



FNCA

# Forum for Nuclear Cooperation in Asia Newsletter

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Photo on the upper left: Workshop participants visiting a radiotherapy site at the National Cancer Center of Mongolia  
(Technical visit at FNCA Workshop on Radiation Oncology in Mongolia)

Photo on the bottom right: JAEA's JRR-1(Japan Research Reactor-1) Entrance / Nuclear Science Research Institute layout model  
(Technical visit at FNCA Workshop on Research Reactor Utilization in Japan)



## Discussion toward Enhancing Cancer Therapy with Radiation in Asia

# FNCA Ministerial Level Meeting Held in Mongolia

The 23<sup>rd</sup> Ministerial Level Meeting (MLM) of the Forum for Nuclear Cooperation in Asia (FNCA) was held in a hybrid form with online participation in Ulaanbaatar, Mongolia, on October 31, 2022. The event was hosted by the Cabinet Office of Japan as the secretariat of Atomic Energy Commission and co-hosted by Mongolia's Ministry of Foreign Affairs, Ministry of Education and Science, and Nuclear Energy Commission. Ministers and senior officials in charge of nuclear science and technology gathered from the FNCA member countries to hold policy discussions on the theme of "Cancer Treatments with Radiation Technology in Asia." Dr. UESAKA Mitsuru, Chairman of the Japan Atomic Energy Commission attended to represent Japan. Mongolia was represented by Ms. Battsetseg BATMUNKH, Minister of Foreign Affairs, and Ms. Lhagva TSEDEVSUREN, State Secretary of the Ministry of Education and Science.

The address of Ms. TAKAICHI Sanae, Japan's Minister of State, was read by Chairman Uesaka, addressing respect for the representatives of the FNCA member countries for their leadership in their respective organizations even during the COVID-19 pandemic over the past three years.

### Keynote Speech

Mr. Hua LIU, Deputy Director General, Department of Technical Cooperation, International Atomic Energy Agency (IAEA), delivered a

keynote speech titled "Addressing Cancer Treatment Disparities" in the form of a video message. He explained the purpose and content of the "Rays of Hope" project, which was launched in February 2022 by IAEA to eliminate cancer diagnosis and therapy inequalities among regions or countries. He said that "Rays of Hope" was a comprehensive support framework for countries that were behind in cancer treatment and that it brought together existing technical and economic resources of the IAEA member states with the goal of helping developing countries access advanced medical services, develop relevant human resources through enhanced education and training, and build the foundation for advanced radiotherapy.

Another keynote speech, titled "Development of LINAC based new technologies in Mongolia," was given by Dr. Uranchimeg TSEGMED, National Cancer Center of Mongolia (NCCM). The speech focused on the background of Mongolia's radiation use, an overview of NCCM and radiotherapy, LINAC project, and cooperation with overseas partners. (see p. 3 for details).

### Round Table Discussion

Lead speeches were given ("Overview of activities for the FNCA Radiation Oncology Project" and "Efficacy of radiotherapy against breast cancer" by Japan and "National efforts and status concerning cancer treatment" by Bangladesh) in line with the main topic of this



<National representatives>

Photo on the left (starting from the second person from the left in the front row): Dr. TRAN Ngoc Toan, Vice President, Vietnam Atomic Energy Institute; Dr. Abdul Rahim Bin HARUN, Director General, Malaysian Nuclear Agency; Dr. UESAKA Mitsuru, Chairman, Japan Atomic Energy Commission; Ms. Battsetseg BATMUNKH, Minister of Foreign Affairs of Mongolia; Mr. Manlajav GUNAAJAV, Secretary of the Nuclear Energy Commission and Head of the Executive Office; Dr. Thawatchai ONJUN, Executive Director, Thailand Institute of Nuclear Technology  
Photo above (from upper left to right): Mr. Alan BRINDELL, Director, Corporate Affairs, Australia's Nuclear Science and Technology Organisation (ANSTO); Dr. MD Azizul HAQUE, Chairman, Bangladesh Atomic Energy Commission; Mr. DENG Ge, Secretary General, China Atomic Energy Authority; Mr. Toti TJIPTOSUMIRAT, National Liaison Officer for IAEA, RKA & FNCA, National Research and Innovation Agency (BRIN) of Indonesia; Prof. Erlan BATYRBEKOV, Director General, National Nuclear Center of the Republic of Kazakhstan; Dr. Hyunjoon KWON, Director-General, Space and Nuclear Energy Bureau, Ministry of Science and ICT of the Republic of Korea; Dr. Renato Umali SOLIDUM, Jr., Secretary, Department of Science and Technology of the Philippines; Ms. Lhagva TSEDEVSUREN, State Secretary of the Ministry of Education and Science of Mongolia; Mr. Hua LIU, Deputy Director General, Department of Technical Cooperation, IAEA

meeting, "Enhancing Radiation Cancer Therapy in Asian Region", followed by a Q&A session and discussion.

### Country Reports

The representatives from member countries reported about their recent developments in nuclear policies and nuclear-related activities, as well as the status of cancer therapy with radiation. Japan made a presentation on nuclear energy use to achieve carbon neutrality in 2050, the current state of ALPS (Advanced Liquid Processing System) treated water at TEPCO's Fukushima Daiichi Nuclear Power Station, the action plan for utilization of medical and other radioisotopes, and efforts to develop and secure human resources in the fields of nuclear energy and science. (see p. 4 for details).

### Joint Communique

To conclude the meeting, a Joint Communique including the following courses of action (which are only an excerpt) was adopted.

- Each FNCA member country under the present circumstances maximizes efforts continuously to normalize promptly FNCA project activities and the regular meetings, with ensuring the safety of the project researchers and participants as a prerequisite and in response to the national health policies of the respective member countries.
- Anticipating that the IAEA will make necessary coordination of

cooperation with the relevant international organizations including the World Health Organization (WHO) in combating zoonotic diseases including COVID-19, explore possible collaboration between the FNCA and the IAEA on the ZODIAC project in the future.

- Seek future cooperation between the IAEA and the FNCA on "Rays of Hope" project, expecting that protocols for cancer treatment to be established by FNCA could be widely used under the "Rays of Hope" framework.
- Based on the policy to enhance cancer therapy with radiation technology in the Asian region, established by the member countries, promote FNCA Radiation Oncology Project in the member countries.
- Adopt "outlook on next nuclear reactor including Small Module Reactors (SMRs)" as the topic for 2023 Study Panel, and discuss by inviting experts on their possibilities and prospects in technology, safety and economy, to support nuclear energy use plan in each member country.
- Continuously work on building up public trust on nuclear science and technology in the member countries and the Asian region.

See [http://www.aec.go.jp/jcst/NC/sitemap/fnca\\_e.htm](http://www.aec.go.jp/jcst/NC/sitemap/fnca_e.htm) for more information on the MLM.



# Mongolia

## ■ Background

Mongolia's Nuclear Energy Commission was established in 1962, followed by the radiological laboratory in 1964 and the Nuclear Research Center in 1965. Mongolia joined the IAEA in 1973. Mongolia has no nuclear power generation facilities, although nuclear technology is used in many fields in the country, such as health, agriculture, science and education, industry, environmental study, and mining. With substantial uranium resources, Mongolia is also preparing for uranium exploitation.

## ■ Radiation Therapy in Mongolia

Nuclear energy is used for a wide range of non-power applications. In particular, nuclear technology is commonly used in the medical field, especially for radiation therapy.

The Department of Radiation Oncology of the National Cancer Center of Mongolia (NCCM) is the only unit in Mongolia that provides radiation treatment. In Mongolia, approximately 800 patients receive radiation therapy annually. According to WHO's recommendation, 50% to 60% of cancer patients need radiation therapy. However, only less than 15% of patients receive radiation therapy in Mongolia, suggesting the need to provide high-quality radiation therapy and increase accessibility.

## ■ Implementation of LINAC

A new facility with radiation therapy systems was built in 2019, funded by the Mongolian government. Then, with a 4 million euro loan from the Austrian government, two linear accelerators (LINACs) which mark a breakthrough in the history of radiation therapy were introduced in June of the same year, allowing the start of three-Dimensional Conformal Radiation Therapy (3D-CRT). To develop human resources required for the introduction of new radiation therapy technology, Mongolia has concluded Memorandum of Understanding (MOUs) with Hiroshima University of Japan and the Korea Institute of Radiological & Medical Sciences (KIRAMS) respectively. In 2020, electron beam therapy began to treat breast cancer. The introduction of boost radiation resulted in reduced average lung doses during radiation therapy for breast cancer



Dr. Uranchimeg TSEGMED, National Cancer Center of Mongolia (NCCM)

patients, thus reducing adverse effects.

To perform Intensity Modulated Radiation Therapy (IMRT) and Volumetric Modulated Arc Therapy (VMAT), the two LINACs require partial upgrade and further focus. After virtual training was provided by experts from the IAEA and partner institutions and experts sent by the IAEA verified and audited the commissioning of IMRT and VMAT, the radiation therapy team successfully introduced IMRT and VMAT in June 2022.

## ■ Next Plan

The next plans include the installation of TrueBeam (LINAC), high-precision X-ray irradiation equipment, during the period from the fourth quarter of 2022 to the second quarter of 2023 and the introduction of equipment for Stereotactic Body Radiation Therapy (SBRT) and Respiratory Motion Management (RMM) in 2023. The establishment of a neuroendocrine tumor center and a new neuro-oncology surgical department is also planned with the idea of introducing Stereotactic Radiosurgery (SRS). In addition, Mongolia carries out a national project together with IAEA to introduce image-guided brachytherapy to NCCM for gynecology, breast cancer, and prostate cancer.

To increase accessibility to radiation therapy and improve its quality, NCCM plans to establish a branch with proton therapy facilities in suburban Ulaanbaatar. A project to build a radiation therapy center in the western region of Mongolia is also in progress.

In closing, significant technological advances in radiation therapy have resulted in enhancing patients' survival and their quality of life. Radiotherapy techniques are progressing remarkably, bringing positive effects to patient's well-being. Introduction of new radiotherapy technologies requires not only capital investment in radiotherapy equipment and facilities but also continuous investment in their maintenance and upgrading, and the training of staff as well.



Mr. KAKUDO Takafumi, Deputy Director General, Cabinet Office of Japan (CAO)

## ■ Nuclear Energy Use to Achieve Carbon Neutrality in 2050

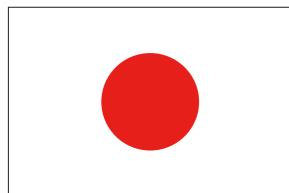
Japan aims to achieve carbon neutrality by 2050 while seeking medium- to long-term economic growth. However, the serious supply shortage of natural gas caused by Russia's invasion of Ukraine has made energy security a common global issue. Every country is struggling to stabilize energy supply. Japan promotes nuclear energy use as a means to respond to global warming, to secure a stable energy supply, and to ensure the economic efficiency of power supply. The Green Growth Strategy Through Achieving Carbon Neutrality in 2050 was established in June 2021, setting forth the goals and schedule concerning SMRs, high-temperature gas reactors, and nuclear fusion. The Sixth Basic Energy Plan was also approved in October 2021, positioning nuclear energy as an important low-carbon baseload power source that contributes to the stability of Japan's energy supply-demand structure in the long term. Nuclear power is expected to comprise approximately 20 - 22% of the total power generation mix by FY2030, up from 4% in 2020. Renewable energy is also predicted to grow to account for as much as 36 - 38% by FY2030, up from 20% in 2020.

## ■ The Current State of ALPS (Advanced Liquid Processing System) treated water at TEPCO's Fukushima Daiichi Nuclear Power Station

The Japanese government announced in April 2021 the basic policy of discharging ALPS treated water stored at TEPCO's Fukushima Daiichi Nuclear Power Station into the sea. To ensure safety of the public and the surrounding environment, ALPS treated water will be discharged into the sea only when TEPCO meets the regulatory standards defined in accordance with the international standards, such as recommendations of the International Commission on Radiological Protection (ICRP). The IAEA has acknowledged that the discharge into the sea is technically feasible and in line with international practice. The IAEA also conducts reviews of the safety aspects of discharge of ALPS treated water from an independent perspective, based on expert and scientific knowledge.

The assessment of the radiological impact on the public and the environment performed by TEPCO by using an internationally accepted method has found that if ALPS treated water is discharged

# Japan



into the sea, the radiological impact on the public and the environment will be far smaller than the natural radiation exposure in Japan. Japan will continue to provide information to the international society in a highly transparent manner.

## ■ Promotion of Production and Utilization of Medical Radioisotopes

Japan is developing an Action Plan Promotion of Production and Utilization of Medical Radioisotopes with the goal of contributing to improvement of people's welfare by enhancing the medical system through cutting-edge nuclear science and technology. Japan is highly dependent on imports for medical radioisotopes and important radioisotopes. To realize domestic production of such radioisotopes, and other goals as well, Japan is considering sequential and integrated measures to promote addressing from research reactors and accelerators based R&D to commercialization and dissemination.

This action plan focuses on the following areas for the achievement of the goals: (1) Promoting initiatives for domestic production and stable supply of the important radioisotopes molybdenum-99 and technetium-99 ; (2) Consolidation of systems and structure to promote utilization of radioisotopes in medical setting; (3) Promoting R&D contributing to domestic production of radioisotopes; (4) Strengthening research infrastructures, human resources, and networks for production and utilization of radioisotopes.

## ■ Human Resource Development and Exchange in the Nuclear Field

Concerns about the sustainability of nuclear education, such as a lack of young human resources in the nuclear field and the aging of research facilities, have driven the Ministry of Education, Culture, Sports, Science and Technology of Japan to launch a project called the Advanced Nuclear Education Consortium for the Future Society (ANEC) in 2021 to maintain and strengthen the foundation for nuclear education. ANEC organically brings together superior resources (e.g., human resources, educational foundation, facilities/equipment, and technologies) held by its member institutions to build an integrated system to develop human resources. Specifically, ANEC is preparing to offer the highest level of education with systematic and specialized education curricula, experiments and hands-on training using nuclear facilities and large laboratories, international training opportunities through systematic collaboration with international organizations and overseas universities, and cooperation and integration with industries and other fields.

## Combating Food Fraud using Nuclear Technology

The FNCA project to harness nuclear technology for combating food fraud commenced in 2022. The first online project inception meeting was held on December 19, 2022 to introduce the project to FNCA member countries. The overarching objective of this ANSTO (Australia) led project is to promote social and economic development through active regional partnerships supporting the peaceful and safe utilisation of nuclear technology. This project will satisfy this aim through encouraging/facilitating the adoption of affordable nuclear techniques by member countries whilst undertaking collaborative research to develop a regional fingerprint database for mitigating fraud in food supply chains.

Countries in Asia play a significant role in global food production and international trade, being one of the largest exporters and importers of food. As there are various links and actors involved in complex and globalized supply chains in the food industry, it is difficult to ensure that all parties honestly follow traceability protocols. There is high evidence of fraudulent activities where food is substituted or adulterated either accidentally or intentionally and this can damage trust and sustainability within the food industry. In particular, buyers and consumers are increasingly interested to know more about the products they buy, including information on provenance and authenticity, and will boycott products or brands if they feel they are being duped. Ultimately, food fraud in supply chains can significantly affect profitability and sustainable development.

This project leverages ANSTO's expertise and capabilities in nuclear technology and harnessing this technology for determining the geographical origin of food to detect fraud in supply chains.

In collaboration with the FNCA member countries, this ANSTO led project aims to undertake research for the establishment of a food



Workshop participants

provenance technology platform using nuclear analysis techniques to mitigate food safety challenges, and the incidents of fraud in the food supply chain.

The project will focus to achieve the following major milestones:

- Sharing of information, transfer of knowledge and improving scientific capacity across member countries

### Workplan and milestones-4 years

Selection of project leaders from participating countries	Establishment of national team, selection of collaborators (Nuclear agency, research institute and University)	Selection of food items for database 1 or 2 food items/country, 1 food must be common	A detailed plan for sample collections and analysis	Workshop to identify knowledge gaps and finalised workplan for each country
Identify analytical facilities	Sample analysis completed	Training (sample analysis, database and modeling)	Establishment of national database	Establishment of regional central database
Testing the efficiency of database and the technology (case study)	Progress review meetings/workshops	Develop consortium partnership for the use of database for export, import and trade		

- Establishment of a federated fingerprint database
- Development of provenance technology platform to comply with international traceability requirements for trade

Active engagement through international research collaborations will greatly benefit the project and assist to deliver regional outcomes that align with respective traceability policies in the FNCA member countries. This international collaboration will also help to share

World's Best Practices and further the development of scientific capacity across member countries to fight food fraud together.

The development of a food provenance platform will act as an advanced technological solution for deterring fraudulent practices in food supply chain. This international platform will minimize the risks of fraudulent food products in the market, thus support well-regarded and effective agribusiness among FNCA member countries which for sustainable growth.

### ~ Message from project leader ~



The second person from the right in the front row:  
Dr. Debashish MAZUMDER (ANSTO)

ANSTO's Novel Seafood Provenance Technology won the Sydney Fish Market Seafood Excellence Awards 2022 for Research Development and Extension Category.

ANSTO, in collaboration with university partners, government bodies, and industry, has developed a technological solution to authenticate seafood and empowering businesses and consumers. Using novel nuclear techniques coupled with machine learning models, the seafood industry is now able to authenticate the geographical origins of seafood with high level of accuracy. This technology will increase transparency of the seafood supply chains, enhancing Australia's credibility as high-quality producers both domestically and internationally.





## Workshop and Open Seminar Held at Takasaki Advanced Radiation Research Institute

The Radiation Processing and Polymer Modification Project aims to promote the development and practical application of new products in the agricultural, environmental, and medical fields through the extensive use of radiation processing using electron beams, gamma rays, and other radiation.

Up to now, various products that meet the needs of each country have been put to practical use. In the agricultural field, plant growth promoters, super water absorbents, biofertilizers, and other products that use naturally derived materials have been developed and commercialized. These results are expected to contribute to the promotion of sustainable agriculture and help address climate change.

Research is also being conducted on growth promotion in fish farming and poultry farming by applying the results obtained in the research and development of plant growth promoters.

In the medical field, wound dressings, 3D cell culture substrates, and hemostatic materials have been developed; and in the environmental field, products developed are being used for metal adsorption, toxic metal removal, and wastewater treatment, serving a wide range of people's lives.

Project leaders from each country have exchanged their outcomes at workshops and have clarified issues and strategies for each theme through group discussions.

Due to COVID-19, the workshop had been held only online since FY2020, but the FY2022 workshop was held for the first time in three years with face-to-face meeting (with some programs also held online) from November 28 to December 2, 2022 at the Takasaki Advanced Radiation Research Institute (TARRI) of the National Institutes for Quantum Science and Technology (QST).

The workshop was attended by 32 participants from 10 countries for presentations and discussions. In the afternoon of the first day, an open seminar entitled "Radiation Technology for Sustainable Development in Asia - Success Story and Future Challenge -" was held jointly with the TARRI Open Seminar.

In the open seminar, the following speakers respectively delivered lectures entitled as follows: "International Nuclear Cooperation and Contribution for Asian Countries" by Mr. OBATA Ryoji (Deputy Director, International Nuclear and Fusion Energy Affairs Division, Ministry of Education, Culture, Sports, Science and Technology of Japan); "Activities on Forum for Nuclear Cooperation in Asia" by Dr.

## Application of Radiation Processing Technology in Agriculture, Medicine and Environment Thematic Studies in Line with Sustainable Development Goals (SDGs)

TAMADA Masao (FNCA Advisor of Japan); "Radiation Processing of Natural Polymers and its Applications" by Dr. NAGASAWA Naotsugu (Senior Principal Researcher, Department of Advanced Functional Materials Research, TARRI, QST); "Development of Microalgae Highly Producing Oil from CO<sub>2</sub>" by Prof. HASUNUMA Tomohisa (Professor, Engineering Biology Research Center, Kobe University); "Radiation Processing of Natural Polymers for Agricultural Application in Thailand" by Dr. Phiriyatorn SUWANMALA (Deputy Executive Director, Thailand Institute of Nuclear Technology); "Radiation Technology Turns the Philippines' kappa-Carrageenan into an Agricultural Solution" by Dr. Charito T. ARANILLA (Senior Science Research Specialist, Philippine Nuclear Research Institute).

During the opening session on the first day of the workshop, Mr.



Open seminar

OBATA, Dr. MAEKAWA Yasunari (Director General of TARRI), and Mr. WADA Tomoaki (FNCA Coordinator of Japan) gave opening remarks.

Starting from the second day, presentations from each country and group discussions were held and future activity plans were discussed on the eight research themes of the project: 1) Degraded Chitosan for Animal Feed, 2) Hydrogel for Medical Application, 3) Environmental Remediation, 4) Synergistic Effect among Plant Growth Promoters, Super Water Absorbents, and Biofertilizers, 5) Plant Growth Promoters and Super Water Absorbents inclusive Process Development, 6) Mutation Breeding of Microbe using Radiation, 7) Sterilization and Sanitization using Radiation, and 8) Recycle Plastic.

On the last day, the participants made a technical visit to TARRI and NHV Corporation to tour around relevant facilities.



Group discussion at the workshop





## Promoting Radiotherapy for Cancer in the Asian Region Radiation Oncology Project Workshop Held in Mongolia

The Radiation Oncology Project, having 11 participating countries, aims to establish and disseminate optimal radiotherapy in the Asian region by conducting joint clinical trials on radiotherapy for cancers that are common in the region.

An annual workshop for project participants was held in Ulaanbaatar, Mongolia for four days from September 29 to October 2, 2022. This was the first face-to-face meeting in three years after the COVID-19 pandemic and the first long-awaited meeting was held in Mongolia since the country joined the project in FY2011.

The meeting on the first day, held in a hybrid form with online participants, provided an update on the progress of clinical trials for cervical, nasopharyngeal, and breast cancer underway in the project. Palliative radiotherapy for bone and brain metastases of cancer, being considered for new clinical trials, was also discussed.

On the second day, an open lecture was held at the National Cancer Center of Mongolia (NCCM), where nine lectures focusing on radiotherapy for various cancers were given (see right side of page for details).

On the second and third days, dose audits for brachytherapy and external radiation therapy were conducted at NCCM mainly by Mongolian and Japanese medical physicists, as part of activities for Quality Assurance (QA) and Quality Control (QC) of doses in

radiotherapy.

On the third day, in parallel with the dose audits, the participants visited a radiotherapy site at NCCM and also received hands-on training in radiotherapy for cervical cancer under the guidance of Japanese radiation oncologists (see right side of page for details). On the fourth and final day, draft minutes were compiled to summarize the workshop.



Workshop participants receiving an explanation of a linear accelerator (high-energy radiotherapy device)

## Improving the Level of Radiotherapy Skills Through Education and Technical Guidance

Radiotherapy, which is said to be one of the three pillars of cancer treatment along with surgery and anticancer drug therapy, is not widely used in Mongolia and is not well recognized among medical professionals in the country. In light of this situation, the main objective of this workshop was to provide local medical professionals involved in cancer treatment with a detailed knowledge of radiation oncology. The National Cancer Center of Mongolia (NCCM), which hosted the workshop, is the only hospital in the country where radiotherapy is provided. In addition to open lectures on radiotherapy for the NCCM medical staff, hands-on training was provided for physicians and medical physicists involved in radiotherapy.

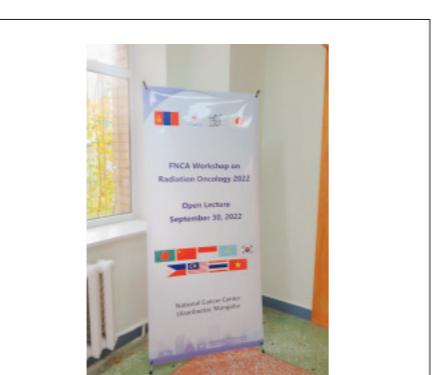
### ■ Open Lectures

Focusing on the education and dissemination of radiotherapy, the lectures incorporated requests from the NCCM. In addition to cervical cancer and breast cancer, which are common in the Asian region, a lecture on radiotherapy for liver cancer, for which Mongolia is said to have the highest mortality rate in the world, was given. A lecture on palliative radiotherapy for symptoms and pain caused by cancer was also given, with interpretation into the local language (Mongolian). In addition, cutting-edge treatments such as particle beam therapy were also presented to promote understanding of radiotherapy to those concerned. Furthermore, local experts introduced the current status of radiotherapy in Mongolia and the country's efforts against cancer. It is hoped that the lectures will raise local awareness of radiotherapy.

### ■ Hands-on training on 3D-IGBT

The project is currently conducting a clinical trial using a treatment method called 3D image-guided brachytherapy (3D-IGBT) for cervical cancer. The 3D-IGBT, which allows for more accurate and safer irradiation of the cervix with tumors, requires high technical skills. Since the start of the clinical trial in 2018, Japan has taken the lead in providing technical guidance to project participants at workshops and in training programs to ensure correct treatment at their facilities. Following the 2018 workshop in Bangladesh, the recent workshop held a second hands-on training session. Under the practical guidance of radiation oncologists and medical physicists mainly from Japan, NCCM's radiotherapy personnel and workshop participants learned 3D-IGBT procedures and techniques on the basis of case studies. Some participants in the training had learned 3D-IGBT before and some had been performing 3D-IGBT treatment on a daily basis. Through the training, question-and-answer session, and exchange of opinions, these participants were able to reconfirm the treatment method and learn again about precautions. It is hoped that this will help project participants conduct appropriate treatment and obtain reliable clinical trial results.

It is hoped that the workshop and hands-on training will lead to improving the level of radiotherapy technology not only among medical professionals in Mongolia but also among many other medical professionals in Asia.



Open lecture at the National Cancer Center of Mongolia (NCCM)



Explaining cases addressed in hands-on training



Training for 3D-IGBT treatment planning



Discussion on 3D-IGBT treatment planning



Practical instruction using training kits

## Workshop Held in Bangkok, Jointly Hosted by Thailand Institute of Nuclear Technology and Rice Department of Thailand

The aim of the Mutation Breeding Project is to contribute to increasing food production and crop quality in the Asian region by using breed improvement technologies that employ the irradiation of gamma rays, ion beams, and other radiation to develop new varieties of crops that are highly needed in Asian countries (e.g., sorghum, soy beans, orchids, bananas, and rice).

The project has focused on rice, an important crop in Asia, since FY2013. Through activities with attention to contribution to climate change issues of growing global concern, as well as to sustainable agriculture, new varieties that are highly resistant to various environmental stress, including resistance to disease, drought, and salinity, have been developed in many member countries.

Since FY2018, the focus has expanded beyond rice to include other major crops in high demand in relevant countries. Activities have begun to contribute to the promotion of sustainable agriculture by developing new varieties that can adapt to environmental changes caused by climate change and that produce high yields even with low input of chemical fertilizer and pesticide.

In some member countries, studies are underway to develop new varieties from landraces that are well adapted to the local environment. New varieties are expected to grow better in the local environment with improved characteristics in yields, cultivation period, and height, while inheriting favorable characteristics from the landraces.

The FY2022 workshop took place from February 21 to 23, 2023 in Bangkok, Thailand. It was a face-to-face meeting held for the first time in three years (with virtual participation possible except for the technical visit).



New mutant variety "Lal Atom Dhan 1" developed in Bangladesh with the cooperation of QST-Takasaki, Japan on ion beam irradiation. This variety can be cultivated with less fertilizer and irrigation water.

The workshop was jointly hosted by the Ministry of Education, Culture, Sports, Science and Technology of Japan, Thailand Institute of Nuclear Technology, and Rice Department of Thailand and was attended by 60 people from 10 countries.

Held on the first day was an open seminar titled "Application of Radiation Technology and Mutation Breeding Technology for Sustainable Agriculture." Presentations were made by Thailand, Japan, Malaysia, and Mongolia on successful practices and future challenges related to mutation breeding in each country.

Participants from member countries made presentations on the Mutation Breeding of Major Crops for Low-input Sustainable Agriculture under Climate Change project, followed by discussions.

In the afternoon on the second day, the participants made a technical visit to the Thailand Institute of Nuclear Technology in Nakornnayok to tour around relevant facilities.

Technical visit to the Thailand Institute of Nuclear Technology



## Toward Effective Mutual Use of Research Reactors Among Asian Countries

Research reactors have been operating in a lot of Asian countries for many years, and they are utilized in a variety of fields. In the Research Reactor Utilization (RRU) project, countries share information on characteristics, usage status, etc., of their research reactors with aims of improving the research base and technical skills of researchers and engineers in FNCA member countries. The RRU project covers a wide range of topics, and workshops held every year represent good opportunities for network building.

The recent workshop for this project was held in Mito City and Tokai Village, Ibaraki Prefecture for three days from November 22 to 24, 2022 in a hybrid form with 12 countries participating.

The RRU group exchanged information on a variety of topics, such as radioisotope production, new research reactors including Small Modular Reactors (SMRs), and neutron scattering.

Neutron scattering is an excellent method for determining the atomic-to nano-order structure of materials using thermal and cold neutrons. While this method was used primarily for determining the magnetic structure of magnetic materials, it is now used for a wide range of applications from the research of various materials in physics, chemistry, and biology to industrial applications.

The Neutron Activation Analysis (NAA) group exchanged information on environmental monitoring using Instrumental NAA (INAA) and other measurement techniques for a wide range of samples, including air pollutants as well as contaminants in soil, rivers, lakes, and oceans.



INAA is a non-destructive method that can quantitatively analyze a large number of elements simultaneously. This analytical method takes advantage of the high penetrability of neutrons and gamma rays emitted after activation, and is actively used in various countries. Its ability to quantify whole solid samples is an outstanding feature not found in other analytical methods.

As a technical visit, the group members visited the Nuclear Science Research Institute of the Japan Atomic Energy Agency (JAEA), where they received an overview of the JRR-3 research reactor, and toured the beam hall and other facilities. The JRR-3 resumed service in July 2021, and <sup>198</sup>Au (gold) and <sup>192</sup>Ir (iridium) produced by neutron irradiation in the reactor have been shipped and used for radiotherapy.

Exterior view of JRR-3 building



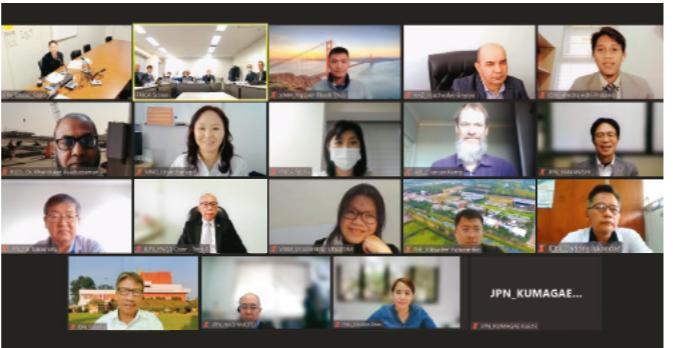
## Information Sharing on Radiation Safety and Radioactive Waste, and Safety Improvement in Handling of the Radioactive Waste

The Radiation Safety and Radioactive Waste Management Project aims to improve safety in the handling of radiation and radioactive waste by sharing information among member countries on the proper treatment and disposal of radiation and radioactive waste, as well as their environmental impact, thereby deepening mutual understanding of each country's approach to radiation safety, as well as waste management in research institutions and other organizations. The participants will gain new perspectives by learning about the efforts of other countries through the activities of this project, and such activities will also help the participants improve their own country's efforts. In addition, information obtained through the project activities is compiled in various reports and published on the FNCA website.

This project is currently working on the theme of Naturally Occurring Radioactive Materials (NORM) and Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM) to investigate the current status, management, and regulatory systems in the member countries and to compile them into a consolidated report.

This fiscal year's workshop was held in a hybrid form in Tokyo, Japan, on January 17-18, 2023, and was attended by 10 FNCA member countries. On the first day of the workshop, each country presented a draft to be included in the consolidated report on NORM and TENORM. The participants presented the current situation and problems of their countries, as well as the framework of safety regulations.

On the second day, the efforts of the IAEA, ICRP, European Commission (EC), and other international organizations were



Workshop participants

introduced as a movement of NORM and TENORM in international organizations. As regards environmental radiation, which is the theme of the next phase of this project, policy and report of Japanese government related to the discharge of the ALPS treated water stored at TEPCO's Fukushima Daiichi nuclear power station, as well as IAEA's review mission and annual amount of discharge of tritium were explained. This was followed by a question-and-answer session and discussion on the draft consolidated report of each country presented on the first day. Since NORM and TENORM pose very different situations and challenges to different countries, it is hoped that this workshop will help to deepen mutual understanding and to establish or review systems in the member countries.

The next fiscal year's workshop will be held in Malaysia, where member countries will continue to work toward the completion of the consolidated report on NORM and TENORM.



(Vietnam) Research activities on rare earth extraction



(Indonesia)  
Left: Research of the prospective sites and design for TENORM waste disposal from tin industry.  
Below: Clean up of the TENORM

## Strengthening Cooperation in the Asian Region on Nuclear Security and Safeguards

Together with nuclear safety, "nuclear security" for protecting nuclear and radiological materials from malicious acts (e.g., theft or unauthorized access) and "safeguards" for protecting nuclear materials from being diverted to the production of nuclear weapons are essential to promoting the peaceful use of nuclear energy. The Nuclear Security and Safeguards Project is strengthening nuclear security and safeguards in the Asian region through measures such as the sharing of relevant experiences, knowledge, and information from the participating countries and the promotion of human resource development in those countries.

The workshop for this project was held in a hybrid form in Bangkok, Thailand for three days from January 10 to 12, 2023. The 12 FNCA member countries, the International Atomic Energy Agency (IAEA) and the Joint Research Center of the European Commission (EC/JRC) participated in the workshop.

One of the key challenges in the field of nuclear security is nuclear forensics, which analyzes the origin and transportation routes of nuclear materials seized and collected by investigative authorities. Development of a nuclear forensics capability will also assist the investigative activities of law enforcement agencies and will have the effect of deterring nuclear terrorism. In this workshop, a table-top exercise (TTX) on nuclear forensics was conducted, and the member countries shared ideas on the national systems needed to build nuclear forensics capabilities and how the responsible organizations should work together.

In addition, each member country has developed a stakeholder matrix to get an overall picture of the national nuclear security posture and to identify the human resources needed to strengthen nuclear security, with the aim of promoting human resource development related to nuclear security. Prior to this workshop, a technical meeting



Online participants



Workshop in progress

on stakeholder matrices was held online in July 2022. In the area of safeguards, the member countries discussed the IAEA's Additional Protocol (AP) for strengthening the safeguards agreements on nuclear nonproliferation that each participating country has concluded with the IAEA; shared information on the recent efforts of each country in the workshop; and deepened discussions on future cooperative activities among the countries. The member countries aim to study good practices of export control in implementing the AP and to create a collection of good practices that will be meaningful and useful to all member countries.



Technical Visit to Emergency Operation Center (Thailand)



Table-top exercise on nuclear forensics at the workshop (Thailand)



## Agreement to Implement New Project of Using Nuclear Technology to Combat Food Fraud

The Cabinet Office of Japan as the secretariat of the Japan Atomic Energy Commission (JAEC), in collaboration with the Ministry of Education, Culture, Sports, Science and Technology of Japan, held online the 22<sup>nd</sup> FNCA Coordinators Meeting on June 28, 2022. The meeting was attended by representatives from 12 FNCA member countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, the Republic of Korea, Malaysia, Mongolia, the Philippines, Thailand, and Vietnam.

### ■ Summary of the outcome of the meeting

The outcome of the meeting is summarized as follows.

- In accordance with the Joint Communique of the 22<sup>nd</sup> FNCA Ministerial Level Meeting, the meeting agreed to further accelerate FNCA activities on agricultural development, food safety, environmental protection, health applications, nuclear security, and human resource development. The meeting also agreed to maximize efforts to promptly normalize FNCA project activities and seven regular workshop meetings in response to the constraints brought about by the COVID-19 pandemic while ensuring the safety of the project researchers and participants as a prerequisite. These activities will be subject to national health policies.
- The meeting implemented a mid-term evaluation of the Mutation Breeding Project and an end-of-project evaluation of two projects terminated at the end of March 2022, namely, the Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Applications Project and the Research on Climate Change using Nuclear and Isotopic Techniques Project.
- The meeting conducted a preliminary evaluation of two project proposals while considering their relevance, effectiveness, efficiency, impact, and sustainability. As a result, the meeting agreed to start in fiscal year 2022 a new phase of the three-year Radiation Processing and Polymer Modification Project and a new five-year Combating Food Fraud Project.
- The meeting discussed the progress of four ongoing projects: the Radiation Oncology, Research Reactor Utilization, Radiation Safety and Radioactive Waste Management, and Nuclear Security and Safeguards Projects, and acknowledged that the projects were successfully implemented with the effective cooperation of the member countries.
- The meeting agreed that the FNCA should promote its cooperation with the IAEA/RCA on the Mutation Breeding, Radiation Oncology, and Radiation Processing and Polymer Modification Projects for possible synergy, as well as its sharing of experience with non-RCA member states.

## Discussion on Building Public Confidence in Nuclear Science and Technology (Stakeholder Involvement)

The Cabinet Office of Japan as the secretariat of JAEC held online the 2022 Study Panel on March 9, 2022. The meeting was attended, through an online conference system, by experts in the fields of radiation protection and radioactive waste management from OECD/NEA and Sweden, in addition to representatives from 11 FNCA member countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, the Philippines, Thailand, and Vietnam.

In his keynote speech, Mr. Greg LAMARRE, Head of the Division of Radiological Protection and Human Aspects of Nuclear Safety, OECD/NEA, introduced the concept of stakeholder involvement and provided an overview of the NEA's efforts. Furthermore, Prof. UESAKA Mitsuru, Chairman of JAEC, gave an overview of efforts in Japan.

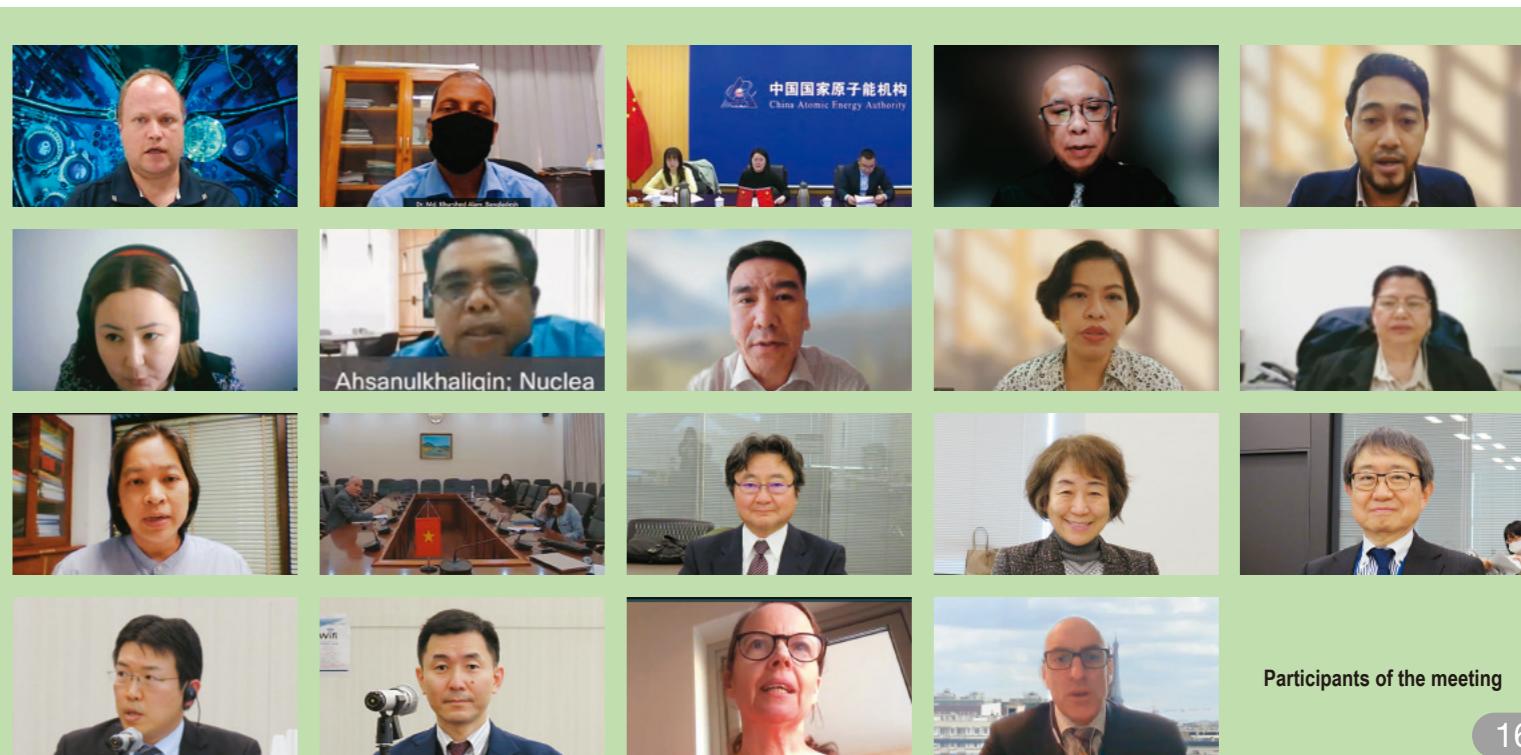
In the session of case studies on radioactive waste management, Ms. Johanna SWEDIN, Scientific Secretary of the Swedish National Council for Nuclear Waste, explained the situation in Sweden, which has made the most progress worldwide in the site selection process for the geological disposal of spent fuel. Furthermore, Mr. SHIMOHORI Tomokazu, Director of the Radioactive Waste Management Policy Division in the Agency for Natural Resources and Energy, explained the situation and challenges facing Japan, which has entered the process of selecting a disposal site.

In the session of case studies on nuclear facilities in general, reports were presented from Australia, Indonesia, Malaysia, and Bangladesh.

### ■ Summary of the meeting

The chairman of the meeting, Mr. SANO Toshio, Commissioner of JAEC, made the following remarks.

- Since there are differences in the forms and methods of public participation in decision-making processes depending on the history, culture, social context, and institutional structures of each country, there is no common or universal model that can be successfully applied to all cases. The first common basis required is achieving transparency with adequate, open and sufficient dialogue among the relevant stakeholders and building trust in the eligibility and competence of those involved in the planning and implementation of projects. Based on this, strategic planning and individual methods that reflect the circumstances of each party may be crafted on a case-by-case basis for the process of participation in decision-making.
- Building public trust in nuclear power projects requires painstaking efforts that need to be made patiently for long periods, and without such efforts, no projects will succeed.
- Decisions related to nuclear energy should be based on scientifically accurate facts and understanding. It is thus necessary to consider the promotion of nuclear science in general education in order to build universal trust not only among those involved in nuclear science and technology, but also among the public at large.



Participants of the meeting

Activities	Date	Venue
The 23 <sup>rd</sup> FNCA Ministerial Level Meeting	October 31, 2022	Mongolia·online
The 22 <sup>nd</sup> FNCA Senior Officials Meeting	June 29, 2022	online
2022 Study Panel	March 9, 2022	online
The 22 <sup>nd</sup> FNCA Coordinators Meeting	June 28, 2022	online
Radiation Utilization Development	Mutation Breeding WS	February 21 - 23, 2023
	Radiation Processing & Polymer Modification WS	November 28 - December 2, 2022
	Combating Food Fraud WS	December 19, 2022
	Radiation Oncology WS	September 28 - October 2, 2022
Research Reactor Utilization Development	Research Reactor Utilization WS	November 22 - 24, 2022
Nuclear Safety Strengthening	Radiation Safety and Radioactive Waste Management WS	January 17 - 18, 2023
Nuclear Infrastructure Strengthening	Nuclear Security and Safeguards WS	January 10 - 12, 2023
		Thailand·online

## FNCA Coordinators

Country	Name	Affiliation
United Kingdom	Ms. Pippa AINLEY	Assistant Advisor, Chief Operating Officer Group Australian Nuclear Science & Technology Organization (ANSTO)
Bangladesh	Engr. Nasir AHMED	Member (Engineering), Bangladesh Atomic Energy Commission (BAEC)
China	Mr. Ping HUANG	Deputy Director General, Department of International Cooperation China Atomic Energy Authority (CAEA)
Indonesia	Mr. Totti TJIPTOSUMIRAT	National Liaison Officer for IAEA TC Programme, National Research and Innovation Agency (BRIN)
Japan	Mr. WADA Tomoaki	Chief Executive Director, Kobe Science Museum
Kazakhstan	Prof. Erlan BATYRBEKOV	Director General, National Nuclear Center of the Republic of Kazakhstan
South Korea	Ms. Si Jeong PARK	Director, Nuclear and Fusion Energy Cooperation Division Ministry of Science and ICT (MSIT)
Malaysia	Dr. Muhammad Rawi Bin Mohamed ZIN	Senior Director, Management Program Malaysian Nuclear Agency (Nuklear Malaysia)
Timor-Leste	Mr. Chadraabal MAVAG	Head, Nuclear Technology Department, Nuclear Energy Commission (NEC)
Philippines	Dr. Lucille V. ABAD	Chief, Atomic Research Division Philippine Nuclear Research Institute (PNRI)
Thailand	Ms. Kanchalika DECHATES	Head of International Cooperation Section, Thailand Institute of Nuclear Technology (TINT)
Vietnam	Dr. TRAN Ngoc Toan	Vice President, Vietnam Atomic Energy Institute (VINATOM)

## FNCA Coordinator of Japan

While I have had my message included in this newsletter every year, the biggest change from last year to this year is the change in the global energy situation. Since last spring, the global struggle for natural gas and oil has been intensifying, and the rising energy prices resulting from spikes in gas and oil prices have had a significant impact on the lives of citizens in many countries. Furthermore, these price spikes are expected to continue for a considerable time period. After the accident at TEPCO's Fukushima Daiichi nuclear power station in 2011, plans for nuclear power generation around the world slowed down, but under the current energy situation, there is a growing movement to reevaluate such plans.

With all countries having adopted carbon neutral policies to comply with the Paris Agreement, it is no longer possible to exclude nuclear power from the future energy mix, and the advantages of nuclear power are being reevaluated also from a price standpoint. France and the UK have clearly announced a return to nuclear power, and in Asia, new measures for nuclear power are being considered in Japan, Republic of Korea, and other countries.

In the case of mega solar power generation, the cost of solar power generation itself is lower than that of nuclear power generation due to the cost reduction of solar panels.

Nevertheless, nuclear power generation is estimated to be superior

when considering the additional cost of maintaining a stable balance between power demand and supply.

Meanwhile, a list of FNCA's recent achievements in the field of radiation application includes: a significant yield increase in a new variety of rice through mutation breeding; development of plant growth promoters and super water absorbent to grow plants resistant to environmental changes; demonstration of usefulness of research on radiation processing in the environmental and medical fields; and high survival rates in clinical trials for cervical cancer, nasopharyngeal cancer, and breast cancer. In the research reactor utilization project, studies on small modular reactors are underway; in the radiation safety and radioactive waste management project, studies on NORM and TENORM have started; and in the nuclear security field, stakeholder matrices for strengthening national systems are being studied. A new Australian-led project of combating food fraud using nuclear technology was also launched in 2022. The achievements of FNCA are mainly in the field of radiation applications. By actively disseminating such achievements, we believe that people will perceive nuclear power and radiation as something close to their daily lives, leading to the spread of nuclear energy.

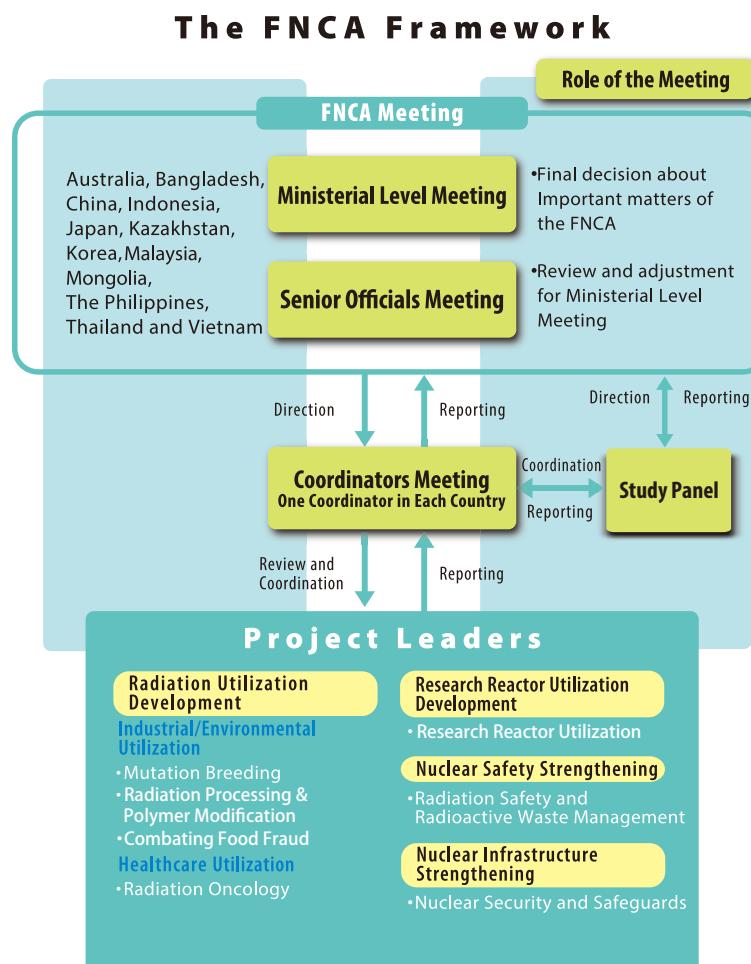
**WADA Tomoaki, FNCA Coordinator of Japan**



# What's FNCA?

## What is FNCA (Forum for Nuclear Cooperation in Asia)?

FNCA is a framework for international cooperation for the peaceful use of atomic energy, led by the Cabinet Office and Ministry of Education, Culture, Sports, Science and Technology of Japan. Twelve countries, i.e. Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, The Philippines, Thailand, and Vietnam, are conducting collaborative activities under equal partnership for joint research on nuclear science and technology, information exchange, and support for nuclear power infrastructure development.



### FNCA Ministerial Level Meeting

A meeting of ministerial level representatives who are in charge of science and technology policy and supervising nuclear energy and radiation uses. FNCA's cooperation policies and nuclear energy policies of the member countries are discussed in this meeting.

### FNCA Senior Officials Meeting

Senior officials from member countries have preliminary discussion on the agenda for the Ministerial Level Meeting.

### FNCA Coordinators Meeting

A coordinator is appointed for each member country to oversee FNCA project activities in various nuclear fields. Coordinators gather to assess the progress of individual projects and discuss their results, evaluations, future policies and general management of FNCA.

### Study Panel

In the Study Panel, senior officials and experts from the FNCA member countries discuss on nuclear policy/technical matters of both power and non-power areas of nuclear energy with a view to applying such knowledge to domestic and international activities.

### Projects

For seven projects in four areas associated with radiation utilization and nuclear power infrastructure, the FNCA member countries take turns holding a workshop or an open seminar to discuss achievements and the plans of activities.

**FNCA**  
Forum for Nuclear Cooperation in Asia

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