RCA News Letter

THE SEVENTH ISSUE | MAY 2024

7th Issue of the RCA Newsletter

The 22 RCA Government Parties are gathering in Beijing, China in May 2024 for the 46th Regional Meeting of the National RCA Representatives (NRM) to discuss the policy issues and the overall management of the RCA Programme. Representatives from the IAEA and RCARO, as well as RCA experts, will join the discussions to review of the progress of the current RCA programme and preparations for the 2026- 2027 cycle based on the regional priorities and needs. This issue also features the results and outcomes of RCA projects on marine radioactivity monitoring, nuclear medicine and radiation oncology, insights and analysis on RCA's contribution to the Asia-Pacific region, ARCCNM's cooperative activities in nuclear medicine in Asia, Singapore's radiation safety activities and Thailand's activities on e-beam technology. Further, it provides stories on RCARO activities including a message from the DIR-RCARO.
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RCA News

RCA Governments Convene 46th Regional Meeting to Review the RCA Programme and Discuss Regional Priorities

With the mission to improve the socio-economic well-being and contribute to the sustainable development of the Asia-Pacific region, the 22 RCA Government Parties (GPs), in cooperation with the IAEA, coordinate and implement the RCA programme in the regional priority areas applying peaceful uses of nuclear science and technology. Since its establishment in 1972, more than 180 RCA projects have been implemented in various fields, including agriculture, industry, human health and the environment, based on the needs of the GPs.

The 22 RCA GPs are expected to convene in Beijing, China, for the 46th Meeting of National RCA Representatives to discuss policy issues, overall management, and planning of the RCA programme. Hosted by the China Atomic Energy Authority (CAEA), the meeting will take place from May 14 to 17, 2024, and will be attended by the National RCA Representatives (NRs) of the 22 GPs, representatives of the IAEA, RCA experts, and the RCA Regional Office. The agenda will include discussion and review of progress for current RCA programmes and regional priorities in preparation for the 2026-2027 RCA programme, as well as potential measures to enhance the efficiency of the RCA.

The opening session will feature statements by the current RCA Chair from Australia, representatives of the host country China, and the IAEA, welcoming the participants and sharing their insights on RCA issues. Subsequently, a new RCA Chair will be elected, expected to be from China. China last chaired the RCA in 2012 after hosting the 34th NRM in Beijing, which also marked the 40th anniversary of the RCA.

During the meeting, participants will review the implementation of the 2023 RCA programme and activities, the draft 2023 RCA Annual Report, and budgeting. The meeting will witness improvements in the design and structure of the RCA Annual Report, with participants expected to provide feedback for finalisation. Following this, all NRs will discuss the prioritisation of projects for further development in preparation for the 2026/2027 RCA programme, considering the report of the RCA Programme Advisory Committee (PAC).

The RCA has been actively enhancing its efficiency and effectiveness through Policy Meetings. The Committee of RCA Chairs will share their perspectives and potential measures to further strengthen the RCA Programme. Additionally, progress reports on ongoing projects by the lead countries will be presented, aligned with the themes of the IAEA Flagship Initiatives, such as Food4Atoms, Global Water Analysis Laboratory Network (GloWAL), and Rays of Hope, highlighting the close cooperation between the RCA and the IAEA in achieving socio-economic impact in the region.

The RCA has a regional office, the Regional Cooperation Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCARO), based in Korea. RCARO will provide updates on its various cooperative activities to promote the RCA and its partnerships. Furthermore, the meeting will allocate time to discuss FNCA (Forum for Nuclear Cooperation in Asia) activities and other matters relevant to the RCA.

The main outcomes of the meeting will include the list of priority projects for the 2026-2027 RCA Programme and strategic decisions/recommendations on the policy and management of the RCA Programme. The RCA GPs recognize that the progress and changes in the region are the result of the concerted efforts by all stakeholders. The 46th NRM will be no exception, demonstrating the commitment of the RCA GPs and the IAEA to jointly fulfil the mission of the RCA.

RCA Policy Meetings

The National RCA Representatives of the 22 Government Parties (GPs) have two policy meetings each year; National RCA Representatives Meeting (NRM) and the General Conference Meeting (GCM).

RCA NRM

The NRM usually takes place in the first quarter in one of the RCA GPs to discuss and review matters related to RCA policy, the programme and other issues. The agenda includes follow up-actions of the previous GCM, review of the RCA Annual Report, implementation of RCA Programme, and activities of Working Groups and RCA PAC. The NRM officially elects the incoming RCA Chair at the beginning of the meeting. One day prior to the NRM, the RCA regularly organizes the meetings of the RCA Chairs and RCARO Standing Advisory Committee.

RCA GCM

The RCA GCM is held at the IAEA headquarters annually, one week prior to the IAEA General Conference in September, to discuss the follow-up actions of the previous NRM and to consider matters related to the progress made on RCA policy, and the Programme. The meetings of the RCA Chairs and RCARO Standing Advisory Committee are held the day before the GCM.

RCA Projects

Enhancing Regional Capabilities for Marine Radioactivity Monitoring and Assessment of the Potential Impact of Radioactive Releases from Nuclear Facilities in Asia-Pacific Marine Ecosystem (RCA): Achievements of RCA Project RAS7028

- **Wahyu Retno Prihatiningsih** | Researcher Associate Expert, National Nuclear Energy Agency of Indonesia (BRIN)

Project Background

The Asia-Pacific region boasts an extensive marine coastline, upon which its economies rely heavily for livelihoods and economic growth. This reliance on ocean resources – seawater, sediments, and marine biota- makes the region susceptible to various challenges, including anthropogenic contaminant discharges, climate change, coastal erosion, population pressures, and marine resource degradation. Recent events, such as the 2011 Fukushima Daiichi Nuclear Power Plant accident and the proposed discharge of stored water, underscore the critical importance of monitoring radionuclides in the marine environment of the Asia-Pacific region.

Plans for expanding nuclear power as a clean energy option further highlight the necessity of maintaining robust capabilities to assess potential radiological impacts on the marine environment. Projections suggest that over 100 new nuclear power plants could be constructed in the Asia-Pacific region in the coming decades. Any future releases of radioactive substances would be dispersed throughout the region via atmospheric transport and regional ocean currents, resulting in transboundary contamination. This contamination could adversely affect national economic zones, international waters, and regional economies. Hence, it is imperative to continue developing and maintaining monitoring capabilities and to coordinate efforts through a harmonized regional approach.

The RAS 7028 project, titled "Enhancing Regional Capabilities for Marine Radioactivity Monitoring and Assessment of the Potential Impact of Radioactive Releases from Nuclear Facilities in the Asia-Pacific Marine Ecosystem," aims to bolster the capabilities of regional countries. It seeks to optimize and coordinate the application of skills and resources available in the region to generate reliable, directly comparable, and exchangeable monitoring data among the participating Government Parties (GPs). Additionally, the project aims to enhance integrated regional quality-assured capabilities for marine radioactivity monitoring and for assessing the impact of both routine and accidental releases of radioactivity into the marine environment. The project's objectives include improving regional skills in marine environmental sampling, radioecology, radiochemistry, dose assessment, risk analysis, and quality assurance. Moreover, it endeavours to assess the needs of participating countries and respond to those needs by offering regional training courses/workshops, expert missions, and proficiency testing programs.

Fig 1. RTC on Radiochemical Analysis of Marine Environmental Samples, Australia 4 – 15 June 2018

Fig 2. RWS on Implementation of QMS in Radioanalytical Laboratories Involved in Marine Radioactivity Studies, Malaysia 29 April – 3 May 2019

Fig 3. RWS on Marine Environment Monitoring Guideline, Indonesia 4 – 8 March 2019

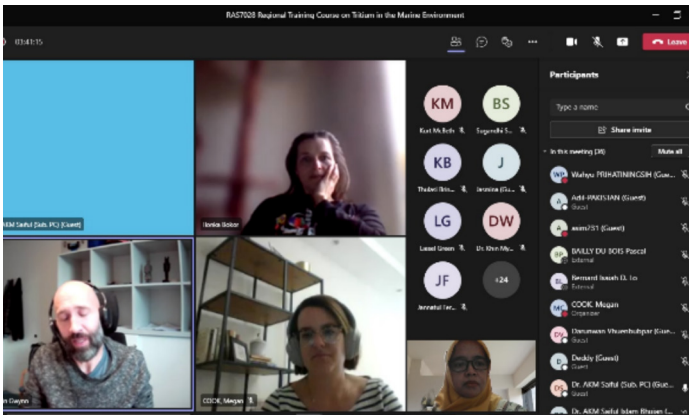


Fig 4. RTC on Tritium in the Marine Environment, Virtual 25 – 28 2021

Project Implementation

Throughout the implementation of RAS7028, several events occurred. The project encompassed seven training courses, four workshops, and two expert missions, collectively training 147 individuals and significantly enhancing the region's capacity to monitor marine radioactivity. Figures 1, 2, 3, and 4 depict documentation of the training and workshop events conducted for RAS7028. Detailed information regarding the training courses, workshops, and expert missions is available in Tables 1, 2, and 3. Furthermore, from 2017 to 2023, the IAEA - Marine Environmental Laboratory in Monaco, conducted Proficiency Tests (PTs) facilitating the enhancement of analytical capabilities in laboratories across the region. The inter-calibration exercise on radionuclides in marine environmental samples, along with yearly PTs for radionuclides in marine environmental samples- such as seawater for ^{3}H, ^{60}Co, ^{90}Sr, ^{134}Cs, and ^{137}Cs proved instrumental in maintaining analytical laboratory competency in the region. Table 4 provides a comprehensive list of Proficiency Tests conducted during this period.

Periodic evaluations are conducted to ensure that the implementation and efforts towards achieving the goals related to RAS7028 remain on track, with various accomplishments

No.	Title of Event	Country	Date
1	RTC on Sampling Plan, Sampling and Basic Analytical techniques	Indonesia	14 – 25 Aug 2017
2	RTC on Analysis of Sr-90 and H-3 in Seawater	India	12 – 23 Mar 2018
3	RTC on Radiochemical Analysis of Marine Environmental Samples	Australia	4 – 15 Jun 2018
4	RTC on Rapid Assessment of Radionuclides in the Marine Environment	United States of America	10 – 21 Sep 2018
5	RTC Gamma-ray Spectrometry	Australia	26 Aug – 6 Sep 2019
6	RTC on Dose Assessment and Risk Analysis Modelling	China	28 Oct – 1 Nov 2019
7	RTC on Tritium in the Marine Environment	Virtual	25 – 28 Oct 2021

Table 1. Regional Training Courses (RTC) on RAS7028 Project

No.	Title of Event	Country	Date
1	RWS on Monitoring Guidelines	Indonesia	4 – 8 Mar 2019
2	RWS on Implementation Quality Management Systems	Malaysia	29 April – 3 May 2019
3	RWS on Radiological dose assessment and communication including seafood consumption	Philippines	24 – 28 Feb 2020
4	RWS on Uncertainties and Characteristic Limits	Virtual	19 – 22 April 2022

Table 2. Regional Workshop (RWS) on RAS7028 Project

No.	Event	Country (Date)
1	Marine radioecology and application	Jakarta, Indonesia (Q4 2017)
2	Marine Environmental Radiological Risk Assessment	Xiamen, China (Q2 2018)

Table 3. Expert Missions on RAS7028 Project

No.	Event	Date
1	IAEA-RML-2017-01 PROFICIENCY TEST H-3, Sr-90, Co-60, Cs-134 and Cs-137 in spiked Mediterranean seawater	2017
2	IAEA-RML-2018-01 PROFICIENCY TEST H-3, Sr-90, Co-60, Cs-134 and Cs-137 in spiked Mediterranean seawater	2018
3	IAEA-NAEL-2019 Proficiency Test for Radionuclide in Shrimp	2019
4	IAEA-RML-2019-01 PROFICIENCY TEST H-3, Sr-89, Sr-90, Cs-134 and Cs-137 and un undisclosed gamma emitter in spiked Mediterranean seawater	2019
5	IAEA-RML-2020-01 PROFICIENCY TEST H-3, Sr-90, Cs-134 and Cs-137 and an undisclosed gamma emitter in spiked Mediterranean seawater	2020
6	IAEA-RML-2021-01 PROFICIENCY TEST	2021
7	IAEA-RML-2022-01 PROFICIENCY TEST	2022
8	IAEA-RML-2023-01 PROFICIENCY TEST Proficiency Test for Tritium, Strontium and Gamma emitters in Seawater	2023, On-going

Table 4. IAEA-MEL Proficiency Test Followed by RAS7028 Members

being made at both national and regional levels. Several review meetings have been convened, as depicted in Figures 5 and 6. These include the Mid-Term Review Meeting held in Phuket, Thailand, from October 29th to November 2nd 2018, the Virtual Progress Project Review Meeting from November 11th to 13th, 2020, and the Final Project Review Meeting in Singapore from November 7th to 11th, 2022.

A document called "Guidelines for the Sampling, Preparation and Radio-analysis of Marine Matrices" has been created as a result of the harmonization of methods among RAS7028 member countries (Figure 7). This document is a collaboration between all members to guide the establishment of a program that aims to harmonize a regional approach to monitoring and analysis of marine samples. The guidelines include recommended methodologies for sample collection, sample preparation, radio-analytical methods, radioecology experimentation, quality management, and data reporting and analysis.

Fig 5. RAS7028 Progress Project Review Meeting, Virtual 11 – 13 November 2020

Fig 6. RAS7028 Final Project Review Meeting, Singapore 7 – 11 November 2022

During RAS7028, marine radioactivity databases were established or updated in each country. The participating groups collected over 76,680 samples of seawater, sediment and biota, all of which were analysed for radionuclides such as 137Cs, 90Sr, 210Po, 3H and others. The radionuclide monitoring data in the marine environment contributed by member laboratories in RAS7028 were collected and submitted to the Asia-Pacific Marine Radioactivity Database (ASPAMARD), coordinated by the Philippines. ASPAMARD was developed with funding from IAEA/RCA and the United Nations Development Programme (UNDP). The primary objectives of ASPAMARD were to provide reference levels of the major anthropogenic radionuclides in the regional seas. A total of 3,074 data collected between 6 March 2011 and 25 August 2021 and uploaded to ASPAMARD were then submitted to the IAEA Marine Radioactivity Information System (MARIS) for wider use.

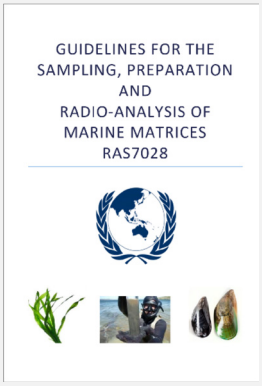


Fig 7. RAS7028 Guideline Document

Apart from the main activities described above, RAS7028 has resulted in many other accomplishments which are summarized below:

1. Through the implementation of RAS7028, the Quality Management System in all laboratories was maintained and improved significantly. The project supported the fulfilment of requirements for maintaining the accreditation of laboratories in the region.
2. In the region, some new laboratories have been established and some of the other laboratories upgraded their infrastructure in terms of radiometric counting systems and other equipment.
3. New analytical procedures for the estimation of radionuclides in the marine environment have been established by member countries.
4. The capabilities for assessing radiological dose and risk to humans and the environment were improved via three training courses, and a collaborative workshop where the RAS7028 data were used to evaluate dose for the background baseline and a range of potential nuclear release scenarios.
5. A total of 74 reports and scientific papers related to marine radioactivity were published during the project.

Conclusion

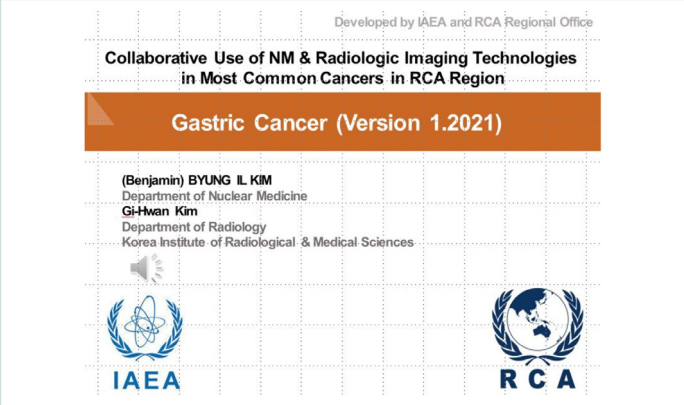
Based on the national and regional achievements, it was concluded that the project was successfully implemented and achieved its objectives. There have been demonstrable improvements in the capabilities of Government Parties (GPs) in marine radiological monitoring. Substantial new data has been developed and shared. A new 'best practice' guidance document has been produced for use throughout the region and internationally, and numerous reports and scientific papers have been published. The project has facilitated improved coordination, communication, and cooperation among participating members. Given the critical importance of marine resources in the Asia-Pacific region, RCA GPs are strongly encouraged to develop a future long-term project that contributes to the sustainable management of the marine environment using nuclear and related techniques.

Achievement of RAS6093, Strengthening Capacity to Manage Non-Communicable Diseases Using Imaging Modalities in Radiology and Nuclear Medicine

- **Byung Il Kim** | Department of Nuclear Medicine, Institute of Radiological & Medical Science (KIRAMS), Republic of Korea

Non-communicable diseases (NCDs), which include cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes, are outlined in the UN Sustainable Development Goals (SDGs), adopted during the 70th UN General Assembly in September 2015. NCDs account for approximately 38 million annual deaths, representing 63% of global mortality, with 16 million individuals succumbing prematurely before the age of 70. Low and middle-income (LMI) countries shoulder 82% of this premature death burden, leading to cumulative economic losses of $7 trillion over the next 15 years (NCDs Key Facts & Global Action Plan for the Prevention and Control of Non-communicable Disease, WHO, as of January 2015). Accurate and early diagnosis of NCDs, including cardiovascular diseases, cancers, and chronic respiratory diseases, through the application of radiology and nuclear medicine technology, can facilitate the selection of appropriate treatment methods, increasing the likelihood of complete recovery from early stages of diseases. This, in turn, reduces premature deaths and enhances the overall quality of life for patients.

While there have been technological advancements in the diagnosis and treatment of NCDs, utilizing radiology and nuclear medicine technologies such as intervention, cardiac computed tomography (CT), high-resolution computed tomography (HRCT), single-photon emission tomography/computed tomography (SPECT/CT), positron emission tomography/computed tomography (PET/CT), and theranostics, these benefits are not universally accessible, particularly in LMI countries. Interventional radiology, cardiac CT for cardiovascular diseases, and HRCT for chronic respiratory diseases are not widely implemented in most LMI countries. Hybrid imaging modalities, such as SPECT/CT or PET/CT, and theranostics, are not effectively integrated into medical practice for NCDs in the region, except in a few resource-rich countries. This disparity is attributed to a lack of physical infrastructure, poverty, the absence of proper screening programs, and a shortage of skilled experts, resulting in more severe socioeconomic damage to LMI countries in line with premature deaths, as described above.



The RAS6093 project, spanning four years from 2019 to 2022, aimed to enhance the regional capacity for diagnosing and treating NCDs in adult and paediatric patients. However, the project faced significant disruptions in early 2020 due to the COVID-19 pandemic, resulting in the cancellation or postponement of many planned activities. Despite these challenges, the project management team exhibited resilience and successfully achieved most objectives, especially in developing E-learning modules outlined during the project design phase and the First Coordination Meeting. Although the project encountered disruptions from 2020 onwards due to the pandemic, the project management team, in collaboration with NPCs from participating member states and the IAEA, managed to execute most of the initially planned activities or find suitable alternatives. Virtual and hybrid events, facilitated by tools like MS Teams, played a crucial role in overcoming challenges, and their use is expected to persist even post-pandemic due to their cost-effectiveness and time-saving advantages.

Despite the hurdles, the project managed to deliver four (4) RTCs, including one with seventy (70) participants and another with more than two hundred fifty (250) participants.

Additionally, seven (7) expert missions were executed primarily within the last twelve months of the project. This final push showcased the commitment of all project participants and bodes well for future capacity-building activities in the field.

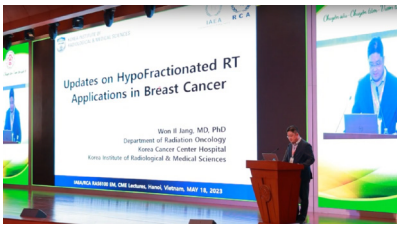
One of the most significant project outputs, aside from training professionals, is the E-learning modules. Their addition to the IAEA's E-learning portals is expected to enhance the education and professional training of radiologists, oncologists, and nuclear medicine physicians across the RCA region and beyond. While acknowledging the challenges in developing E-learning modules, their suitability for IAEA's human resource development goals is emphasized. Despite the COVID-19 pandemic, active participation and utilization of these modules by each institution are recommended. To ensure sustainability, there is a recommendation to establish an international and educational Picture Archiving and Communication System (PACS) capable of collecting and utilizing PET/CT educational images by IAEA in the long term. Regular revisions reflecting new research results by the same developers are also advised.

Several member states have reported increased interest in improving diagnostic capabilities in their domestic nuclear medicine communities and a growing demand for specialized national training courses following the project. For long-term sustainability, participating member states, with full support from the LCC, have unanimously urged the IAEA to allocate appropriate funding for, or integrate into a future RCA project, the task of regularly updating the E-learning modules created as part of this project, preferably at three-year intervals. Additionally, there is a suggestion to consolidate these modules with those created by the RCARO, to form a comprehensive set of educational materials.

IAEA-RCA RAS/6100 Expert Mission and 2023 Scientific Conference on Radiation Oncology in Viet Nam

- **Bieu Quang Bui** | Department Chair, Vice Director of Cancer Center, 108 Central Military Hospital, Viet Nam

Cancer poses a significant health burden in the RCA region. Over the decades, the RCA programme has aimed to increase life expectancy and improve communicable disease control through the safe and effective practice of radiation medicine, including radiotherapy, nuclear medicine, and radiology. In the healthcare sector, RCA projects have notably enhanced the application of nuclear medicine and the quality of radiation therapy in cancer treatment in Vietnam. As a result of recent RCA projects, many Vietnamese radiation oncologists, medical physicists, and radiation therapists have gained and exchanged valuable knowledge and experience in applying advanced radiation therapy techniques for cancer treatment.



MD. PhD Won Il Jang, KIRAMS gave CME lectures on 18 May 2023

The 108 Military Central Hospital (Tran Hung Dao Hospital) stands out as one of the country's leading facilities in applying advanced radiotherapy techniques for cancer treatment. With a close cooperative relationship with the IAEA and a longstanding tradition of participating in RCA projects, the hospital signed a Memorandum of Understanding on cooperation between Tran Hung Dao Hospital and the Korean Institute of Radiation Medicine (KIRAMS) in 2016. This marked a significant milestone in cooperation, demonstrating extra efforts to enhance the effectiveness and efficiency of RCA projects' implementation in Vietnam.

The Department of Radiation Oncology and Radiosurgery at Tran Hung Dao Hospital was established in 2013 with well-trained personnel and modern equipped radiotherapy and radiosurgery systems. It treats more than one thousand cancer patients per year. Through RCA projects over the past decade, such as RAS6077, RAS6087, RAS6086, RAS6100, and the PERTAIN study, the Department has steadily grown, benefiting from regional activities of human resource training, technology transfer, and scientific research. Consequently, it has become a prestigious radiotherapy centre in Vietnam.

To further enhance cancer treatment in the RCA region, the project RAS6100 on "Strengthening Clinical Application of Hypofractionated Radiotherapy (RCA)" has been implemented since 2022. In May 2023, an expert mission within the project framework was designated to Vietnam to enhance the clinical application of hypofractionated radiotherapy in the country. The Department of Radiation Oncology and Radiosurgery, Tran Hung Dao Hospital, which has directly coordinated the project RAS6100, was honoured to receive the expert mission on the occasion of the 10th anniversary of its establishment.

On this important occasion, Tran Hung Dao Hospital held a Scientific Conference on Radiation Oncology on May 18 - 19, 2023. The medical education program on the first day provided the audience with updated lectures on the application of hypofractionated radiotherapy in rectal cancer, prostate cancer, and breast cancer, as well as quality audit and dosimetry in hypofractionated radiotherapy. These lectures were presented by experts under the expert mission of the RAS6100 project. Approximately 300 attendees, including radiation oncologists, medical physicists, and radiation therapists from most radiotherapy centres in the country, participated in the conference. "I did not expect so many attendees to participate in the conference," remarked Won Il Jang, MD, Chief of the Radiation Oncology department at KIRAMS.

On the second day, valuable experiences in applied research and the development of modern radiotherapy techniques were shared. Professor Tran Van Thuan, Deputy Minister of Health of Vietnam, and Associate Professor Bui Dieu, President of the Vietnam Cancer Association, were special guests. The conference was attended by experts in radiation oncology from Korea, Australia, Turkey, and India, as well as 600 representatives from hospitals, medical universities, scientists, and colleagues from across the country.

The conference featured six sessions covering topics such as radiosurgery, head and neck cancer, gastrointestinal cancer, lung-cervical-prostate cancer, and medical physics and radiotherapy techniques, each with numerous valuable reports. It served as a forum for the implementation and promotion of cooperation activities, training, and the transfer of more advanced techniques in radiotherapy. This contributed to further strengthening the cooperative relationship among the 108 Central Military Hospital, IAEA, KIRAMS, and other domestic and international hospitals.

Deputy Minister of Health of Viet Nam addresses the Scientific Conference on Radiation Oncology, 18 -19 May 2023

The conference also provided an opportunity for scientists to share valuable experiences in applying advanced radiotherapy techniques safely and efficiently with modern radiotherapy systems, thereby enhancing the quality of radiotherapy treatment for cancer patients.

Deputy Minister of Health, Professor Tran Van Thuan expressed his sincere gratitude to the hospital for organising a symposium on radiation oncology and also congratulated the Department of Radiation Oncology and Radiosurgery on the occasion of the 10th establishment anniversary.

It is anticipated that international cooperation in general and specifically through IAEA/RCA, will continue to foster the development of radiation applications in Vietnam, particularly in the healthcare sector. This will aid in optimising the effective utilisation of image-guided radiotherapy and enhancing quality control in cancer treatment nationwide.

Featured Articles

RCA Contributions to the Development in Asia and the Pacific Region : Part 2

- **Prinath Dias** | Chair, RCA Programme Advisory Committee / Former IAEA / RCA Focal Person

* Following the article published in the 6th issue, this article is Part 2 of the RCA contributions to the development in Asia and the Pacific Region

[Human Health]

The Regional Cooperative Agreement for Asia and the Pacific (RCA) has been assisting the parties to the Agreement[1], to address human health issues using nuclear techniques, since its inception in 1972. With the assistance of the International Atomic Energy Agency (IAEA), which has been providing technical, administrative, and financial support, the parties to the Agreement have been able to carry out these activities effectively. This brief overview highlights the contributions made by the RCA Programme in addressing human health issues in the Asia-Pacific Region.

RCA activities in the human health sector can be broadly categorized into three main areas: the use of radiotherapy for cancer treatment, the utilization of nuclear medicine for disease diagnosis, and the enhancement of the capabilities of medical physicists.

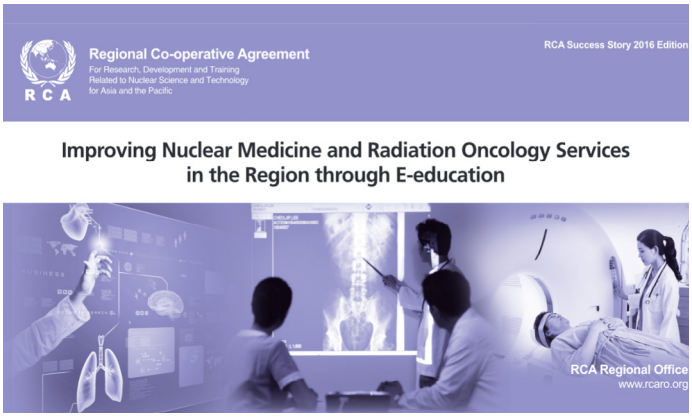
1. Australia, Bangladesh, Cambodia, China, Fiji, India, Indonesia, Japan, Republic of Korea, Lao, Malaysia, Mongolia, Myanmar, Nepal, New Zealand, Pakistan, Palau, The Philippines, Singapore, Sri Lanka, Thailand and Vietnam

Radiotherapy

Over the past fifteen years. The RCA has overseen the implementation of eleven regional projects related to radiotherapy. These projects varied in duration from two to four years and focused on a range of techniques including hypo-fractionated radiotherapy, stereotactic body radiation therapy (SBRT), intensity-modulated radiation therapy (IMRT), radionuclide therapy, 3D image-guided brachytherapy (IGBT), image-based radiation therapy, 3D conformal radiotherapy, palliative care, online networking for radiation oncology professionals, and distance learning for radiation oncologists.

During regional training courses conducted under these projects, participants from RCA Government Parties

Improving the Quality of Radiotherapy in the Asia Pacific Region



Improving Nuclear Medicine and Radiation Oncology Services in the Region through E-education

received training on various topics including imaging and treatment planning for 3D conformal radiotherapy, image-based radiotherapy for specific cancers, 3D image-guided brachytherapy, clinical applications of stereotactic body radiotherapy, radionuclide cancer therapies, treatment of lymphoma, intensity-modulated radiation therapy, clinical applications of stereotactic body radiotherapy, and palliative radiation therapy. A total of 1030 individuals were trained in these regional training courses.

Expert services for the implementation of these projects were provided by experts from RCA Government Parties, Australia, China, India, Japan, the Republic of Korea, New Zealand, the Philippines, Thailand, and Singapore.

The RCA Projects on radiotherapy have significantly increased the use of various advanced techniques such as 3D image-guided brachytherapy, stereotactic body radiation therapy, intensity-modulated radiation therapy, stereotactic body radiotherapy, and stereotactic radiosurgery for cancer

treatment. Additionally, they have led to the development of a distance learning program for training radiation oncologists, the establishment of six regional training hubs, the implementation of quality assurance programs, increased use of 3D treatment planning systems in participating RCA Government Parties, and collaboration between RCA and the Federation of Asian Organizations for Radiation Oncology (FARO). Further details can be found in the fourth and sixth batches of RCA Success Stories (RCA Regional Office (rcaro.org)).

Nuclear Medicine

Improving Human Health Using Nuclear Medicine Technology and Radionuclide Therapy

Seven RCA projects on nuclear medicine have been implemented during the past fifteen years. These projects varied in duration from two to four years and focused on various aspects, including the use of nuclear imaging in managing non-communicable diseases, cancer management through computed tomography, distance-assisted training for nuclear medicine professionals, nuclear medicine in managing cardiovascular diseases, clinical use of hybrid imaging, and clinical applications of positron emission tomography (PET).

During the regional training courses conducted under these projects, participants from RCA Government Parties received training on a wide range of topics, including the diagnosis of cardiovascular and pulmonary diseases, paediatric nuclear medicine and theragnostic, cancer staging for abdomen, urogenital system, thorax, musculoskeletal system, and head and neck cancers, radionuclide imaging in the management of cardiovascular disorders, and clinical applications of PET. A total of 497 individuals were trained in these regional training courses.

Expert services for the implementation of these projects were provided by experts from RCA Government Parties, Australia, China, India, Indonesia, the Republic of Korea, Malaysia, Myanmar, Pakistan, the Philippines, Sri Lanka, and Vietnam.

The RCA Project on distance-assisted learning in nuclear medicine made it possible to develop an online distance-assisted training (DATOL) programme for nuclear medicine professionals. This is accessible through the IAEA website (www.iaea.org) and nuclear medicine professionals from Latin American and African countries, in addition to professionals from RCA Government Parties have been trained. As a result of the other RCA Projects in nuclear medicine, professionals from RCA Government Parties have developed the capability of using advanced nuclear medical techniques for early diagnosis of cancer, and diagnosis of cardiovascular, and pulmonary diseases. There has been a significant increase in the establishment of new PET and other nuclear medical facilities in the Asia and the Pacific Region. The RCA Projects have also contributed to the improvement of quality assurance in nuclear medicine. Further details can be found in the sixth and seventh batches of RCA Success Stories RCA Regional Office (rcaro.org).

Medical Physics

'Distance assisted training' strengthens Regional skills in nuclear medicine

Four RCA projects on Medical Physics have been implemented during the past fifteen years. Their duration varied from two to four years. They focused on improving the capabilities of Medical Physicists in Asia and the Pacific Region through education, training and certification, improving the safety aspects of operating practices and technical standards through the establishment of common quality assurance/quality control (QA/QC) programmes, and improving the quality of health care and patient safety in areas related to radiation medicine through better medical physics services.

At the regional training courses conducted under these projects, participants from RCA Government parties received training on the implementation of the International Code of Practice for Radiotherapy Dosimetry (IAEA TRS-398), implementation of Quality Assurance for Radiotherapy Treatment Planning Systems (IAEA TRS430), medical

physics in diagnostic radiology, quality assurance in nuclear medicine, medical physics aspects in low and high dose rate brachytherapy, imaging and treatment planning, and quality management and quality assurance in radiotherapy, nuclear medicine, and diagnostic radiology medical physics. A total of 258 persons were trained in these training courses.

Expert services for the implementation of these projects were provided by experts from RCA Government Parties, Australia, Bangladesh, China, India, Japan, Indonesia, New Zealand, Malaysia, the Philippines, Singapore, and Thailand.

These projects resulted in the development of three guidelines for the education and training of Medical Physicists: "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)", and "Clinical Training of Medical Physicists Specializing in Diagnostic Radiology (IAEA Training Course Series 47)". These guidelines have facilitated the initiation of clinical training programs for Medical Physicists in IAEA Member States of all regions and have instilled confidence in the abilities of Medical Physicists while supporting stakeholders in their certification and registration. Additionally, an e-learning platform called AMPLE (Advanced Medical Physics Learning Environment), running on the IAEA's CLP4NET platform, was developed to prepare and adopt guidelines for the accreditation of educational institutions and clinical training facilities, as well as guidelines for the certification of professionals in medical physics. Further details can be found in the first batch of RCA Success Stories RCA Regional Office (rcaro.org).

[Industry]

Non-Destructive Testing (NDT)

Non-destructive testing is a technique utilized for the early detection of defects in metallic components across various industries, aiming to prevent catastrophic failures. These techniques find applications in the electrical power industry, petrochemical industry, shipbuilding, aircraft maintenance, building construction, and other heavy industries. Over the past fifteen years, six regional projects on non-destructive testing have been implemented under the auspices of the RCA. Their durations ranged from two to four years, focusing on various aspects such as the utilization of portable digital industrial radiography (DIR) systems, establishing quality management systems (QMS) by ISO standards, portable gamma tomography systems for in situ applications in process

Strengthening skills in NDT for regional industry

and petrochemical industries, and the use of non-destructive testing in civil engineering.

At the regional training courses conducted under these projects, participants from RCA government parties received training on digital industrial radiography (DIR) and tomography (CT) systems, quality management systems in non-destructive testing, use of advanced software for DIR image analysis and interpretation, advanced NDT techniques for in-service inspection of nuclear power plants and civil engineering structures for life prediction and extension and DIR and CT for metallic, non-metallic and composite materials. A total of 388 persons were trained in these regional training courses.

Expert services for the implementation of these projects were provided by experts from RCA Government Parties, Australia, India, Indonesia, Malaysia, New Zealand, Pakistan, the Philippines, Singapore, and Vietnam.

The RCA Projects on non-destructive testing have significantly increased the number of individuals trained to conduct NDT inspections according to international standards through both regional and national training courses. They have facilitated the use of advanced NDT techniques such as digital industrial radiography (DIR) and computed tomography, adoption of guidelines for training, examination, and certification in DIR testing, establishment of quality management systems, and attainment of ISO certification. Furthermore, they have extended NDT services to building construction, established and expanded companies providing NDT services. Further details can be in the second batch of RCA Success Stories (RCA Regional Office (rcaro.org)).

Radiation Processing

Over the past fifteen years, four RCA projects on radiation processing have been implemented, with durations varying from two to four years. These projects focused on several key areas, including the development of new materials

using natural polymers for applications in agriculture, industry, healthcare, and the environment, recycling of industrial polymeric waste, and the establishment of quality management systems in radiation processing facilities.

At the regional training courses conducted under these projects, participants from RCA Government Parties received training on the use of radiation for the modification of natural polymers for use in agricultural, industrial, health, and environmental sectors, recycling of polymeric waste using radiation technology, and on establishing quality management systems according to ISO standards in radiation processing facilities. A total of 336 persons were trained in these regional training courses.

New materials from natural polymers : using nuclear technology to improve Nature's gifts

Expert services for the implementation of these projects were provided by experts from RCA Government Parties, India, Indonesia, Japan, Malaysia, and Vietnam.

The RCA projects on radiation processing have made it possible to develop hydrogel wound dressings that can be used to treat a variety of clinical complications following burns. Sewage made hygienic by radiation can be used as manure, while other applications have produced toxic metal absorbents, super water absorbents, plant growth promoters, and adsorbents for the purification of water. Several RCA Government Parties established new radiation processing facilities as a result of these projects. Further details can be found in the first batch of RCA Success Stories RCA Regional Office (rcaro.org).

Nuclear Tracers and Sealed Sources

Three RCA projects on nuclear tracers and sealed sources have been implemented, with durations ranging from two to four years. These projects aimed to address issues in the coal and petroleum industries, enhance the performance of multiphase systems in the chemical, petrochemical, and

Enhanced Energy Analysis and Planning Capabilities

petroleum sectors, and optimize process dynamics in complex industrial systems.

During the regional training courses conducted under these projects, participants from RCA Government parties received training on various nuclear techniques, including in-situ analysis of coal quality, analysis of metalliferous ores and cement quality, validation of mathematical models of multiphase systems, characterization of multiphase flow in petroleum and chemical industries, particle tracking techniques for investigating process hydrodynamics, and gamma scanning of industrial process columns. A total of 223 individuals were trained in these courses.

Enhancing the Regional Capability in using Innovative Radiotracer and Sealed Source Techniques for Investigation of Complex Industrial Systems

Expert services for the implementation of these projects were provided by experts from RCA Government Parties, Australia, China, India, New Zealand, Malaysia, the Republic of Korea, Thailand, and Vietnam.

As a result of these projects, the RCA government parties were able to develop protocols for inter-well radiotracer testing for oil fields, gamma scanning of industrial process columns, online leak detection in heat exchangers using radiotracers, and maintenance and calibration of data acquisition systems for radiotracer and sealed source applications. It was also possible to collectively acquire

capabilities for process visualization using radiotracers and sealed sources in diagnosing industrial multiphase systems, develop and implement the radioactive particle tracking technique (RPTT) for flow visualization and design evaluation, and establish collaboration with petrochemical and chemical industries. Further details can be found in the third and sixth batches of RCA Success Stories RCA Regional Office (rcaro.org)

Empowering Capacity Building of Nuclear Medicine Professionals in Asia Pacific Region by ARCCNM

- **Hee-Seung Henry Bom** | Immediate Past Chairman of ARCCNM/Editor-in-Chief, Nuclear Medicine and Molecular Imaging/Professor Emeritus, Chonnam National University Medical School, Republic of Korea

Global Health Issues

Non-communicable diseases (NCDs), such as cancer, cardiovascular, and cerebral diseases, are a major global concern for human health. The United Nations (UN) recognized NCDs as an urgent and growing threat. On May 13, 2010, the UN General Assembly passed a resolution on the prevention and control of NCDs, and the UN Political Declaration on Prevention and Control of NCDs was reported the following year. The UN General Assembly adopted the 2030 agenda as the Sustainable Development Goals, which include NCDs as a sustainable development priority for all countries. The UN targets reducing premature mortality from NCDs by one-third through prevention and treatment by 2030.

One of the major diseases within NCDs is cancer. The International Atomic Energy Agency (IAEA) has a long history of supporting successful cancer diagnosis and treatment programs in the developing world using radiation medicine as part of its health program. The Programme of Action for Cancer Therapy (PACT) was created within the IAEA in 2004 to build upon the Agency's experience in radiation medicine and technology, enabling developing countries to introduce, expand, or improve their cancer care capacity and services sustainably by integrating radiotherapy into a comprehensive cancer control program that maximizes its therapeutic effectiveness and impact. [1] IAEA Director General Rafael Mariano Grossi impressively mentioned the significance of managing cancer patients in his opening remarks to the General Conference in 2023, stating, "Each death is a tragedy. The fact that cancers that are routinely diagnosed and successfully treated in high-income countries are killing increasing numbers of people in developing countries is an injustice." [2]

RCA-ARCCNM Cooperation for prevention and control NCDs

The Asian Regional Cooperative Council for Nuclear Medicine (ARCCNM) was founded in 2000 to address the heterogeneity of practice, education, and research in nuclear medicine (NM) across Asia. Initially comprising 13-member states in Southeast Asia, South Asia, and Far East Asia, ARCCNM has since expanded to include 18-member states. Its primary objectives are to establish liaisons with the official national bodies of nuclear medicine and to enhance regional scientific activities through conferences, seminars, and educational programs, thereby facilitating communication among experts, trainees, and fellows in the field. [3,4]

ARCCNM has convened annual general meetings (AGM) in conjunction with national or international meetings for the past 20 years. However, due to the COVID-19 pandemic, AGM-ARCCNM was not held in 2021 and was conducted online in 2022. Starting from 2023, the AGM of ARCCNM will be held in South Korea, alongside the annual conference of the Korean Society of Nuclear Medicine, for the next 6 years.

Since 2004, the RCA has been supporting ARCCNM in training NM professionals in the Asia-Pacific Region. The RCA regional office (RCARO) has recognized NM as an essential technology in the diagnosis and treatment of non-communicable diseases (NCDs). The project RAS6083, titled "Improving Patient Care of Non-communicable Diseases by Expert Networking of Nuclear Medicine Professionals in the Region," achieved significant success and was selected as a success story.

Training of NM professionals began with academic symposia in developing countries and later expanded to the education of young leaders throughout the region. Recently, ARCCNM has collaborated with RCARO on two projects: developing e-learning modules and fostering young leadership in Asia. ARCCNM has developed 50 e-learning modules, which are available on the RCARO website. In 2013, ARCCNM initiated the establishment of the Asian Nuclear Medicine Board (ANMB) examination. The ANMB examination has been held annually since 2014, and individuals who pass

the examination are awarded the title of Fellow of ANMB (FANMB). Presently, there are 276 FANMBs (Figure 1).

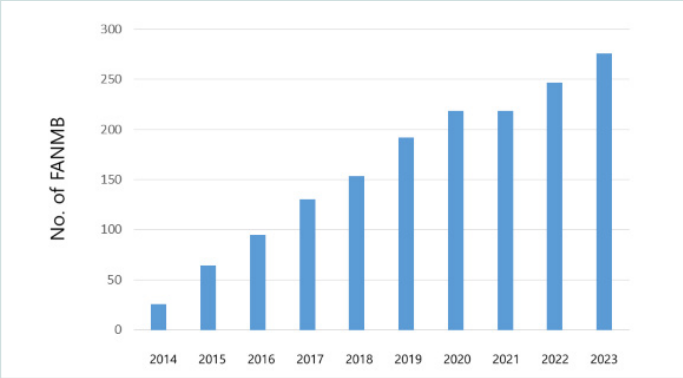


Figure 1. A growing number of fellows of the Asian Nuclear Medicine Board (FANMB).

Theranostics as an emerging technology in cancer treatment

Cancer treatment relies on precise diagnosis and subsequent treatment tailored to the diagnosis. Conventional diagnosis typically involves morphological assessment of tumours within the body. However, more precise diagnosis can be achieved by detecting molecular targets using molecular imaging (MI) technologies. Nuclear medicine (NM) plays a crucial role in MI by utilizing radionuclides to locate molecular targets, often through positron emission tomography (PET). By employing stronger radionuclides, it becomes possible to target and destroy cells containing these molecular targets. This approach is known as "theranostics," a fusion of "therapy" and "diagnosis." Theranostics, particularly in NM, has garnered increasing interest from oncologists and the public alike, as it offers personalized management for various cancers. It enhances patient selection and enables more precise treatment through the prediction of response and determination of prognosis. Furthermore, it can help avoid unnecessary and costly diagnostic examinations and treatments. Examples of nuclear theranostics include the diagnosis of neuroendocrine tumours (NET) using Ga-68 DOTATE PET and subsequent treatment using Lu-177 DOTATE, as well as the diagnosis of prostate cancer via F-18 PSMA PET and treatment using Ac-225 PSMA.

Conclusion

According to the UN Sustainable Development Goals, premature mortality from NCDs should be reduced by a third through prevention and treatment by 2030. The IAEA works to enable developing countries to integrate radiotherapy into comprehensive cancer control programs. Nuclear medicine (NM) theranostics is an emerging radiotherapy technology that utilizes radionuclides for both diagnosis and treatment. Over the last two decades, the RCA has supported ARCCNM in training NM professionals in the Asia Pacific region. Young NM professionals trained through the RCA-ARCCNM collaboration now lead further promotion of NM in the region, including theranostics for successful cancer treatment.

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Articles from GPs

Strengthening Radiation Safety and Emergency Preparedness in Singapore

- **Angela Tan** | Deputy Director / Head, National Environment Agency (NEA), National Radiochemistry Laboratory, Singapore (picture on the top)
- **Daryle Toh** | Scientific Officer, National Environment Agency (NEA), National Radiochemistry Laboratory (picture below)

The landscape of nuclear activity in the Asia-Pacific region has undergone rapid evolution. While Singapore itself does not host nuclear power plants, the presence of research reactors and the potential construction of advanced reactors in neighbouring countries are significant developments. The proximity of these nuclear facilities to ASEAN borders raises valid concerns. In the event of an incident or accident at a radiological or nuclear facility in a neighbouring country, Singapore and other ASEAN nations could be impacted by radioactive releases. This underscores the critical importance of effective radiological and nuclear emergency preparedness and response (EPR) measures to safeguard the environment and the public from the adverse effects of radiation.

In alignment with this imperative, the Regional Cooperative Agreement Regional Office (RCARO), in collaboration with the ASEAN Network of Regulatory Bodies on Atomic Energy (ASEANTOM), led a project titled "Enhancing Emergency Preparedness and Response Capabilities in the ASEAN Region through Building Technical Capacity in Radiation Monitoring and Dose Assessment" (Phase 1, 2020-2022 and Phase 2, 2022-2024). The primary objective of this project is to strengthen EPR capabilities within ASEAN countries and enhance their ability to respond effectively to radiological emergencies. This collaborative effort is rooted in the collective commitment to ensure the safety and security of the environment, workers, and the public during radiological crises.

Singapore actively participated in and benefited from Phase 1 of the project, particularly in environmental radioactivity measurement and population monitoring during radiological emergencies. A series of webinars organized during the COVID-19 pandemic covered essential topics such as environmental sampling and measurement, population monitoring, and dose assessment during emergencies.

National Environment Agency
Safeguard · Nurture · Cherish

Under Phase 2 of the project, three delegates from the National Radiochemistry Laboratory (NRL) of the National Environment Agency (NEA) in Singapore participated in the Regional Training Course on Enhancing Technical Capabilities on Radioactivity Measurements for Environmental Radiation Monitoring during Radiation Emergencies, held from 21 to 24 August 2023 in Daejeon, Korea. This four-day course, hosted by RCARO in collaboration with the Korea Research Institute of Standards and Science (KRISS), aimed to impart theoretical and practical knowledge in radiological monitoring. The delegates were instructed on measurement standards, uncertainty, and metrological traceability, as well as the fundamentals of gamma-ray spectrometry and liquid-scintillation counting. Hands-on sessions were conducted to practice sample preparation, calibration of high-purity germanium (HPGe) detectors, and setting up distillation columns for tritium analysis.

Through this training, Singapore continues to enhance its expertise in radioactivity measurement and radiological monitoring. The Environmental Baseline Radiation Monitoring Programme (EBRMP) was established in 2018 to systematically monitor and assess baseline radiation levels in Singapore's environment. NRL consistently performs well in annual proficiency tests conducted by the International Atomic Energy Agency (IAEA) Worldwide Proficiency Tests and became a member of the IAEA Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA) in 2019.

Looking ahead, Singapore aims to further elevate its capabilities in radiological dose and impact assessments, a critical aspect of radiological emergency preparedness. While technical competence in radioactivity measurement is established, understanding the implications for potential dose levels during radiological emergencies is paramount. By enhancing dose

assessment abilities, Singapore will be better equipped to evaluate the impact of radiological incidents and make informed decisions to safeguard its population and environment.

On the regional front, Singapore actively co-leads two of the ASEANTOM Technical Working Groups (TWGs) – TWG-Radiation Monitoring (RM) and TWG-Hazard Assessment and Radiological Dispersion Modelling (HARDM) – in addition to supporting the other three TWGs. Activities under the TWG-RM aim to enhance the technical competency and capacity of members in radioactivity monitoring. Domestically, NRL champions the Community of Practice (CoP) among radiochemistry laboratories in Singapore, promoting the harmonisation of test methodologies and elevating technical knowledge and competency in radiochemistry. NRL is also actively developing techniques for low-level detection of radionuclides in seawater and establishing rapid assessment methods.

Singapore's commitment to radiological preparedness is evident through its participation in training initiatives such as this RCA project, active regional and international collaborations, and continuous improvements in measurement techniques. This proactive approach equips Singapore with the knowledge and skills to respond effectively to radiological emergencies, including those originating beyond its borders.

Expert Mission on E-Beam Operation and Maintenance: A Truly Korean-Thai Collective Endeavor

- **Chatchawan Mansaithong** | International Cooperation Officer, Thailand Institute of Nuclear Technology

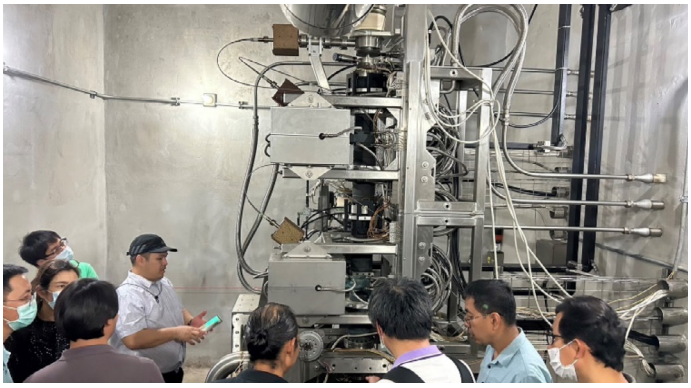
Nuclear science and technology have played an important role in bettering life quality and research and development in the world, let alone Asia and the Pacific. Regional projects under RCA which have been core vehicles for delivering technical assistance to its member states have always been focusing on various application aspects of nuclear science and technology. However, none of them was devoted to the most fundamental tool to make everything possible in the first place itself – nuclear and radiation equipment!

The RCA Regional Office (RCARO) has creatively launched the "Project on Enhancing Regional Capacity in Developing, Using and Maintaining Radiation Equipment", attempting to alleviate a problem with equipment operation and maintenance which has certainly been one of, if not, the most underrated technical problems in any research and utility institute. The problem has never been given enough consideration despite proper and reliable equipment condition being essential to all activities ranging from daily operations to frontier research. As a nuclear research institute dealing with all kinds of radiation equipment and providing nuclear technology services, the Thailand Institute of Nuclear Technology (Public Organization) or TINT could not be more pleased with the project initiation. While the global pandemic adversely affected the project's progress, the Meeting for the project NPCs in March 2023 provided the project with much-needed momentum moving forward. The Meeting focused on three important radiation applications; namely inspection system, cyclotron and electron beam accelerator. The invited NPCs were able to learn about good practices and Korea's abilities and willingness to share their expertise. Two NPCs from Thailand, Phiphat Phruksarojanakun from the Office of Atoms for Peace and Chatchawan Mansaithong from TINT, were quick to approach their Korean counterparts, Ms Kyungeun Shon of the RCARO and Dr Byeongno Lee of KAERI, hoping to arrange a first national activity under the project. Little did we know at the time; a candid conversation would lead to the Expert Mission on E-Beam Operation and Maintenance in Thailand during 11-13 July 2023.

The Expert Mission was made possible by financial support from TINT and cost-free experts from the Republic of Korea. It was truly a collective effort by both receiving and providing countries. With great coordination from the RCARO and TINT, the Expert Mission was able to recruit Korean experts: Dr Byeongno Lee, Senior Researcher from KAERI and Mr Taesung Ha, Mr Sangyoung Lee and Mr Junyoung Kang from the GeV company. The Expert Mission was initially planned for electron beam users at TINT; however, it quickly grabbed the attention of other users from various organizations in the country. By the time, the Expert Mission took place, the number of E-Beam users in attendance who shared common problems with equipment operation and maintenance was more than double of an originally planned attendance. It was hard to think of any event that attracted as much interest as this Expert Mission. The Korean experts did not disappoint anyone a bit as they brought to the event so much positive energy that deservedly went toe to toe with attendees enthusiasm to learn more about the topics. The atmosphere was genuinely friendly leading to effective learning and discussion.

The first day was started by introducing all organizations being represented in the event. There were several centres within TINT participating in the event: Irradiation Centre, Advanced Engineering and Nuclear Technology Centre, Nuclear Engineering and Instrument Centre and Nuclear Technology, Research and Development Centre. In addition to TINT, there were E-Beam users from the Synchrotron Light Research Institute (SLRI) and the National Metal and Materials Technology Centre (MTEC) in attendance. This was aimed to get all attendees to better understand organizations' roles and contributions to the event. Highlights of the first day included five presentations about Korean institutes and the GeV company and an opportunity for the participants to express their gratitude to the RCARO as Ms Kyungeun Shon presented an overview of the RCARO and the project. The Mission could not have started on a better note as everyone was actively involved with all presentations and kept challenging the experts with questions following each presentation.

The second day was devoted to learning about country-specific situations and problems regarding the E-Beam operation and maintenance through a technical visit to the TINT Electron Beam Centre and on-site interviews. The experts gained a better understanding of the actual problems so that they were able to give proper advice to improve the efficiency, operation and maintenance of equipment. Important findings that were identified during the visit were lack of appropriate maintenance plans, insufficient budgets for maintaining the equipment and inaccessibility to integral equipment components. Seeing the facility struggle with maintaining its equipment made the experts more empathic and added more fuel to their desire to help the facility utilize its equipment to its highest possible capability under given constraints.



Expert mission on E-beam operation and maintenance in Thailand

All activities leading up to and during the Mission have culminated in a fruitful discussion to draw conclusions and action plans aiming to help alleviate current problems with the E-Beam operation and maintenance at TINT in particular as a pilot institute. In addition to some internal issues that must be sorted out by the host institute and some noteworthy follow-up activities that can be collaboratively pursued are:

- *Joint research between KAERI and TINT based on E-Beam technology*
- *In-depth review of the current status of TINT Irradiation Center (TIC)*
- *Transfer of local Korean technology in the area of E-Beam*
- *Additional expert mission*
- *Possibility to establish a partnership with professional companies in Korea*
- *Formulating a long-term cooperation plan in this area*

The Expert Mission sparked the opportunity for the two countries' national nuclear research institutes, TINT and KAERI, to have an initiative collaboration in the area of the utilization of eBeam accelerator for materials modification.

Sights of tireless experts giving out technical information or active discussions among the experts and participants were constantly observed throughout a constructive three-day mission. The atmosphere was terrific as questions from the participants were answered and problems were attempted to be solved collaboratively. The Expert Mission not only helped the E-Beam users with technical aspects of equipment operation and maintenance but also exemplified RCA's underlying spirit of harmonization and hospitality. After a subconsciously quick three days, the Mission had duly come to an end but we all could agree that the network and friendship among participants and experts would not end but continue to grow out of this Mission.

What's More

Greetings from the Director of RCARO

- **Dae Ki KIM** | Director, RCA Regional Office

It is both a great honour and pleasure to have been appointed as the Director of the RCA Regional Office, and I am deeply grateful for the support extended by the RCA Government Parties. While I am humbled by the responsibility bestowed upon me, I am committed to exerting my utmost efforts to fulfil the missions entrusted to RCARO, working closely with the RCA GPs and IAEA to advance the goals of the RCA and foster socio-economic development across the region.

RCA was established in 1972 under the auspices of the IAEA and has implemented numerous projects over the past 51 years to address regional issues through cooperative efforts and promote the peaceful utilisation of nuclear science and technology. Through the execution of over 180 RCA projects, the RCA has successfully facilitated technology transfer and bolstered technological capabilities and human resources in nuclear science and technology across the Asia-Pacific region.

As the membership of the RCA expands and the needs of the GPs increase and diversify with the growing development of the region, it is essential for the RCA to secure more budget to address them in a timely and appropriate manner. The majority of financial resources for the RCA come from the IAEA. However, it the IAEA's budget has been steady over the years and more emphasis has been placed to the RCA GPs to find means to secure resources to continue and enhance the good work of the RCA. In response to this need, the RCA Regional Office in Daejeon, Korea, was established in 2002 with the support of the Korean government and RCA GPs to increase the visibility and viability of the RCA.

In 2022, coinciding with the 50th anniversary of the RCA, RCARO celebrated its 20th anniversary with an international symposium attended by over 250 representatives from the IAEA and RCA, including Mr. Rafael Grossi, Director General of the IAEA, RCA Chairs, and experts. Over the past 21 years, RCARO has diligently pursued its mandate, expanding and diversifying cooperative activities and projects to complement and expand the RCA Programme. This includes the implementation of partnership projects with international/regional organizations such as UNDP, ASEANTOM, and the US Department of Energy, launched in 2023. Additionally, RCARO has played a leading role in executing RCA Technical Cooperation projects, RCA Research Projects, and capacity-building activities in collaboration with various Korean nuclear institutes.

Here I would like to share some of RCARO's focused areas for the coming years to further strengthen the RCA collaboration and effective implementation of the RCA Programme:

Firstly, RCARO will strengthen activities related to RCA policy and information. By assisting the RCA Chair in coordinating activities for NR meetings, RCARO will actively participate in reviewing policy issues and providing necessary information. Together, RCARO will continue seeking ways to secure the necessary resources to meet the identified needs of GPs. This will be supported by providing a more comprehensive information service to RCA stakeholders. Given the rapid development of information technology such as AI, RCARO will seek to archive and make available through the RCA website a wide range of information and data related to the RCA and necessary for RCA GPs. This will include information on RCA projects, trends, and developments in nuclear science and technology, as well as issue papers and technical consultations.

Secondly, RCARO will continue seeking opportunities to establish partnership projects with international/regional organizations outside the RCA region. Building on the experience of implementing partnership projects with UNDP, ASEANTOM, and US-DOE, RCARO will aim to expand partnerships for RCA GPs to participate in projects funded by relevant organizations/institutes outside the RCA region.

Thirdly, we plan to reform and expand various capacity-building activities tailored to the needs of GPs. The Masters

and Doctoral Scholarship Programs will be expanded to include a Post-Doctoral Program, Hands-on Training Program, Expert Support Programme, and Fellowship to provide more integrated learning opportunities at different levels to help build the competent expertise needed in the region. I expect this will contribute to effectively training the next generation of nuclear professionals for the RCA and support technical development in the region.

Fourth, RCARO will seek appropriate means and ways to provide innovative and strategic solutions through the Policy & Information Centre as a think tank for the RCA. Established in 2022 to celebrate the 20th anniversary of RCARO, the Policy & Information Centre has a future vision to bring sustainable, innovative, and inclusive growth to the region. Through the Centre, RCARO will support the IAEA and RCA Working Groups/Committees in policy analysis and assist RCA GPs in developing strategic policies and initiatives for the RCA.

Last but not least, I would like to express my sincere gratitude to the RCA GPs and the IAEA for their support and cooperation with RCARO. Although the above work may be challenging, I am confident that our concerted efforts and cooperation will serve as a profound stepping stone to further facilitate regional cooperation to address the national and regional needs of the RCA, thus contributing to the sustainable development of the region.

Launching of RCARO/DOE Project on Supporting the Adoption of Electron Beam Technology and its Applications in Areas of Food and Agriculture, Industry, Human Health, and Environment Treatment

Introduction and Background Information of the Project

Ionising technologies, such as electron beam (eBeam), X-ray and cobalt-60, have a wide range of applications across industries, including the sterilisation of medical devices, the pasteurisation of food and the phytosanitary treatment of agricultural commodities. However, rising costs and supply chain constraints associated with cobalt-60 have led to a growing demand for alternative ionisation technologies, particularly eBeam and X-rays. Recognising the key role of ionising technology in both sustainability and survivability, the Regional Centre for the Americas (RCARO) took the initiative to disseminate eBeam technology through a partnership project with the United Nations Development Programme (UNDP) and the United Nations Office for South-South Cooperation (UNOSSC). This initiative has been instrumental in increasing the uptake and application of the technology in the region.

Photos from the Workshop

Following the completion of projects in 2021, there was sustained demand from the Government Parties (GPs) for the facilitation of eBeam technology. The main obstacles identified included a lack of deep and actionable information, as well as a shortage of human capital and equipment, which hindered the adoption process. In response to these challenges, RCARO hosted a workshop titled "Accelerating the Adoption of eBeam/X-ray Technologies in Asia and the Pacific" from November 14 to 18, 2022, in Daejeon, Republic of Korea. This workshop, held in cooperation with the Office of Radiological Security (ORS) of the US Department of Energy/National Nuclear Security Administration (DOE/NNSA), drew over 130 researchers, decision-makers, and industry representatives from 22 countries. The event underscored the necessity of addressing regional needs for eBeam and X-ray technologies.

Building on the insights gained from the workshop and in response to the identified regional needs, RCARO, in partnership with the Office of Radiological Security (ORS) of the United States Department of Energy National Nuclear Security Administration (DOE/NNSA), is undertaking a project titled "Supporting the Adoption of Electron Beam Technology and its Applications in Areas of Food and Agriculture, Industry, Human Health, and Environmental Treatment." Initiated in 2024 and spanning the next five years, the project aims to enhance the quality of the environment and living conditions in the Asia-Pacific region by supporting the establishment of eBeam infrastructure and facilitating its applications.

Project Coordination Meeting in December, 2023

To kick off the initiative, the first project coordination meeting took place from December 12 to 15, 2023, in Bangkok, Thailand. The meeting attracted more than eighty (80) participants, including representatives from the RCA Regional Office, National Project Coordinators (NPCs) of twenty-one (21) RCA Government Parties, experts from the US, and the IAEA. The event proved successful in achieving its three main objectives. Firstly, it conducted a comprehensive review of the status, needs, and critical issues faced by the participating countries concerning the adoption of eBeam technology and its applications. Secondly, the meeting facilitated discussions and finalization of details for the project activities scheduled from 2024 to 2028, covering aspects such as venue duration, periods, and expected outcomes for each activity. Lastly, the meeting provided insights into recent trends in utilizing eBeam technology both within and outside the region, along with the sharing of best practices and lessons learned.

Upcoming Events: Hands-On Technical Workshop and Expert Missions

According to the 2024 work plan, a hands-on technical workshop was held from April 15th to 19th, 2024, in Texas, U.S. The primary objective of this workshop aligns with the overarching goal of enhancing the quality of the environment and living conditions in the Asia-Pacific region by supporting the development of eBeam infrastructure and facilitating its applications. This workshop aims to provide a comprehensive understanding of the principles and applications of eBeam and X-ray technologies to countries planning to adopt the technology. The workshop spans 5 days, with 2.5 days focusing on medical and pharmaceutical applications and the remaining 2.5 days focusing on food, environmental, and other applications. Participants will also have the opportunity to engage in hands-on sessions where they can learn dose mapping and obtain preliminary data on the products they bring from their home countries.

In the project's inaugural year, three countries – Mongolia, Cambodia, and Malaysia – have been selected to undertake expert missions. Mongolia and Cambodia are conducting fundamental feasibility studies, while Malaysia is addressing facility maintenance issues. Cambodia is scheduled to host the expert mission in the second quarter of this year, while both Mongolia and Malaysia are planning for the third quarter.

Other Project Activities in 2024

Additionally, a dedicated webpage for sharing project information is currently in preparation and scheduled to be launched in the second quarter. Another purpose of this webpage is to strengthen the APEX network (Asia-Pacific Network for eBeam & X-ray Experts), which is a network of experts established under the project. The webpage will provide APEX members with relevant information and data on eBeam and X-ray technology. Furthermore, they will receive regular updates on news, events, and opportunities within the APEX global network.

RCA at a Glance

The RCA (Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology for Asia and the Pacific) **is an intergovernmental agreement among the IAEA Member States that are located in South Asia, South East Asia and the Pacific, and the Far East.**

Establishment

1972

Membership

Member States of the International Atomic Energy Agency (IAEA) in the Asia and the Pacific Region. Current membership 22 states.

Objective

To cooperate with each other and the IAEA in the use of nuclear techniques to contribute to the socio-economic development of the members (Government Parties) of the RCA (Regional Cooperative Agreement for Asia and the Pacific).

Thematic Areas

Agriculture, Environmental Protection, Human Health, Industry, Radiation Protection, Energy Planning and others

No. of RCA Projects Implemented

180 (up to 2023)

Number of persons trained in regional training courses

Approximately 14,000.

Financial Resources

Technical Cooperation Fund of the IAEA and the Extra Budgetary contributions of the RCA Government Parties for regional activities, RCA Government Parties for national activities and partner organizations.

Role of the IAEA

To provide financial, administrative, and technical support to the programs and projects of the RCA.

Governance

By National RCA Representatives appointed by the Government Parties at two annual meetings.

Project Implementation

By national project teams functioning under National Project Coordinators, led by a Lead Country Coordinator

RCA website

www.rcaro.org

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