest Edition ISO 9712 and ISO17024 Regional Workshop on the Application of NDT for Civil Engineering Structures
Achievements	i. Trained personnel of participating GPs; 66 personnel trained in advanced NDT/E, 45 trained personnel in NDT for civil structures inspection, and 53 trained personnel in the requirement of NDT qualification and certification system, exceeding the targeted indicators set for the outputs for the project; ii. The overall improvement in regional capabilities in the application of NDT by providing training courses with ISO 9712 certification which allows GPs to produce competent (qualified and certified) personnel in advanced NDT technique i.e. RT-D, which enable GPs to contribute to enhanced inspection efficiency and productivity across industries; iii. The enhancement of the regional capabilities in the application of NDT by providing training in NDT for civil structures inspection which will allow GPs to develop their capacities and capabilities for improved safety of buildings and structures, pre- and post-disasters; iv. The ability of GPs to produce certified personnel locally through the establishment of national certification body and international recognized certification scheme for NDT and training centres, enabled GPs to fulfilled the demands of industries and be self-reliant in NDT – currently 7 national

	certification body for NDT from participating GPs have fulfilled the requirements of ICNDT MRA; and v. The expansion of NDT activities and businesses at GPs national level through availability of trained and certified personnel as reported by the NPCs, which provide socio-economic benefits to GPs.
Comments	Project implementation was affected by Covid pandemic

Thematic Sector	Industry
Project Area	Non-Destructive Testing
Project Number	RAS1029
Project Title	Enhancing Regional Capabilities in Advanced Non-Destructive Testing Techniques for Improved Safety and Inspection Performance in Industries (RCA)
Implementation Period	2023-2026
Project Lead Country	Malaysia
Budget (Euros)	TCF: 495,468.75
Objective	To establish regional advancement in NDT to fulfil the requirements set by global standards for self-reliance and sustainable NDT systems of GPs.
Participating GPs	TBD
Regional Activities	<u>Expert Missions</u> •
	<u>Training Courses (planned)</u> • RTC on RT-D Level 2 with certification for trainers. • RTC on NDT techniques for quality control in civil engineering • RTC on Time of Flight Diffraction (TOFD) with certification. • RTC on ISO 9712 qualification and certification requirements in NDT for civil structures • RTC on the practical operation and application of CT for NDT inspection of composite • RTC on RT-D Level 3 for personnel involve in the NDT qualification and certification scheme. • RTC on 3D volumetric visualization of composite using advanced-radiation based NDT techniques.

	• RTC on NDT for civil structures for certification as per ISO 9712
	Meetings and Workshops • First Coordination Meeting • Expert group meeting to develop a draft document on Time of Flight Diffraction • Mid-term review meeting • Final review meeting
Achievements	Project is under implementation
Comments	

Thematic Sector - Radiation Safety

Project Area: Radiation Protection Infrastructure

Thematic Sector	Radiation Safety
Project Area	Radiation Protection Infrastructure
Project Number	RAS9042
Project Title	Sustainability of Regional Radiation Protection Infrastructure (RCA)
Implementation Period	2007-2010
Project Lead Country	Australia / Japan
Lead Country Coordinators	David Woods (2007-2008), Kazuo Sakai (2009-2010)
Budget (Euros)	TCF: 613,614.42, EB: 94,836.15, Total:708,450.57
Objectives	RCA Member States are to be assisted: to sustain their radiation protection infrastructures; to maintain standards of radiological measurements, the ability to interpret measurements and provide related technical advice through regional inter-laboratory comparisons and information-sharing; to maintain a skilled manpower base in the region through a regular programme of regional training and exercises; to refine methods and mechanisms of regional co-

	operation in radiation protection regulatory infrastructures, occupational exposure control, medical exposure control, public exposure control, and emergency planning and preparedness, to promote regional self-reliance, networking, and mutual support; to pursue and develop subject matter with a common approach to waste management strategies and environmental discharge criteria; to create a regional network of regulatory authorities to continue mutual interaction with minimal Agency support beyond 2010; to establish a regional ALARA (keeping radiation "as low as reasonably attainable") network that is self-sustaining beyond 2010; to create an RCA regional focus group or network of medical practitioners who do not in their normal professional development receive training in radiation protection practices for patient exposure control (e.g., interventional cardiologists, urologists, orthopaedic surgeons, gastroenterologists) and who have received IAEA training in patient protection; to create a regional network of decision makers on radiological emergency preparedness and response to continue mutual interaction with minimal IAEA support beyond 2010; and to provide a series of practical regional exercises and workshops to foster regional networking and the development of a regional action plan for self-sustainability.
Participating GPs	AUL,BGD,CPR,IND,INS,JPN,ROK,MON,MAL,MYA,NZE,PAK,PHI,SIN,SRL,THAVIE
Regional Activities	Expert Missions
	Training Courses
	• Meetings and Workshops • Project Planning Meeting • Meeting of the Network of Cardiologists Trained by the IAEA in Radiation Protection Meeting for Establishment of a Regional Forum for Regulators in the Framework of RaSaReN Regional Meeting to establish a Regional ALARA Network Steering Committee • Regional Meeting for Emergency Management Decision-Makers Meeting on the network of Asian cardiologists and medical specialists in radiation protection Technical Meeting of the RCA Regulators Forum on Regional Priority Issues and Solutions of the RCA Project • Technical Meeting of the ALARA Network for the Asia and the Pacific Region (ARAN) on Improving Radiation Protection Mid-term Progress Review Meeting • Technical Meeting of the ALARA Network for the Asia and the Pacific Region on Radiation Protection in NORM • Regional Seminar of Radiation Protection Regulators on Sharing Best Practices in Managing Disused Sources and Networking Meeting of Asian Network of Cardiologists in Radiation Protection • Meeting for Emergency Management Decision-makers • Final Progress Review Meeting

Achievements	• The project created a networks of Cardiologists, Asian ALARA Network, an Emergency Responders Network, and a Regulators Network. • Through the activities of the RAS/9/042 it became evident that information sharing via networks is a powerful tool to improve the radiation protection status in member states. • As use/handling of radiation/radioactive materials expands, radiation protection becomes an ever important essential element. • The RAS/9/042 activity should be continued; however, some components of the programme is not fully self-sustainable yet.

Project Area: Emergency Response

Thematic Sector	Radiation Safety
Project Area	Emergency Response
Project Number	RAS9092
Project Title	Strengthening the Capacity to Respond to Radiological Emergencies of Category II and III Facilities (RCA)
Implementation Period	2020-2023
Project Lead Country	Republic of Korea
Budget (Euros)	EB: 262,777.69
Objectives	To ensure radiation safety for workers and the public during nuclear or radiological emergencies in the RCA region.
Participating GPs	AUL,BGD,JPN,CAM,LAO,PHI,ROK,SRL (the list may not be complete)
Regional Activities	<u>Expert Missions (planned)</u> Expert Missions to participating GPs
	<u>Training Courses (planned)</u> Regional Training Course on Operational Intervention Levels (OILs) for Radiological Emergencies Regional Training Course on Protection Strategy for EP Category II and III
	<u>Meetings and Workshops (planned)</u> Project Coordination Meeting in conjunction with a Technical Workshop on the Regional Status of the EPR for Category II and III Facilities Mid-term Review Meeting in conjunction with a Technical Workshop on the Plans for Applying the Protection Strategies Technical consultation meeting to develop a handbook Final Review Meeting in conjunction with a Technical Workshop on the Enhancement of the EPR Arrangements (Review on the Handbook)
Achievements	Project activities are well-implemented according to the work plan. Throughout 2023 and 2024, more countries are expected to develop the draft of the emergency plan and/or protection strategy.
Comments	Project implementation was affected by Covid pandemic.

Other Project Areas

Project Area: Research Reactor Utilization

Project Area	Research Reactor Utilization
Project Number	RAS4026
Project Title	Adding Value to Materials through Irradiation with Neutrons (RCA)
Implementation Period	2007-2008
Project Lead Country	Republic of Korea
Lead Country Coordinator	B.J. Jun
Budget (Euros)	Not known
Objectives	To improve the utilization of research reactors in the region by enhancing the capability of Member States to produce value added materials using neutron irradiation.
Participating GPs	AUL,BGD,CPR,IND,INS,MON,MYA,PAK,ROK,VIE
Regional Activities	Expert Missions Preparation of Guidelines on Gem Coloration and Neutron Transmutation Doping of Silicon Peer External Review of report "Guidelines on neutron transmutation doping and gem coloration
	Training Courses Regional Training Course on Neutron Irradiation Technology Regional Training Course on Design and Operation of Neutron Irradiation Facilities
	Meetings and Workshops Project Planning Meeting and TM on Irradiation Technology Mid-term Progress Review Meeting Final Project Review Meeting
Achievements	The project intended participating Member States to have capability in neutron transmutation doping, gem coloration, wafer irradiation and membrane production. Since regional experience in wafer irradiation and membrane production is very limited, however, the neutron transmutation doping and gem coloration have been main topics. Fortunately, the project could invite lecturers on the wafer irradiation and membrane production and Member States could have basic idea for their future decision. All activities planned have been successfully implemented except national training courses and expert assistances. Member States already active in commercial services of neutron irradiations show distinct improvement, but since lead time to implement and commercialize the technology is long, it

	seems too early for other Member States to have national training courses or to request expert assistance. Though the technologies have commercial values, experienced Member States actively shared their knowledge, knowhow and experiences with other Member States. In addition to information disseminated by the TM, RTC and project meetings, guidelines on the neutron transmutation doping and gem coloration are documented by experts participated in the projects. Since the guidelines are expected to be very valuable for all research reactor society, the Agency is under review process to publish the guidelines as an IAEA document. It is found that design feature of reactor itself is one of the most important factors for the implementation of the technologies. Therefore, the information provided through the project will be very valuable to some Member States considering new research reactors.

Project Area: Energy Planning

Project Area	Energy Planning
Project Number	RAS0045
Project Title	Formulation of Sustainable Energy Development Strategies in the Context of Climate Change (RCA)
Implementation Period	2007-2008
Project Lead Country	Republic of Korea
Lead Country Coordinator	LEE, Man-Ki
Budget (Euros)	Not known
Objectives	The objective of the project is to strengthen the sustainable development of Member States in the post-Kyoto period by assessing the role of nuclear and other energy options and evaluating the resources for energy-related activities and environmental concerns. The primary goals of the project are: 1) To make RCA Member States better able to elaborate sustainable energy strategies in the context of climate change; 2) To conduct national studies to set up sustainable energy development taking into account the role of nuclear power and other energy options; and 3) To provide recommendations for appropriate actions consistent with national objectives for sustainable development.
Participating GPs	AUL,BGD,CPR,IND,INS,MAL,MON,MYA,PAK,PHI,ROK,SIN,SRL,THA ,VIE
Regional Activities	Expert Missions To assist in the conduct of a National Workshop/Training Course on Evaluation of Energy Supply Strategies using MESSAGE (PHI)

	Training Courses Regional Training Course on Applications of IAEA Analytical Tools for Evaluation of Sustainable Energy Strategies for Addressing Climate Change Issues Advanced Regional Training Course on Applications of IAEA Analytical Tools for Evaluation of Sustainable Energy Strategies for Addressing Climate Change Issues
	Meetings and Workshops (planned) Project Planning Meeting Regional Seminar to Review Progress of National Studies Final Progress Review Meeting
Achievements	**Project Outcomes:** The project assisted most of the participating Member States with completing their national studies, except for a couple of countries. Almost all participating Member States created energy development scenarios, in which nuclear power was introduced as a means not only to supply electricity but also to reduce future greenhouse gas (GHG) emissions. One of the major achievements throughout the national studies was a cost-benefit analysis assessing the additional economic costs driven by introducing nuclear power and the benefit of alleviating the burden on GHG emissions. Generally, the national studies revealed that increasing the share of coal resources is of national economic interest, because it provides both reliable energy supply and efficient allocation of energy resources. However, increasing the share of coal resource would lead to climate change concerns on the national, regional and global level due to significant increase of GHG emissions. The introduction or expansion of nuclear power was determined to significantly help reduce future GHG emissions and foster environmentally sound sustainable energy development. The most important outcome of this regional project was that participating national teams from the RCA Member States are now equipped with appropriate analytical tools to evaluate all technological options with regard to economics, environmental costs and benefits as well as the overall impact on social and economic progress. They are also now able to elaborate their own countries' sustainable energy development strategies, make decisions on energy sector development, assess the potential role of nuclear power and other energy options and incorporate recent energy issues in the region. The project assisted RCA Member States to develop scenarios, with respect to their energy plan, and understand the level of environmental burden different options contribute. The various scenarios developed will also help Member States during negotiations on their countries' position for the post Kyoto agree