RCA News Letter

THE TENTH ISSUE | SEPTEMBER 2025

10th Issue of the RCA Newsletter

This 10th issue of the RCA Newsletter highlights the key outcomes of the 47th Meeting of National RCA Representatives held at the Nadi, Fiji. It also introduces the first-ever RCA initiative dedicated to strengthening women's participation in the nuclear field. In addition, readers will find a special contribution from the National Project Coordinator of RAS1028 and other featured articles on women in nuclear. To continue receiving future issues, please subscribe by contacting rcaro@rcaro.org.

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RCA News

Strengthening Regional Cooperation: Key Outcomes from the 47th RCA National Representatives Meeting

The Regional Cooperative Agreement for Research, Development, and Training Related to Nuclear Science and Technology for Asia and the Pacific (RCA) is an intergovernmental regional agreement comprising 22 RCA Government Parties. The National Representatives (NRs) of these parties meet twice a year to review and discuss issues related to the implementation of the RCA programme and related policy matters. The meetings include the National RCA Representative Meeting (NRM) held in April/May and the General Conference Meeting (GCM) held in September.

Key outcomes of the 47th National Representative Meeting (NRM) in Fiji

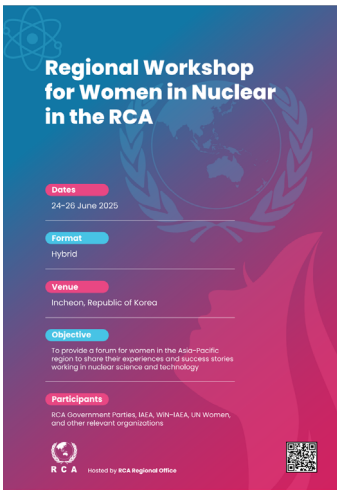
The 47th National Representative Meeting (NRM) was held in Nadi, Fiji, from 19 to 23 May 2025. The key agenda items discussed include the implementation of the RCA programme in 2025, the development of projects for the 2026-2027 TC Cycle, the review of the RCA Annual Report, and the review of the Working Group and the appointment of the RCA Programme Advisory Committee Chair (PAC) and members. Government Parties participated in the Meeting, along with representatives from the IAEA and RCARO, to discuss key issues.

Upcoming 54th RCA General Conference Meeting (GCM)

The 54th RCA GCM will be held on 12th September 2025, at the IAEA Headquarters in Vienna. This meeting will cover key discussions on the future direction of the RCA programme, policy updates, and ongoing cooperation among RCA Government Parties.

Key Initiative in 2025: Women in Nuclear Workshop

Regional Workshop for Women in Nuclear in the RCA



In accordance with the decision of the 47th NRM, the RCA Regional Office hosted a Regional Workshop for Women in Nuclear in the RCA in Incheon, Republic of Korea on 24-26 June 2025. It was a special gathering of inspiring professionals, policymakers, and researchers from across the Asia-Pacific to explore how we can better support and expand women's participation in the nuclear field. Over the three days, the participants delved into the following agendas, including:

- Global and regional initiatives similar to the IAEA's 'Women in Nuclear" programme
- Country presentations on the status of women in the nuclear field
- Success stories from leaders in India, the Philippines, Indonesia, Thailand, and more
- Roundtable discussion on how we can work together to create more inclusive opportunities

The workshop was held in a hybrid format and attracted a strong regional interest, with over 50 participants attending in person and more than 130 joining virtually form across the Asia-Pacific.

In addition, a roundtable discussion was held to facilitate exchange of views among participants and in-depth dialogue on actionable items to expanding women's participation in the nuclear field and the RCA. The workshop noted the needs to enhance women's participation in the nuclear field and called for collective efforts and actions from the RCA GPs. Some actionable items were proposed by the workshop to advance the gender equality in the RCA.

RCA Policy Meetings

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

RCA NRM

The NRM takes place in the first quarter in the country of 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 Programme Advisory Committee (PAC). The NRM officially elects the incoming RCA Chair at the beginning of the meeting. One day prior to the NRM, the RCA organized the meeting of the RCA Chairs and RCARO Standing Advisory Committee (SAC).

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 SAC are held the day before the GCM.

RCA Projects

Reflection on the Quality Management Program for RAS1028 Radiation Processing Facilities

- **Yunjong Lee** | Principal Researcher, Korea Atomic Energy Research Institute (KAERI)

Project Overview and Technical Background

RAS1028, titled "Improving the Quality Practices in Radiation Processing Facilities for Better Performance and Applications," is designed to improve the level of competitiveness and customer satisfaction of radiation processing facilities across RCA Government Parties (GPs). With an approved funding of USD 641,150, this ambitious project has brought together 17 GPs categorized into three distinct groups based on their implementation level of quality management practices. The participating countries include Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam as intermediate countries, while Australia, China, and Korea serve as resource and advanced countries. Additionally, Cambodia, Lao PDR, Mongolia, Myanmar, and Nepal participate as beginner countries, creating a comprehensive regional network for knowledge sharing and capacity building in radiation processing quality management. This article reflects my experiences as a National Project Coordinator of Korea.

Radiation processing technology plays a crucial role in the sterilization and decontamination of various products, as well as in producing new materials, with its use growing steadily in the Asia-Pacific region. Recognizing the need to ensure quality management of radiation processing facilities to guarantee the quality of irradiated products, the RCA Government Parties launched this regional project with Malaysia serving as the Lead Country.

The reliability and accuracy of dosimetry systems in radiation processing facilities are critically important considerations. This project has been carefully designed to support quality enhancement and establish quality management systems in industrial gamma-ray and electron beam facilities.

Dosimeter Intercomparison Exercise and Methodology

One of the key activities conducted under this project was a dosimeter intercomparison exercise for alanine/ESR dosimetry. This comprehensive exercise involved 12 gamma irradiation facilities and 7 electron beam accelerator facilities across multiple participating countries including Bangladesh, India, Indonesia, Malaysia, Myanmar, Pakistan, the Philippines, Sri Lanka, Thailand, Korea, and Vietnam. The Korean Association for Radiation Applications (KARA), which operates internationally accredited dose measurement facilities, was designated to conduct dose measurements and analysis for this comparison exercise. KARA distributed alanine dosimeters and holders by mail to individual facilities in participating countries. Each facility then irradiated the alanine dosimeters at five dose levels of 5 kGy, 10 kGy, 15 kGy, 30 kGy, and an unknown dose level before returning the samples to KARA for analysis to determine accurate radiation dose values. The facilities mounted alanine samples in phantoms according to their respective radiation irradiation service procedures, irradiated them at the specified dose values, measured the doses using their evaluation equipment, and subsequently sent the samples to Korea for comprehensive analysis.

Korea, leveraging its advanced experience and radiation processing facilities, supports the development of Quality Management Systems (QMS) and intercomparison exercises on dosimetry by hosting national workshops and providing expert missions, thereby sharing professional expertise with developing countries.

Mid-term Review and Challenges

Regional Training Course on Quality Assurance and Quality Control for Gamma Dosimetry Applications, 24-28 June, 2024, Philippines

At the mid-term review meeting held in Suzhou, China, in April 2024, various challenges were identified and discussed among participants. Problems with the dose comparison

evaluation test were shared, providing valuable insights into the complexities of standardizing dosimetry practices across different facilities and countries. KARA encountered information gaps, receiving incomplete data about irradiation environments from some facilities that had not followed prepared procedures or had not submitted detailed dose condition information with their returned samples. During these discussions, participants were able to share the difficulties and uncertainties they faced in finding accurate setting methods to match precise absorbed dose rates when comparing routine dosimeters[1] commonly used in their daily work with alanine dosimeters.

Regional Training Course on Significance and Importance of Dosimetry System and Associated Uncertainty for Radiation Processing Facilities, Pathum Thani and Bangkok, Thailand, November 13-17, 2023

Discussions during the Regional Training Course in Thailand in 2023

Project Impact, Achievements, and Future Outlook

All participants reached a consensus that RAS1028 serves as a valuable platform for conducting in-depth reviews of current and future activities in radiation facility quality management performed by participating institutions. The discussions revealed significant differences in capabilities that can be performed according to the conditions and resources available in each country. Nevertheless, participating institutions expressed joint gratitude for the generous support of the IAEA, which played a decisive role in advancing these common goals and producing successful results throughout the project implementation.

Phantoms and Alanine Dosimeters for Dose Assessment Intercomparison

Participants conducted comprehensive presentations highlighting the latest achievements of their respective institutions at every meeting and technical cooperation gathering. These presentations consistently emphasized the pivotal role of the RAS1028 project and its substantial impact on national research and development activities, particularly in medical and industrial research and development fields, as well as the resulting positive economic impacts on their respective countries and regions. The RAS1028 project successfully achieved most of the planned deliverables during its implementation period, with all participants acknowledging that the regional projects provided by the IAEA have played a valuable role in advancing Quality Assurance (QA) and Quality Control (QC) standard procedures for radiation technology applications. These initiatives have significantly contributed to the widespread utilization of these technologies.

There is hope for continued support so that these activities can continue beyond their scheduled end in October 2025, ensuring the sustainability of quality management improvements in radiation processing facilities across the Asia-Pacific region.

[1] Routine dosimeters are less expensive than alanine dosimeters, so institutions with high usage volumes conduct routine dose measurements using various dosimeters such as PMMA, film, calorimeters, and similar devices.

Featured Articles

Empowering Women in Nuclear Science: Insights from Interviews

The recent Regional Workshop for Women in Nuclear in the RCA, held from June 24 to 26 in Incheon, Republic of Korea, shed light on the incredible journeys of women who have established successful careers in the nuclear field. Three remarkable individuals - Hazmimi Binti Kasim, Muhayatun Santoso, and Shila Khatiwada - shared their experiences and insights, highlighting the role of women in nuclear science, technology, and policy. Their stories offer valuable advice and encouragement for young women considering a career in this vital industry.

Pioneering Nuclear Technology Development in Malaysia

- Hazmimi Binti Kasim

Hazmimi Binti Kasim has been a driving force in Malaysia's nuclear industry for over 23 years. After earning her Master's degree in Industrial Chemistry, Hazmimi began her career with the Malaysia Nuclear Agency in 2002. Her journey started with radiochemical analysis but quickly expanded to management and administrative roles in nuclear technology development. Hazmimi's work has focused on creating high-quality infrastructure for nuclear technology, aiming to make nuclear technology more visible and accessible in daily life.

One of Hazmimi's proudest accomplishments was her involvement in the development of Malaysia's first National Nuclear Technology Policy 2030, which was launched in 2023. She recalls how challenging yet rewarding it was to create a clear vision for the country's nuclear future, something Malaysia had lacked for over 50 years. This accomplishment reflects her deep commitment to advancing the role of nuclear science and technology in her home country.

Hazmimi's message to young women pursuing a career in nuclear science is clear: "Do not stop. We need to keep advancing ourselves as women. Young women have the right to say their desire." She encourages young women to stay active in international projects and to share knowledge and networks, building confidence and contributing to the region and beyond.

A Role Model for the Next Generation of Nuclear Scientists

- Muhayatun Santoso

Muhayatun Santoso, a research professor at BRIN (the National Research and Innovation Agency of Indonesia), has been an influential figure in the field of nuclear technology, particularly in the environmental and air quality sectors. Her passion for nuclear science was sparked at a young age, inspired by the story of Marie Curie. Since joining the field, she has received significant support from colleagues and mentors, which has fueled her dedication to the discipline.

As the first Research Project (RP) leader for the RCA, Muhayatun led the air quality and environmental impact assessment in the RCA region, working with over 100 young scientists. She also led two major research projects over six years, which contributed valuable data and insights into the region's environmental challenges.

For young women entering the field, Muhayatun emphasizes the importance of collaboration. "Gender equality must continue to be pursued," she says, stressing that women must work hard, build strong teams, and collaborate across various platforms to overcome any challenges, including limited facilities or experience. Her career is a testament to the power of hard work and perseverance.

Muhayatun also shares her positive experience with the RCA community, noting how the atmosphere of the Regional Workshop is empowering. She is motivated by the strong support from the RCA and the encouragement for women to participate in the nuclear sector at the same level as their male counterparts.

A Trailblazer in Nepal's Nuclear Policy Development

- Shila Khatiwada

Shila Khatiwada works for the Ministry of Education, Science and Technology in Nepal as a senior divisional chemist, where she plays a key role in formulating nuclear policies and regulations. Though Nepal does not yet have a regulatory body for nuclear licensing, Shila has made significant strides in developing the country's nuclear framework. As the focal point for the RCA, she is responsible for disseminating information and promoting nuclear technology in Nepal.

Shila's path into the nuclear field began when she was assigned to work as the National Representative of Nepal, and she has since taken on various responsibilities, including networking with international experts and cooperating on policy development. She proudly mentions her role in promoting the RCA and encouraging young women in Nepal to consider nuclear science as a career. "There are many opportunities in this field. I encourage young women to take any chance possible," she says.

Shila's advice for young women in the nuclear field is to persevere, even when faced with challenges. She reflects on how women in her country often face opposition or scrutiny in male-dominated fields, but encourages women to work hard and remain determined. Her experience at the Regional Workshop opened her eyes to many opportunities for women in nuclear science, such as fellowships and internships, and she is eager to continue empowering women in Nepal and beyond.

The Future of Women in Nuclear Science

The experiences of Hazmimi, Muhayatun, and Shila provide a glimpse into the evolving landscape for women in nuclear science and technology. These women have not only overcome challenges but also actively contributed to shaping the future of nuclear policy and technology in their respective countries. Their involvement in the RCA network has further empowered them, providing new perspectives and opportunities to continue advancing the role of women in the field.

Building on these inspiring journeys, the Regional Workshop for Women in Nuclear in the RCA (24–26 June 2025, Incheon, Korea) reaffirmed that there is strong hope for the future of women in the nuclear sector. The workshop, the first-ever RCA event dedicated solely to gender issues, was organized in response to recommendations by the RCARO SAC and received strong support from RCA Government Parties. It attracted broad regional and international attention, with over 50 participants attending in person and more than 130 joining virtually from across Asia and the Pacific. The event brought together National RCA Representatives from several countries, women professionals from Indonesia, Malaysia, Nepal, and the Philippines, and distinguished representatives from global organizations such as WiN IAEA, UN Women, WiN Korea, WiN Australia, and the Korea Foundation for Women in Science, Engineering and Technology (WISET). This diversity of voices allowed for rich dialogue that combined personal experiences, institutional perspectives, and regional insights.

Throughout the three-day programme, participants engaged in thematic sessions that examined global and regional initiatives, shared success stories, and assessed national challenges to advancing women's participation in nuclear science. Country presentations revealed both progress and persistent gaps: while many governments are increasingly recognizing the importance of gender equality, women continue to face barriers such as limited access to leadership positions, underrepresentation in technical cooperation projects, and insufficient mentoring opportunities. The workshop also underscored how gender disparities are not only a matter of fairness but also limit the overall potential and innovation of the nuclear sector. By increasing the participation of women, the RCA community can draw on a wider pool of ideas, skills, and perspectives—an asset for addressing complex challenges in nuclear science and technology.

The workshop concluded with a sense of shared commitment and optimism. Participants agreed that advancing gender equality in the RCA cannot be achieved by women alone but requires collective responsibility from both men and women, backed by strong leadership from RCA Government Parties. They also stressed that the workshop outcomes should not remain as discussions but must be translated into tangible actions, presented to the 54th RCA GCM, and embedded in future RCA initiatives. In this regard, the stories of Hazmimi, Muhayatun, and Shila, when placed alongside the workshop's concrete recommendations, illustrate a powerful narrative of resilience, progress, and hope. Together, they demonstrate that with perseverance, collaboration, and active participation in global networks, young women can not only overcome barriers but also shape the future of nuclear science in lasting and meaningful ways.

Their stories, together with the outcomes of the workshop, serve as a beacon of hope—reminding young women everywhere that perseverance, collaboration, and active participation in global networks can lead to success and make a lasting impact on the world of nuclear science.

Empowering Women in Nuclear: My Journey with the IAEA Marie Sklodowska-Curie Fellowship Programme

- **Suhyun Kang** | Fellow, IAEA Marie Sklodowska-Curie Fellowship Programme

In 2022, I had the distinct honor of being the sole recipient from the Republic of Korea selected for the International Atomic Energy Agency (IAEA) Marie Sklodowska-Curie Fellowship Programme (MSCFP). This prestigious fellowship supported my two-year master's studies at the KEPCO International Nuclear Graduate School (KINGS), where I specialized in nuclear power plant (NPP) decommissioning and radioactive waste management. Driven by a passion for international collaboration and a desire to contribute to the global nuclear sector, I embarked on a one-year internship at the IAEA from February 2024 to January 2025.

Contributing to Global Nuclear Data Systems

During my internship, I served in the Nuclear Power Engineering Section of the Nuclear Power Division, contributing to two pivotal projects: the Power Reactor Information System (PRIS) and the Country Nuclear Power Profiles (CNPP).

PRIS is the IAEA's comprehensive database that compiles information on nuclear power reactors worldwide, including those in operation, under construction, or being decommissioned. It provides detailed data on reactor specifications, performance history, and operational statistics, serving as a critical resource for performance benchmarking and analysis.

CNPP offers in-depth profiles of IAEA Member States, detailing the status and development of their nuclear power programs. These profiles encompass organizational structures, industrial aspects, legislative and regulatory frameworks, and statistical data on energy and electricity sectors.

My responsibilities included collecting and validating data on reactor operations, construction statuses, annual energy production, and capacity metrics from Member States. Notably, I identified discrepancies between PRIS and the World Association of Nuclear Operators (WANO) performance indicators. Through meticulous analysis and proactive communication with Member States, we resolved these inconsistencies, enhancing the accuracy and reliability of the data.

I also contributed to the development of IAEA publications such as the PRIS poster, Operating Experience with Nuclear Power Stations in Member States (OPEX), and Nuclear Power Reactors in the World (RDS-2). Additionally, I participated in the enhancement of the PRIS website, collaborating with various IAEA departments to improve statistical data on non-electric applications, reactors under construction, and decommissioned reactors.

In the 2024 CNPP publication process, I meticulously reviewed country profiles submitted by Member States, ensuring the accuracy of sensitive information and considering diplomatic nuances to maintain the integrity of the content.

Skills and Professional Growth

This immersive experience at the IAEA allowed me to develop a diverse skill set:

- Data Analysis and Quality Assurance: I honed my ability to analyze complex datasets, identify anomalies, and implement quality control measures to ensure data integrity.
- International Collaboration: Working with professionals from various countries enhanced my cross-cultural communication skills and understanding of international nuclear policies.
- Project Management: Balancing multiple projects and adhering to publication timelines improved my organizational and time-management abilities.
- Technical Writing and Editing: Contributing to official IAEA publications refined my technical writing skills, with an emphasis on clarity and precision.
- Web Development Collaboration: Participating in website enhancement projects provided insights into user experience design and the importance of accessible information dissemination.

Engaging with the Global Nuclear Community

Beyond my departmental duties, I actively engaged with the broader IAEA community and attended high-profile events such as the 68th IAEA General Conference and the

International Conference on Small Modular Reactors and their Applications. These gatherings offered invaluable opportunities to network with leading experts and gain insights into emerging trends in nuclear technology.

I also took the initiative to attend meetings aligned with my interests by reaching out to Scientific Secretaries, demonstrating the IAEA's openness to fostering professional development across various domains.

Furthermore, I participated in the IAEA's mentoring program, where I received guidance from a seasoned nuclear professional. Our discussions helped me navigate career pathways, set professional goals, and understand the dynamics of the international nuclear landscape.

RCA Side Event during the 68th IAEA General Conference on 17 Sep 2024

Women directors, staff, and interns from the Nuclear Power Division at the International Conference on Small Modular Reactors and their Applications, October 2024

Celebrating Women in Nuclear

During March 2024, I joined over 400 women from the IAEA Marie Sklodowska-Curie Fellowship Programme (MSCFP) and the Lise Meitner Programme (LMP) at the IAEA's International Women's Day event, titled "For More Women in Nuclear." The event featured keynote speeches, panel discussions, and networking sessions aimed at empowering women in the nuclear field. IAEA Director General Rafael Mariano Grossi emphasized the need to address gender disparities in nuclear science and technology, inspiring participants to continue breaking barriers.

Participants of the IAEA Marie Sklodowska-Curie Fellowship Programme (MSCFP) and Lise Meitner Programme (LMP) with IAEA Director General Rafael Mariano Grossi, at the International Women's Day event "For More Women in Nuclear" on 7 March 2024 in Vienna

The event fostered a sense of community and shared purpose among women in nuclear, reinforcing our commitment to advancing diversity and inclusion within the sector.

A Personal Journey into Nuclear

My journey into the nuclear field began after earning a bachelor's degree in environmental engineering. I worked as an environmental engineer on the Barakah Nuclear Power Plant (BNPP) project in the United Arab Emirates, Korea's first NPP export. This experience highlighted the significance and potential of Korea's nuclear industry, motivating me to pursue specialized knowledge in nuclear energy.

Subsequently, I enrolled in a master's program at KINGS, focusing on nuclear decommissioning and radioactive waste management. Encouraged by my advisor, I applied for the MSCFP, which paved the way for my enriching internship at the IAEA.

Looking Ahead

Reflecting on my experiences, I am grateful for the opportunities provided by the MSCFP and the IAEA internship. These programmes have been instrumental in shaping my career, offering exposure to international best practices and fostering connections with professionals worldwide. As I continue to advance in the nuclear sector, I am committed to leveraging my experiences to promote diversity, drive innovation, and contribute to the safe and sustainable use of nuclear technology.

RCA contributions to sustainable agricultural development in Myanmar

- **Myat Minh** | Director, Biotechnology Research Department, Ministry of Science and Technology

Myanmar seeks to enhance household-level food security by tackling the root causes of food insecurity and under-nutrition, while supporting healthy dietary practices. In doing so, Myanmar will prioritize safe and efficient food production, particularly where chronic and acute food insecurity persists, while recognizing that the natural environment–fertile soil, clean water, and pollination– provides the very foundation of food production.[1] Research and development for agricultural development in Myanmar primarily focuses on improving crop yields, addressing climate change challenges, developing new varieties of rice (the staple crop), enhancing irrigation systems, and building capacity within the local research institutions. There is a key focus on supporting smallholder farmers through technology transfer and extension services, while also tackling issues like land tenure and access to credit to maximize the potential of Myanmar's vast agricultural land.

Myanmar joined the International Atomic Energy Agency (IAEA) in 1957. It has been an active member of that organization and has benefited from scholarships and training programme of the IAEA. Myanmar nationals have been trained by the IAEA in the application of nuclear technology for peaceful purposes.[2] Myanmar joined the Regional Cooperation Agreement for Research, Development and Training in Nuclear. Science and Technology (RCA) in 1997, and actively participated in regional projects. The Technical Cooperative activities of the International Atomic Energy Agency (IAEA) in Myanmar primarily focus on the application of nuclear technology in the fields of agriculture and health, emphasizing on utilizing techniques like mutation breeding, radiotracer studies, and radiation technology to improve food production and diagnosis of diseases within the country.[3]

The agriculture sector has a major role to play in addressing zero hunger through agricultural diversification, variety improvement, and soil, water, and nutrient management using nuclear technologies. Mutation breeding is one of the most effective way of generating genetic variability and new mutant lines with desirable traits. In Myanmar, rice improvement using induced mutation was initiated in the early 1970s, and the first mutant rice variety, Shwe War Tun (a mutant of IR 5), developed through gamma irradiation, was released in 1974. Another mutant variety, Shwe Thwe Tun (a mutant of IR 24), was released in 1980. Since then, Mutant variety, Shwe War Tun has been grown as the second largest rice variety in terms of occupying area in the country; it has performed particularly well in rainfed lowland regions. Thukhayin (BB disease and pest WBPH resistance mutant of Mannawthuka) and Yezinlonethwe (photoperiod insensitive and high yield variety) were officially released in 2005.[4] Sin Shwe Se (early maturity and high-yield quality rice mutant of IR53936) was officially released in 2015. Production of short-duration mutant varieties, high-yielding and pest and disease resistance crops using radiation-induced plant mutation breeding processes are remarkable achievements through the close cooperation of IAEA and RCA [RCA Projects: RAS-5088, RAS-5077, RAS-5070, RAS-5056, RAS-5045]. Therefore, plant breeding using gamma irradiation has the potential to make a significant contribution to agricultural development in Myanmar. By developing improved crop varieties that are more productive, resilient, and nutritious, this technology can help to improve food security and the livelihoods of farmers in the country.

One of the early maturity mutant rice variety (Sin-Shwe-Se) at a farmer field

In the areas of soil and water management and crop nutrition, isotope and nuclear techniques are employed to measure and monitor the interactions between soil, water, and nutrients to ensure that these are used efficiently in various cropping systems. Scientists from the department of Biotechnology Research (DBR), Ministry of Science and Technology (MOST), used isotopic techniques to measure changes in soil, water, and nutrient movement, thereby supporting farming practices that keep the soil healthy, improve efficiency of water and nutrient usage, and optimize crop yields and soil resilience against the impacts of climate change and variability. In 2019, Farmer Field Day (FFD) was held for disseminating technologies

Farmer Field Day: disseminating technologies with best soil–water–nutrient management practices to optimize crop productivity to the key farmers from different villages

with the best soil–water–nutrient management practices to optimize crop productivity to government officers, farmers, stakeholders, and service providers from the Kyaukse Region. More than 50 key farmers from different villages and several extension providers learned new technologies and how new technologies are applied in the real world. Our research team monitored the efficiency and effectiveness of the N-fertilization technique under irrigation and different nitrogen fertilization rates for optimizing nitrogen fertilizer application for a new mutant rice variety, var. Sin Shwe Se by using isotopic 15N tracer under the RCA projects.[5] Introduction to photoperiod-insensitive mutant of Ayarmin and disseminating technologies with best soil–water–nutrient management practices were also remarkable successes of IAEA and RCA cooperation. [RCA Projects: RAS 5093, RAS-5084]

Myanmar has benefitted greatly from the agency's assistance in sectors such as food and agriculture, health, and nutrition, water and the environment, industrial applications, radiation safety, and nuclear knowledge management. With the agency's support, Myanmar has received extensive training and capacity-building opportunities through national and regional programmes Notably, in the food and agriculture sector, Myanmar has established seven laboratories focusing on molecular genetics, grain quality analysis, entomology, soil analysis, dosimetry, marine radiation monitoring, and isotope hydrology. This laboratory was established with the help of an IAEA technical cooperation project and also has the necessary facilities to implement the objectives of its National Workplan within the RCA projects. The IAEA also provided training programmes relevant to RCA project activities to enhance the capability of scientists to handle the mutated population and utilization of the modern bio-techniques in crop improvement programme and also in agricultural soil and water analysis. In the last few decades, more than 65 young researchers and scientists participated in IAEA training events achieving a high level of knowledge, training, expertise, and capabilities in the application of radiation mutation and related biotechnology. Such well-established laboratories are also local training centers for university students, young researchers, lab workers, and also farmers. In 2024 these laboratories supported 4 training programmes: basic agricultural soil, water nutrient management training with 52 participants including farmers, thereby supporting farming practices that keep the soil healthy, improve water and nutrient use efficiency, and optimize crop yields and soil resilience against the impacts of climate change and variability, basic soil and water analysis training programme with 22 participants from university and government institutions and advanced soil and water analysis training programme with 17 participants and basic molecular genetic training programme with 17 participants from different universities. Training provided farmers with the latest agricultural knowledge and skills can help ensure food security, environmental conservation, and rural prosperity for sustainable agricultural development.

Myanmar always considers the RCA an important partnership between the IAEA and member states to promote sustainable development. The IAEA Regional Cooperative Agreement (RCA) has made significant contributions to sustainable agricultural development in Myanmar, particularly in the areas of food security, crop improvement,

Laboratory training programme participating young researchers from different government institutions

and pest and disease control. The new crop varieties, soil–water–nutrient management, and IPM strategies that have been developed as a result of the RCA have helped to improve food security, increase farmers' incomes, and protect the environment. Nowadays, global climate change negatively impacts farming and agricultural practices and disrupts the input supply of the local food systems. Climate change is also having a significant impact on agriculture in Myanmar, causing lower crop yields, food shortages, and increased water scarcity. So, we expect that the RCA will play a unique role in addressing the climate change issue with its subsequent effects through the utilization of nuclear technologies. We are convinced that the RCA government parties within the cooperation agreement are best placed to solve any precarious situation related to nuclear science and technology.

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Articles from GPs

Overview of Pakistan's Nuclear Security Regime as a Responsible IAEA Member State

- **Afsah Qazi** | Assistant Professor, Air University

Pakistan's advanced and well-managed nuclear programa stands at par with global regulatory standards. Pakistan has successfully put nuclear energy and radiation to use for the benefit of the people across diverse sectors. The country currently has six nuclear power reactors in operation at Karachi and Chashma with a combined electricity generation capacity of 3262 MW. While the nuclear sector's contribution to Pakistan's energy needs was 17.4% in 2023, its nuclear energy vision for 2050 aims to increase this share up to 25% of the total generating capacity by constructing 32 NPPs with a total capacity of 40,000 MW. This is also believed to pave the way for green transition of Pakistan's energy sector. Nuclear energy is now also seen as a means for climate change mitigation. The comments of IAEA's Director General during in February 2025 visit to Pakistan reflected a resolve for greater cooperation in employing nuclear energy to health, energy and food sector – as demonstrated by Pakistani representatives to the IAEA delegation. This is reflective of the decades-long interaction, close collaboration and trust-building between the IAEA and Pakistan.

Pakistan and the IAEA

Pakistan's association with the IAEA goes back to Eisenhower's atoms for peace program and the Agency's formative years. From being one of the IAEA's founding members, Pakistan has sustained long-standing cooperation with the international nuclear watchdog. From depending on the IAEA for initiating the nuclear program, and having all its NPPs under IAEA safeguards, the relationship has become bidirectional with time, as today, Pakistan also assists other countries under the auspices of the IAEA. Pakistan fully acknowledges the benefits that long-standing cooperation and technical assistance offered by the IAEA have accrued to the country's nuclear program and its use for socio-economic growth and development sector.

Being an IAEA member since 1957, Pakistan has been among the largest recipients of support under IAEA's Technical Cooperation Program (since 2006) and over years has endeavoured to employ nuclear technology in varies sectors with health (cancer treatment), energy and agriculture receiving top priority. So far Pakistan has had four country program frameworks (CPFs) with IAEA with the fourth one for the period 2020-25 signed in September 2019 – identifying nine priority areas.

Pakistan currently runs 19 cancer hospitals overseen by Pakistan Atomic Energy Commission (PAEC) – cumulatively treating over a million patients every year. The first of these known as Nuclear Medicine, Oncology, and Radiotherapy Institute (NORI) in Islamabad was established with assistance under 'Rays of hope' initiative of the IAEA. In his March 2018 visit the then DG IAEA, Yukiya Amano appreciated Pakistan's cooperation and active contribution – by providing expertise and conducting training - to IAEA's efforts for capacity building in other regional countries. Of the 35 currently active multi-domain 'inter-regional' technical cooperation projects, Pakistan participates in 23.

As a proactive IAEA member, and one with an efficient nuclear security regime, Pakistan participates in the Advisory Group on Nuclear Security, the Nuclear Security Guidance Committee, and the International System of Occupational Exposure. Besides, Pakistan has continuously updated its safety standards based on recommendations of INFCIRC 225/Rev.5, and upgrading security at all nuclear medical centers as well as civilian nuclear power plants and research reactors as per IAEA's 'Code of conduct on safety and security of radioactive sources'. IAEA has had several Operational Safety Review Team (OSART) missions conducted to verify the reliability of Pakistan's nuclear facilities. With the agency's continued assistance, Pakistan has implemented medium and immediate-term measures to enhance the safety of its newer and advanced Generation-III NPPs.

Pakistan's Nuclear Security Regime

As officially stated by Pakistan's Foreign Secretary, the country considers nuclear security to be a primary national responsibility. Furthermore, engendering a 'culture' of nuclear security has been a key aim of national efforts in this domain. At the International Conference on Nuclear Security: Shaping the Future at Vienna in May 2024, Pakistan reinforced 'vigilance, thorough preparedness and

zero-complacency' as the fundamental values guiding its nuclear security culture.

IAEA sees that nuclear security regime as a set of systems and regulations that allows for implementation of international legal instruments pertaining to various aspects of use and employability of nuclear technology – inclusive of national-level contingency plans and response measures. Aligned to IAEA's vision, and through decades of learning in safe and secure operation of a comprehensive nuclear program, Pakistan's commitment to nuclear security and safety has only grown stronger with time.

International Regulations

An overview of Pakistan's legal obligations and voluntary commitments to international protocols for nuclear safety and security at the systemic level is a good starting point to contextualize the regulatory and institutional developments at national level down to the point of enforcement mechanisms. The following table compiles a list of international legal and regulatory mechanisms that Pakistan adheres to.

Pakistan's Alignment with International Instruments on Nuclear Security

1. UN Security Council Resolutions (UNSCRs 1373, 1540 and 1887)

- Submitted six National Reports to 1540 Secretariat
- Established inter-Agency Committee for Coordination, Review and Monitoring (CRMC) for implementing 1540 decision, in August 2018
- Offered technical assistance/training to interested states in areas of expertise w.r.t. 1540 implementation

2. Nuclear Security Conventions

- Convention on the Physical Protection of Nuclear Material (CPPNM) + A/CPPNM)
- Convention on Nuclear Safety (CNS)
- Convention on Early Notification of a Nuclear Accident (Early Notification Convention)
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention)

3. Non-binding instruments/arrangements

- IAEA's "Code of Conduct on Safety and Security of Radioactive Sources"
  - Supplementary Guidance on 'Import and Export of Radioactive Sources'
  - Supplementary Guidance on 'Management of Disused Radioactive Sources'
- Member of Illicit Trafficking Data Base (ITDB)
- Member IAEA Advisory Group on Nuclear Security (AdSec)
- Joined Global Initiative to Combat Nuclear Terrorism (GICNT) in 2007
  - Guidance for drafting documents Nuclear Detection Working Group (NDWG) and Response and Mitigation Working Group (RMWG).
- Joined Nuclear Security Contact Group (NSCG) in 2019
- Engagement with Global Nuclear Security Summit (NSS) Process
- Member of UN Scientific Committee on the Effects of Atomic Radiation
- Hosted a workshop of International Physical Protection Advisory Service (IPPAS)
- Intent to join International Convention on Suppression of Acts of Nuclear Terrorism

At the second tier comes the integrated nuclear security architecture at national level that combines legislative, organizational, and procedural elements along with an emphasis on capacity building. The national nuclear security regime (NSR) allows Pakistan to ensure nuclear security in its best interests and for fulfilling the above-listed international commitments.

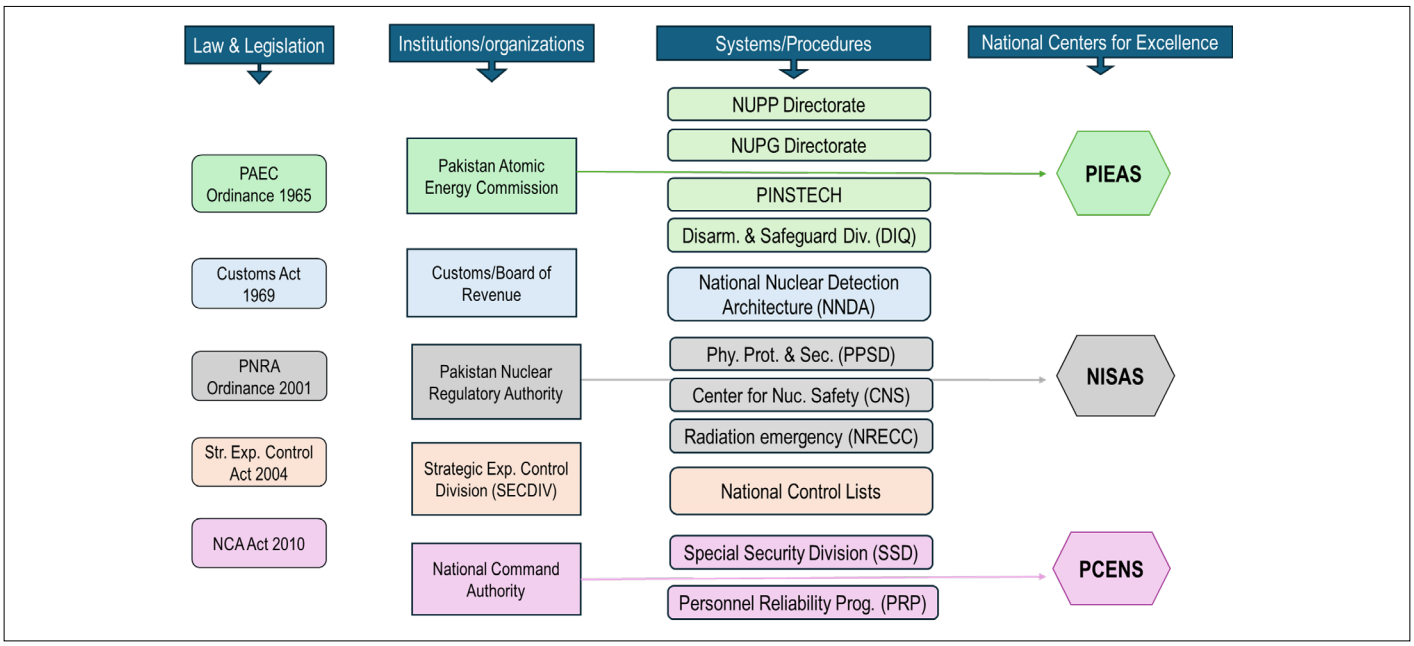
Pakistan's Integrated Nuclear Security Architecture: Legislations, Institutions and Security Systems (Procedures)

Pakistan's multilayered NSR anchors itself in the culture of vigilance, all-round preparedness and zero-complacency, and therefore has the dynamism to adapt and an intrinsic ability to meet emergent threats. Pakistan's NSR is devised with the objective of protecting the 'personnel, property, society and environment' from destructive impact of accidents or mishaps involving nuclear materials (and radiation) while they are in storage, use or being transported. It also aims to secure the country's nuclear program against unauthorized or inadvertent use, sabotage and illicit access.

Three essential elements: Legislative and Regulatory Framework, Institutions and Organizations and Nuclear Security Systems/Measures/Procedures are put together to create a comprehensive architecture that works for ensuring nuclear security. The flowchart below gives an integrated representation of Pakistan's NSR – along with the description that follows.

(i) Pakistan Atomic Energy Commission (PAEC)

The PAEC Ordinance 1965 granted a statutory mandate for creating PAEC as the main financial and administrative organ empowered to conduct research, development and promotional activities for advancing peaceful uses of atomic energy. PAEC as the operator of nuclear facilities in Pakistan oversees all nuclear energy and research application in Pakistan. Additionally. it is also responsible and answerable



Overview of Pakistan's National Nuclear Security Architecture

for fulfilling Pakistan's international obligations and its adherence to global standards.

PAEC's central R&D setup is the Pakistan Institute of Nuclear Science and Technology (PINSTECH) operating two Research Reactors, with its engineers and scientists playing active roles in joint projects with IAEA and other inter-governmental scientific organizations. Two directorates within PAEC - Nuclear Power Projects (NUPP) Directorate and the Nuclear Power Generation (NUPG) Directorate – work respectively to manage the planned units, and to administer the operational units. The Division of Disarmament and Safeguards (D&S) is important for acting as the state-level safeguards office and with its Design Information Questionnaire (DIQ) entailing design and operational detail of new nuclear facilities for IAEAs accountancy and scrutiny.

(ii) Pakistan Customs

The Customs Act, 1969 granted statutory powers to Pakistan's custom officials to implement regulations related to trade and transfer of contraband items – whose list also included nuclear/radioactive materials and items/technologies that are on NSG control lists. The National Nuclear Detection Architecture (NNDA) directorate has been established under the Federal Board of Revenue for detecting, preventing, investigating and prosecuting all cases of illicit trafficking of nuclear/radioactive material at custom checkpoints. It's comprehensive SOPs to allow for document and reporting cases of innocent, false, and actual alarms to PNRA for further reporting to IAEA.

(iii) Pakistan Nuclear Regulatory Authority (PNRA)

PNRA Ordinance 2001 mandated the establishment of PNRA. PNRA as the main regulator/inspector and competent body for supervision and licensing related to nuclear safety, including physical protection, radiation safety and nuclear waste management in Pakistan. PNRA's regulations on 'Physical protection of nuclear material and installations (PAK/925)' are aligned to INFCIRC/225/Rev.5 and CPPNM/A, while those on 'Security of Radioactive sources (PAK/926)' are based on IAEA's 'Code of Conduct for Safety and Security of Radioactive Sources'. The important procedures for ensuring safety regulation by PNRA include the Directorate of Physical Protection and Nuclear Security (PPSD), Centre for Nuclear Safety (CNS), and National Radiation Emergency Coordination Center (NRECC).

(iv) Strategic Export Controls Division (SECDIV)

The Strategic Export Control Act 2004 was promulgated to establish export controls for sensitive dual use goods/technologies/delivery systems to strengthen commitment to nuclear non-proliferation in line with UNSCR 1540. Consequently, SECDIV was established in 2007 at the Ministry of Foreign Affairs to administer export controls. The national control were designed inclusive of the scope of control lists of NSG, Australia Group and MTCR and are periodically reviewed and revised to that end. SECDIV also organizes international outreach events on topics related to Strategic Trade Management – the latest one held in September 2022 on 'Promoting Strategic Trade Controls through International Cooperation' was well-attended, including 36 foreign delegates.

(v) National Command Authority (NCA)

The NCA Act 2010 provided a mandate for umbrella coverage to the entire spectrum of activities that fall under a state's NSR. It required the creation of the National Command Authority that is the apex body endowed with an over-arching jurisdiction and decision-making authority over varied entities working within the nuclear security architecture. With the mandate to assure against all threats, including internal, external, and insider as well as cyber threats, creating a Special Security Division (SSD) under NCA in purview of the complex threat environment has been a notable step. It comprises of 20,000 personnel who not only secure all sensitive nuclear sites but also comprise the elite response force to deal with any probable nuclear emergencies. Its Personnel Reliability Programme (PRP) helps devise technical solutions to assure against WMD terrorism and proliferation challenges.

The Centres of Excellence

In addition to the above , where legislative instruments back subsequent organizations that then devise systems and implementation procedures, there are three specific Centers of Excellence that are working towards capacity building for bolstering the nuclear safety and security in Pakistan while also sharing best practices through international engagement. These are briefly described below:

- **Pakistan Centre of Excellence for Nuclear Security (PCENS)** that works under the NCA comprises an academy that offer cutting-edge training in nuclear security – thus contributing to the International Network for Nuclear Security Training and Support Centers (NSSC Network). It has state-of-the-art physical protection labs, and simulation and training facilities. It conducts specialized courses dedicated to the functioning of NCA's nuclear security force in an all-encompassing manner. Pakistan even offered at the 2012 Seoul Nuclear Security Summit (NSS), for its PCENS to act as interregional hub for capacity building of officials. 156 foreign participants from over 40 IAEA members have so far benefited from various nuclear security trainings organized at PCENS.
- **National Institute of Safety and Security (NISAS)** functions under PNRA and organizes trainings for inspectors and regulators. Inaugurated in 2014 by the then DG-IAEA during his Pakistan visit, NISAS radiational detection and physical protections labs meet the IAEA standards. Its delivers wide range on-the-job training, professional courses and workshops for enhancing competency. So far, NISAS has conducted 221 training courses related to nuclear security, with 29 in collaboration with IAEA, imparting competencies for 730 personnel comprising 23 foreigners.
- **Pakistan Institute of Engineering and Applied Sciences (PIEAS)** works under the PAEC. It was declared as an IAEA collaborating centre in December 2019, for supporting the member states in research and capacity building related to advanced nuclear technologies. It builds expertise in the field through its post-graduate degree in Nuclear Engineering and through offering regular courses on 'physical protection' and 'nuclear security' since 2009.

The three Centres of Excellence (and the overall architecture at large) work together to impart education, training and technical support to entire spectrum of stakeholders relevant to nuclear security in Pakistan.

Hence, believing and vying for in-depth and multi-layered defense, Pakistan has acquired a robust and multi-tiered nuclear security regime that allows the country to fulfil its international responsibilities in a satisfactory manner.

Calendar of RCA Projects in 2025

September

SUN	MON	TUE	WED	THU	FRI	SAT
31	1	2	3	4	5	6
7	8 ①	9	10	11	12 ②	13
14	15	16	17	18	19	20
21	22 ③	23	24	25	26	27
28	29	30	1	2	3	4

① *(RAS1029)* **Regional Workshop on ISO 9712 Qualification and Certification Requirement in NDT for Civil Structures**
Christ Church, New Zealand | 08-12 Sep

② *(RAS0092)* **54th RCA General Conference**
Vienna, Austria | 12 Sept

③ *(RAS6105)* **Regional Training Course on theranostic applications of radiotracers in endocrine related cancerradiotracers in endocrine related cancer**
Beijing, China | 22-26 Sept

October

SUN	MON	TUE	WED	THU	FRI	SAT
28	29	30	1	2	3	4
5	6 ① ②	7	8	9	10	11
12	13 ③	14	15	16	17	18
19 ④	20	21	22	23	24	25
26	27 ⑤ ⑥ ⑦ ⑧	28	29	30	31	1

① *(RAS6101)* **Regional Workshop on the Role of the Medical Physicist in Quality Management and QA in Nuclear Medicine Departments**
Bangkok | 6-10 Oct

② *(RAS5101)* **Regional Training Course on Advanced Mutation Breeding Techniques for Improvement of Nutritional Quality**
Faisalabad, Pakistan | 06-18 Oct

③ *(RAS1028)* **Regional Training Course on Quality Control Procedures for the manufacturing of Medical Devices**
Colombo, Sri Lanka | 13-17 Oct

④ *(RAS6105)* **Joint Regional Training Course with ARASIA on Hybrid Imaging with non-FDG Tracers**
Amman, Jordan | 19-23 Oct

⑤ *(RAS1028)* **Final review meeting**
Penang, Malaysia | 27-31 Oct

⑥ *(RAS1029)* **Regional Training Course on Phased Array Ultrasonic Testing (PAUT) Level 2**
Seoul, ROK | 27-31 Oct

⑦ *(RAS1028)* **Final Review Meeting**
Malaysia | 27-31 Oct

⑧ *(RAS7043)* **Regional Training Course on Water Resource Management**
Islamabad, Pakistan | 27-31 Oct

November						
SUN	MON	TUE	WED	THU	FRI	SAT
26 / 30	27	28	29	30	31	1
2	3 ①	4	5	6	7	8
9	10 ②	11	12	13	14	15
16	17 ③ ④	18	19	20	21	22
23	24 ⑤	25 ⑥	26	27	28	29

① *(RAS7043)* **Mid-term Review Meeting**
Hanoi, Vietnam | 03-07 Nov

② *(RAS5091)* **Final Review Meeting**
Vienna, Austria | 10-14 Nov

③ *(RAS7040)* **Final review meeting**
Vientiane, Lao PDR | 17-21 Nov

④ *(RAS1028)* **Sub-regional Workshop on the Development of Electron Beam (EB) Irradiator**
Wuhan, China | 17-21 Nov

⑤ *(RAS6101)* **Regional Workshop on the Certification of Medical Physicists**
Surakata, Java Island, Indonesia | 24-28 Nov

⑥ *(RAS6100)* **Final Review Meeting**
Virtual | 25-28 Nov

December						
SUN	MON	TUE	WED	THU	FRI	SAT
30	1	2 ①	3	4	5	6
7	8 ② ③	9	10	11	12	13
14	15 ④	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	1	2	3

① *(RAS6098)* **Final Review Meeting**
Mumbai, India | 02-04 Dec

② *(RAS6105)* **Mid-term Review Meeting**
Vienna, Austria | 08-12 Dec

③ *(RAS6110)* **Regional Training Course on Management of External Beam Radiotherapy**
Jakarta, Indonesia | 8-12 Dec

④ *(RAS6109)* **Mid-term review meeting**
Vienna, Austria | 15-17 Dec

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

186 (up to 2024)

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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