

Promoting cancer treatments with radiation technology and exchange of human resources

FNCA Ministerial Level Meeting held in Tokyo...01

Latest Trends of Nuclear Energy Policy in FNCA Countries03
Special Topic 1- Climate Change Science Research Project05
Special Topic 2- Mutation Breeding Project07
Results of Activities in 3 years09
Introduction of Ongoing 7 Projects13
FNCA Award 201915
FNCA Activities in JFY 201916
The 20th Coordinators Meeting17
2019 Study Panel18
What's FNCA?19

Forum for Nuclear Cooperation in Asia (FNCA)
The 20th Ministerial Level Meeting (MLM)

Tokyo, Japan, December 5, 2019

Host: Cabinet Office of Japan (CAO), Japan Atomic Energy Commission (JAEC)



◎ Promoting cancer treatments with radiation technology and exchange of human resources

FNCA Ministerial Level Meeting held in Tokyo

The 20th FNCA Ministerial Level Meeting (MLM) was held at Mita Conference Hall, Tokyo, Japan on December 5, 2019. The meeting was organized by the Cabinet Office of Japan (CAO) and the Japan Atomic Energy Commission (JAEC).

Ministers in charge of nuclear science technologies from FNCA member countries attended the meeting and held policy discussions under the theme "Radiation Technology Utilization in Human Health and Medical Well-Being".

From Japan, Mr. TAKEMOTO Naokazu, Minister of State for Science and Technology Policy, attended the meeting and mentioned that utilizing radiation in the medical field has been rapidly expanding in recent years globally and FNCA has made achievements, through its project activities, in the treatment of particular types of cancers found predominantly in Asia and has established and disseminated standard treatment procedures. The meeting concluded with the adoption of a joint communique referring to the "Promotion of cancer treatments with radiation technology widely in Asia", "Activation of organizational exchange of human resources among universities and research institutions" and so on.

■ Keynote Speech

Dr. HIRANO Toshio, President of National Institutes for Quantum and Radiological Science and Technology (QST), gave a keynote speech entitled "Future Dream: Quantum Scalpel -Aim for healthy and long-living society with zero-cancer-deaths-" in which he introduced the history, present situation and goals of QST's development of radiation therapy equipment. Also, Dr. OKA Yoshiaki, Chairman of JAEC, gave a presentation entitled "Nuclear Education and Human Resource Development" in which he introduced the history, results, and future plan of educational cooperation between Japan and the other countries in Asia.

■ Country Report

Representatives of the member countries reported on the progress of their nuclear policies and efforts, including the present situation of "applying radiation technology to medical care" and "developing human resources in the field of nuclear energy". Japan's report which was taken note of by the representatives of the member countries contained the situation of restarting operations of nuclear power plants, promotion of the development of innovative nuclear technology, decommissioning of the TEPCO's Fukushima Daiichi Nuclear Power Station (NPS) and recovery of Fukushima, nuclear emergency preparedness, boosting of radiation utilization in industries and other topics.

■ Round Table Discussion

The theme "Radiation Technology Utilization in Human Health and Medical Well-Being" was divided into three subthemes: "Policies and Issues in the Radiation Medicine Field", "Situation of Leading-Edge Technology for Radiation Therapy for Tumors", which introduces the present situation and future perspectives of radiation therapy technologies including heavy particle beam that is led by Japan, and "Present Situation and Problems of Radiation Medical Technology, Including Clinical Cancer Treatment Methods Originating in FNCA". Kazakhstan, Japan and Thailand introduced the above-mentioned subthemes respectively, and opinions were exchanged based on them. The discussion ended with a speech given by Mr. SANO Toshio, the Chair of the round table discussion and the Commissioner of JAEC. In his speech he said that in order for people to enjoy the benefit of advanced medical care, it is necessary to establish a technology infrastructure that supports the safety of such medical care and a sound medical system that takes into account the fair dealing between the patients and the government for their expenses. And that is a mission of the government. And it is also important to spread the cutting-edge cancer therapy equipment.

■ The 3rd FNCA Award Ceremony

FNCA awards were given to the countries that have made significant achievements through the FNCA project activities in 2018. The Best Research Team was awarded to Kazakhstan (Radiation Processing and Polymer Modification), and the Excellent Research Team was awarded to Vietnam (Mutation Breeding) and Australia (Research Reactor Utilization) (For details, refer to page 15).

■ Joint Communique

The meeting concluded with the adoption of a joint communique that defines the following activity policies:

- Continue to accelerate the FNCA Radiation Oncology project according to the topic endorsed during the Round Table Discussion in the 20th Ministerial Meeting to enhance cancer therapy with radiation technology in Asia.
- Encourage member countries to reinforce their cooperation regarding environmental protection and the countermeasures to climate change including the adoption of "Nuclear Isotopic Technology and Climate Change" as the main topic of the 2020 Study Panel.
- Encourage member countries to utilize the outcomes of projects with end-users, taking into account the possibility of their commercialization, which can more effectively contribute to the member country's socio-economic well-being.
- Promote the activities prioritized by member countries in a wide spectrum of interests from member countries to support their sustainable development.
- Activate organizational exchange of human resources among universities and research institutions, and of information related to the reinforcement of Human Resources Development (HRD) infrastructure by utilizing the FNCA networks.
- Continue to promote public acceptance of nuclear technology through the FNCA website and open lectures, and make efforts to maintain or reinforce further the relationship with relevant international organizations, including the IAEA and the OECD/NEA.

Mr. TAKEMOTO Naokazu Minister of State for Science and Technology Policy, Japan

■ Restarting the Nuclear Power Plants in Japan

Nuclear power is considered as an important energy source available at inexpensive prices in safe and stable manner. It is also expected to contribute to reducing greenhouse gas emissions. Japan intends to achieve stable, safe, and long-term use of existing light-water reactors. Only when the light-water reactors satisfy the new regulatory standards, those will be moved forward to restart.

■ Promoting the Innovation of Nuclear Technologies

One of the roles of the government is to present policies and plans for R&D of nuclear technologies. Private sector is expected to lead the technological development as the end-user of the technologies to be developed.

It is necessary to make the users of and investors in the technologies involved in a project from the beginning and to implement the market-oriented technology selection process. Meanwhile, there is an excessive financial risk for the private sector to undertake the nuclear R&D program alone, and a considerable period of time is required to achieve such a program. Therefore, according to the degree of maturity of each technology, the government provides them with funding supports and R&D infrastructures when appropriate. Furthermore, to promote private-sector-led nuclear innovation, human resource development and interaction with regulatory authorities are also important.

■ "International Roundtable for Final Disposal of High-level Radioactive Waste"

According to the agreement concluded at the G20 Karuizawa Ministerial Meeting held in Japan in June 2019, this roundtable was launched with the aim to formulate "the basic strategy for intergovernmental cooperation in final disposal" and to collect "the best practices of public dialogue activities of participating countries". The first roundtable was held in Paris, hosted by Japan, on October 14 in cooperation with the OECD/NEA, and representatives of the main countries using nuclear power participated in it.



■ Decommissioning of TEPCO's Fukushima Daiichi NPS and Reconstruction and Regeneration of Fukushima

Based on the medium and long-term roadmaps for Fukushima Daiichi NPS decommissioning, etc., the decommissioning of the Power Station is being implemented steadily and safely. Contaminated water from the Power Station is purified by purification facility and most of the radionuclides, except for tritium, are reduced to about one millionth compared to the radionuclides before purification. The treated water is safely stored in tanks in the site. The government is discussing how to handle the treated water at the subcommittee, but has not reached any conclusion yet. The average air radiation dose rate within 80 km from TEPCO's Fukushima Daiichi NPS has decreased by approx. 77% since July 2011. Evacuation orders have been cancelled in most of the areas in Fukushima Prefecture. At present, evacuation orders are only given to approximately 2.5% of areas in Fukushima Prefecture. The air radiation dose rate of major cities in Fukushima Prefecture is almost the same level as that of major cities overseas. Japan has the strictest level of standards in the world for managing radioactive contamination of food. Foods and agricultural products exceeding the standards are not permitted to be distributed in the market. Under the leadership by the Japanese government, reconstruction and regeneration of Fukushima is advancing steadily.

Prof. Bambang Permadi BRODJONEGORO

Minister for Research and Technology,
Chairman for National Agency for Research and Innovation
Republic of Indonesia

In the Republic of Indonesia, nuclear science technologies aimed at peace and public well-being have been used in various fields for national development for over 50 years and have contributed to the national achievement of the sustainable development goals (SDGs). Nuclear science technologies play important roles in medical and human health areas including the fields of nuclear medicine diagnosis, radiotherapy, and production of radiopharmaceuticals for cancer, which is one of the most significant diseases causing death.



Mr. ZHANG Jianhua

Vice Chairman, China Atomic Energy Authority (CAEA)
People's Republic of China

This year coincides with the 70th anniversary of the founding of the People's Republic of China. China adheres to the concept of innovation, coordination, green, open and sharing, and has explored the road to nuclear energy development.

The application of Linac (medical linear accelerators) in China is rapidly spreading. At present, nearly 2,000 accelerators have been used. Important progress has been made in proton and heavy ion therapy techniques, etc. Radiotherapy has become one of the three main clinical treatments for tumor patients in China.

Mr. Manlaijav GUNAAJAV

Secretary of the Nuclear Energy Commission (NEC)
Head of Executive Office
Mongolia

Nuclear technology applications are expected to play a major role in healthcare services modernization. There are also two main events took place in the country, inter alia, the establishment of the National Diagnostic and Treatment Center and the launch of Linear Accelerators in National Cancer Center. These will definitely increase the level of medical services and will positively impact on the development of health sector in the country.



Dr. Renato U. SOLIDUM, Jr.

Undersecretary
Department of Science and Technology (DOST)
Republic of the Philippines

The Philippine Nuclear Research Institute (PNRI) has been continuously working toward re-establishing the Philippine research reactor-1 (PRR-1), which stopped operation in 1988. It also has a plan to commission the Project on Subcritical Reactor Assembly for Training, Education and Research (SATER) by using the TRIGA fuel elements by 2020. In the medical and human health fields, the Philippines continues to work on increasing awareness regarding the roles of radiotherapy/radiation oncology and the improvement of Image Guided Brachytherapy (IGBT) technologies in cervical cancer.



Understanding Climate Change through Measurement using Radiation, Radionuclides and Isotopic Techniques

Climate Change Science Research Project Workshop held in Kyoto and Fukui

Venue : Kyoto city, Kyoto Prefecture and Tsuruga city, Fukui Prefecture, Japan

Held on : October 7 - 10, 2019

Hosted by : Australian Nuclear Science and Technology Organisation (ANSTO)

Ministry of Education, Culture, Sports, Science and Technology (MEXT)

Participating Countries : Australia, Bangladesh, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (10 Countries)

The Climate Change Science Research Workshop was held in Kyoto city, Kyoto Prefecture and Tsuruga city, Fukui Prefecture for four days from October 7 to 10, 2019. To investigate historical changes in the global environment, the Climate Change Science Research Project has been promoting information sharing and cooperation among member countries regarding the collection and analysis of radionuclides and stable isotopes that exist in natural sediments, corals, soil, and other substances. On the first day, participants reported on the activities that have been implemented in each country, and on the second day, Prof. MATSUZAKI Hiroyuki of The University of Tokyo gave a presentation on the analysis of nuclide records by an accelerator mass spectrometry. Both the techniques for processing and collecting samples and the analysis equipment possessed still vary among the member countries. Therefore, Australia, the project's leader country, and Japan led a discussion about guidelines for

sampling techniques, as well as processing methods for samples collected in participating countries. On the fourth day, the FNCA Open Seminar on Climate Change Science took place at the Wakasa Wan Energy Research Center in Tsuruga city, introducing the current situation where measurement technologies used for nuclear power and radiation are being applied to research on climate change. On the same day, the workshop participants visited the Varve Museum in Wakasa town, Mikata-kaminaka district, Fukui Prefecture. Prof. NAKAGAWA Takeshi of Ritsumeikan University gave a lecture about the layers (varves) of plankton, pollen, volcanic ash, and yellow sand, etc. that have been deposited in Lake Suigetsu, Fukui Prefecture, for at least 70,000 years, and that such varves improve the accuracy of radiocarbon dating and is used to clarify past temperatures, precipitation, and volcanic activity, etc.

Examples of Research by Project Member Countries

1. Analysis of Lake and River Sediments

Old pollen, diatoms, and the remains of living organisms have accumulated at the bottom of lakes and rivers over a long period of time. By collecting the layers of sediment and analyzing the radionuclides contained in them or using radiation to perform measurements, we can learn the time when each layer was formed and what the environment, climate, and ecosystem were like when that layer was at the surface. For example, diatom communities in the lakes on Macquarie Island, an uninhabited island south-east of Tasmania, Australia can change their composition only with a minute change in spindrift. Australian members collect diatoms deposited in the lake sediments, and investigate the degree of spindrift in the lake by using the Itrax X-ray Fluorescence (XRF) to research the strength of winds in the past.



Collecting lake sediments on Macquarie Island

2. Analysis of Soil Carbon

Soil contains a large amount of organic carbon. Temperature rises caused by warming activate microbial degradation of organic materials in soil, which increases carbon release and may lead to further warming. Such global carbon movement is called the "carbon cycle," and study of it is helpful in predicting the future of the global environment. A small amount of radiocarbon contained in a soil's organic carbon decreases by half over 5,730 years due to radioactive decay. By measuring the amount of radiocarbon in the soil's organic materials, it is possible to investigate how old the organic materials in the soil are;

that is, how hard it is for them to decompose. Categorizing soil organic materials into components with different properties and using an accelerator mass spectrometry to determine the amount of radiocarbon contained in each one can reveal the decomposability. This allows prediction of how much carbon is released from soil organic materials that contain various components. Japan is striving to disseminate to other member countries techniques such as how to collect and classify organic materials in soil and how to handle the accelerator mass spectrometry.



Left and center photos: Measurement of soil organic materials. Right photo: Combustion of a soil sample

3. Analysis of Corals

The skeletons of corals display growth varves (coral varves) like tree rings. Since the density of each growth varve changes depending on the water temperature and precipitation levels of the sea where the corals have been growing. It is possible to learn about past marine environments by analyzing coral varves. The Philippines investigated historical sea surface temperatures by using X-ray analysis of coral varves that were collected in nearby waters. They also used accelerator mass spectrometry and inductively coupled plasma mass spectrometry to investigate the ratios between a stable isotope (I-127) and a radioisotope (I-129) of the iodine that had remained in the coral varves, and observed that the isotopic ratios correspond to those observed in past nuclear testing and nuclear accidents.



Sampling of corals



Contributing to Sustainable Agriculture with Radiation Breeding Technologies

Mutation Breeding Project Workshop held in Malaysia

Venue : Bandar Baru Bangi and Bangi, Malaysia

Held on : September 3 - 6, 2019

Hosted by : Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Malaysian Nuclear Agency (Nuclear Malaysia)

Participating Countries : Bangladesh, China, Indonesia, Japan, Malaysia, Mongolia,
The Philippines, Thailand, Vietnam (9 Countries)

A workshop on the Mutation Breeding Project was held in the cities of Bandar Baru Bangi and Bangi, Malaysia for four days from September 3 to 6, 2019.

In the open seminar titled "Applications of Radiation Technologies and Mutation Breeding for Sustainable Agriculture" that took place on the first day, 45 people from local universities, research institutes and private companies participated. The seminar introduced mutation breeding studies and the latest initiatives, etc. for sustainable agriculture that have been launched in each country.

On the second day, each member country reported their mutation breeding projects for major crops, aiming for low-input sustainable agriculture under climate change.

On the third day, participants attended a technical visit to a seed company and rice fields in Tanjung Karang and Sekinchan, Selangor.

First, the participants visited the seed company Haji MD

Nor bin Haji Abd. Rahman, the Integrated Agriculture Development Area (IADA), and Bayer Co., an international company in the life science field. They introduced outlines of their activities.

Following that, the participants visited a rice seed factory to see their treatment processes up to shipment. They also visited a rice farm where a mutant varieties of rice (NMR152), developed by the Malaysian Nuclear Agency, is being cultivated.

Through these visits, the participants confirmed that the Malaysia Nuclear Agency is effectively promoting activities in close cooperation with other governmental organizations and end-users, namely seed companies and farmers.

The fourth day featured a roundtable discussion about the project and a report and discussion on cooperation with the International Atomic Energy Agency (IAEA) / Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA).

Developing New Varieties Adaptable to Environmental Changes due to Climate Change and Realizing Higher Yield even with Low-Input Conditions

■ Outline of Mutation Breeding Project Activities

The Mutation Breeding Project has been working to develop new varieties of crops that are in high demand in Asia by applying breeding technologies. These technologies use radiation such as gamma rays and ion beams to help increase food production and improve the quality of agricultural crops in Asia.

Since 2013, the project has been conducting activities targeting rice, a crucial crop in Asia, focusing on the climate change that has drawn increasing global attention and its contribution to sustainable agriculture. As a result, new crop varieties have been developed that are resistant to disease and tolerant to drought, salt and various other environmental stresses.

Since 2018, in addition to rice, the project has expanded its scope to major crops that are in high demand in member countries, launching activities aiming to contribute to promoting sustainable agriculture through developing new crop varieties with higher yield, even with low-input agricultural chemicals that can adapt to environmental changes arising from climate change.

In addition, the QST Takasaki is cooperating through its use of ion-beam irradiation, helping to promote research in member countries.

■ Results of Discussions at Workshop in 2019

Participants in 2019's workshop reported on the progress of activities performed in their respective countries, and the following items were confirmed in the roundtable discussion. The sharing of knowledge and problems during the workshop is expected to promote the research activities in each member country.

1. All the member countries are striving to realize low-input sustainable agriculture.
2. Improving the efficiency of nitrogen use is one of the important targets to focus on to breed high-yield mutant varieties in the future.
3. The root system is one of the most important properties to consider for achieving high yield under low-input conditions.
4. Mutant varieties developed in the Mutation Breeding Project are precious resources to identify genes effective for breeding superior varieties.
5. Employing both mutant varieties and optimized cultivation methods (e.g. minimal use of chemical fertilizers and chemical pesticides, greater use of organic fertilizers) is one way to realize sustainable agriculture.



Meeting



Briefing at the seed company



Visit to the rice seed factory



Group photo at the rice field

Radiation Oncology Project



Special Session on 3D-IGBT at Open Seminar in the First Affiliated Hospital of Soochow University

Establishing and Spreading Optimal Treatment Procedures of Radiotherapy for Cancers Predominant in the Asian Region

The Radiation Oncology Project is working with 11 member countries of FNCA to conduct joint clinical trials of radiotherapy for uterine cervical, nasopharyngeal, and breast cancer, which are all common in Asia. Among them, the clinical trials for uterine cervical cancer, which has the highest incidence and mortality rate in women, have been implemented since the launch of the project. Five treatment procedures (protocols) have been established to date.

In recent years, the project team has been running clinical trials that combine radiotherapy with chemotherapy for advanced uterine cervical cancer.

The fourth protocol (Cervix-IV) targets severe locally advanced cervical cancer and irradiates an extended-field that includes the para-aortic node region while concurrently using cisplatin. The results of this clinical trial were very good, with a five-year local control rate after treatment of 91% and an overall survival rate of 77%. A paper that summarizes the results was published in an international medical journal in 2019. Cervix-IV has been adopted at hospitals in the member countries and is

expected to be adopted at more hospitals in the future.

In 2018, the project team started clinical trials for the fifth protocol (Cervix-V). Cervix-V uses 3D-Image guided brachytherapy (3D-IGBT), which can accurately and safely deliver radiation to uterine cervical tumors. Because it is a cutting-edge type of radiotherapy, technical guidance had to be given to FNCA members. In response to this, the project team conducted hands-on training on 3D-IGBT for local radiation oncologists and medical physicists in the 2018 workshop (Bangladesh) as an initial trial. The training ended with success, and a special session on 3D-IGBT was also held in the open seminar during the 2019 workshop (China) to provide an outline, case studies, practical training using a training kit, aiming to promote understanding of 3D-IGBT, and give technical guidance. In addition, the MEXT's Nuclear Researchers Exchange Program provides a 3D-IGBT training course for FNCA experts to attend the training in Japan. The project is expected to continue cultivating human resources that can handle 3D-IGBT in Asia and work to spread Cervix-V.

Promoting Cooperation among Researchers for Multipurpose Utilization of Research Reactors

Several Asian countries have been operating and managing multipurpose research reactors for many years. The Research Reactor Utilization Project launched its activities in 2017 jointly with the Neutron Activation Analysis (NAA) Project. The project teams are sharing information such as characteristics and usage of research reactors owned by member countries, in order to promote the establishment of research base for researchers and engineers in FNCA member countries and improving their technical skill levels.

The 2017 workshop covered "Radioisotope Production Including New Radioisotopes" and "New Research Reactors", and the 2018 workshop focused on "Boron Neutron Capture Therapy (BNCT) and Neutron Radiography (NR)" and "Material Research", besides NAA for both workshops. BNCT is a type of cancer radiotherapy in which a boron agent is administered in advance to patients with cancer. The cancer-affected parts are irradiated with neutron beams, which kill the cancer cells by utilizing α particles and Li ions generated by boron-neutron nuclear reactions. NR is a nondestructive visualization technique focusing on the damping characteristic brought about by the interaction between

various nuclei and neutrons when neutrons pass through the matter. It is used for image-based research and image processing, etc. in archaeology and fluid dynamics. Providing cutting-edge scientific information from experts in Japan in the fields of BNCT, NR and material research, the project has contributed to increasing the motivation of member countries to utilize research reactors.

The workshop covered "Nuclear Science" and "Human Resource Development" in this field as its themes in 2019, and member countries exchanged information on the status of their initiatives.

NAA is a nondestructive quantification technique that quantifies the elements contained in a sample. The project members are using this technique to analyze suspended particulate matter (SPM) that can cause air pollution and rare-earth elements in mineral resources. Regarding the SPM sub-project, changes in air pollution over the past 10 to 15 years have been observed by comparing recently obtained data with previously obtained one. The NAA technique can quantify multiple elements almost simultaneously without destroying solid samples. For this reason, it is actively used in each member country and will continue to play a prominent role in the future.

Research Reactor Utilization Project



Technical Visit to Kyoto University Research Reactor

Radiation Safety and Radioactive Waste Management Project



Visit to rare earth factory in Vietnam at the Workshop in 2019

Preparing a Consolidated Report Looking Ahead to Construction Plans for Low-level Radioactive Waste Repositories

Radiation Safety & Radioactive Waste Management Project team is working to boost the technical capabilities of member countries by sharing its knowledge and experience in radiation safety and radioactive waste management. Particularly in recent years, several Asian countries are considering plans to introduce nuclear power generation programs, so it is vital to ensure and enhance nuclear safety.

The project outcomes include implementing "task group activities" that dispatch several Japanese experts to the member countries to carry out field surveys (2001–2007), holding a panel discussion (in 2010) with the Third Asian and Oceanic Congress on Radiation Protection (AOCRP-3), and publishing the "FNCA Consolidated Report". This report summarizes the actual status of radiation safety and radioactive waste management in each member country. We have published the consolidated reports on the FNCA website, providing detailed information about radiation safety and radioactive waste management in Asia region for non FNCA-participating countries and international organizations, such as the IAEA.

Recently, participating countries shared information, under the theme of "Low-level Radioactive Waste Repositories", to understand the issues and realize the construction plans of those repositories. As a result, we published the "Consolidated Report on Low-level Radioactive Waste

Repositories (interim report)" in 2020. Participating in the preparation of this report helped countries improve their own efforts by gaining new perspectives and understanding the endeavors of other countries.

In addition, members exchanged information and discussed the issues facing the workshop host countries. For example, Australia (in 2018) held discussions and presentations on public acceptance, and Vietnam (in 2019) did the same about NORM/TENORM*, and participants obtained new knowledge through discussions and presentations.

* NORM stands for Naturally Occurring Radioactive Materials. TENORM stands for Technologically Enhanced NORM, which is a naturally occurring radioactive material with its density enhanced through technological processes.



Poster Session at the Workshop in 2019

Contributing to Enhance Nuclear Security and Safeguards in Asia through Promoting Cooperation on Information Exchange and Human Resource Development

The Nuclear Security and Safeguards Project was launched in 2011. Advancing the peaceful use of nuclear power requires "nuclear security", which protects nuclear materials and radioactive materials from malicious acts such as theft and unauthorized access, and "safeguards", which prevents transfer of nuclear materials to nuclear weapons. The project is working to enhance nuclear security and safeguards in Asia through sharing experiences, knowledge, and information as well as promoting cooperation for human resource development and the like.

In recent years, we have been sharing information about the latest initiatives to tackle major issues on nuclear security and safeguards in respective member countries, and deeper discussions have been taking place about future cooperative activities. Priorities in the field of nuclear security include "nuclear forensics", which involves analyzing the sources and transportation routes of nuclear materials seized and collected by law-enforcement authorities; "cyber security", which covers protective measures against the threat of cyberattacks; and "security of radiation sources" to prevent malicious acts that are brought about using lost, stolen, or destroyed radiation sources.

In addition, the member countries have concluded a safeguards agreement with the IAEA, with the aim of

nuclear non-proliferation. The project has adopted a theme of the Additional Protocol (AP) to strengthen this agreement, and shared information on its latest initiatives with the member countries through workshops. It is also deepening discussions on the future cooperation among those countries.

As for the nuclear security, a Table Top Exercise (TTX) on nuclear forensics took place during the 2019 workshop. The scenario involved a fictitious country receiving a report from a neighboring country about the theft of radioactive materials, and several days later, the radioactive materials were found at the country's border and in a suspicious car at a hotel in the capital city. At each stage of the scenario, the member countries discussed who should respond to the accident, who has the ability to detect nuclear materials, and what kind of organizations should get involved, based on their own experiences and challenges. As for the safeguards field, surveys on good practices on AP implementation were distributed to member countries in 2018 and 2019, and the survey results were shared among those countries in the workshops, where participants conducted discussions and investigations with the aim of preparing and implementing a collection of good practices that would be meaningful for all member countries.

Nuclear Security and Safeguards Project



Table Top Exercise on nuclear forensics at the Workshop in 2019

Introduction of Ongoing 7 Projects

Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Applications

This project was launched in 2018 by merging the former Electron Accelerator Application Project and the former Biofertilizer Project with a theme on radiation processing and polymer modification.



Workshop 2019

- Dates: September 3-7
- Place: Yogyakarta, Indonesia
- Participating Countries: 10



From left: control, with biofertilizer, with oligochitosan, with biofertilizer + oligochitosan

TOPICS

- Progress reports and discussions took place about research activities on radiation processing, polymer modification and biofertilizers.
- Participants visited agricultural fields in Kulon Progo District and confirmed that oligochitosan and biofertilizers, developed by BATAN (National Nuclear Energy Agency of Indonesia), were applied to chrysanthemum, shallot, and chili plant, etc., and useful effects were obtained.
- Workshop participants attended the symposium of Indonesia Nuclear Expo 2019 held at the same time and gave invited lectures and oral presentations. In addition, they exhibited in the poster session.

Radiation Oncology

This project has been establishing optimal treatments and improving treatment results for cancers that are common in Asia, and also disseminating radio therapeutic methods throughout Asia.



Workshop 2019

- Dates: October 28-31
- Place: Suzhou, China
- Participating Countries: 10



TOPICS

- Presentation and discussion of clinical data took place about each study on cervical, nasopharyngeal, and breast cancers.
- The results of project activities in 2017 to 2019 were reviewed and the activities over three years were evaluated. In addition, an activity plan for 2020 to 2022 was discussed.
- Participants visited the First Affiliated Hospital of Soochow University, Shanghai Proton Heavy Ion Center, and Shanghai Cancer Center. An open seminar was held at the First Affiliated Hospital of Soochow University after the visit. In this open seminar, a special session on 3D-IGBT was held and introduction, case studies and practical training using a training kit were carried out.

Nuclear Security and Safeguards

Promotion of peaceful use of nuclear power requires the improvement and maintenance of nuclear safety, security and safeguards. This project has been enhancing nuclear security and safeguards in Asian countries by sharing information, and cooperation in developing human resources.



Workshop 2019

- Dates: November 26-28
- Place: Manila, the Philippines
- Participating Countries: 9



TOPICS

- Information was shared on implementations of nuclear security and safeguards in 2019 in each country.
- Presentations and discussion took place on capacity building in nuclear forensics, security of radiation sources, and good practice in implementing Additional Protocol, etc. as common major issues in member countries.
- A tabletop exercise on nuclear forensics was conducted at the Philippine Nuclear Research Institute (PNRI). In the training, not only the workshop participants but also staff members from PNRI's Nuclear Safeguards and Security Section, and Philippine National Police joined the exercise to learn about the necessary framework for building national nuclear forensics capability, the form of cooperation among relevant organizations, and the needed functions of the nuclear forensics laboratory.

As FNCA project activities, 7 projects are being conducted in various fields. Each project promotes joint research, debates in common challenges, and holds a workshop annually. Each project also reports results and provides guidelines / manuals on which research in Asian countries should be based.

Mutation Breeding

This project has been using mutation breeding technology with irradiation to major crops and establishing new varieties with higher yield under low-input condition and more resistance to various environmental stress under climate change in order to promote sustainable agriculture.

Workshop 2019

- Dates: September 3-6
- Place: Bandar Baru Bangi and Bangi, Malaysia
- Participating Countries: 9



TOPICS

- Progress reports and a roundtable discussion took place on Mutation Breeding of Major Crops for Low-input Sustainable Agriculture under Climate Change.
- Reports and discussions took place on cooperation with the IAEA/RCA.
- An open seminar titled "Applications of Radiation Technologies and Mutation Breeding for Sustainable Agriculture" was held.
- Participants visited a seed company and rice field in Selangor, and confirmed that testing and practical realization of the mutant variety developed by the Malaysian Nuclear Agency are progressing in close cooperation with other governmental organizations, seed companies, and farmers.

*Please refer to P7-8 for more details about this project.

Research on Climate Change using Nuclear and Isotopic Techniques

Aiming at interpretation of the mechanisms and processes of past climate change in Asia Pacific region, this project promotes sharing expertise on environmental archives and carbon storage in member countries by using nuclear and isotopic analysis.

Workshop 2019

- Dates: October 7-10
- Place: Kyoto and Fukui, Japan
- Participating Countries: 10



TOPICS

- Progress reports and discussions took place on climate-change science activities in each country.
- The member countries agreed to consider developing sampling guidelines for soil and environmental archives.
- Future action plans were discussed, including the possibility of adopting themes related to food-provenance and food security on and after 2020.
- An open seminar was held at the Wakasa Wan Energy Research Center in Tsuruga city on applying radiation technologies in studies on climate change.
- Participants visited Varve Museum in Fukui Prefecture, guided by Prof. NAKAGAWA Takeshi of Ritsumeikan University.

*Please refer to P5-6 for more details about this project.

Research Reactor Utilization

This project has been promoting mutual collaboration among researchers in Asian countries on multipurpose use of research reactors and aims to contribute to the personnel training of researchers concerned with the research reactors of each Asian country, based on the experience of the research reactor in Japan.

Workshop 2019

- Dates: September 10-12
- Place: Kurchatov, Kazakhstan
- Participating Countries: 9



TOPICS

- The Research Reactor Utilization Group delivered country reports and discussed nuclear science, including human resource development.
- The Neutron Activation Analysis Group delivered country reports on activities related to air pollution and mineral resources, and discussed the theme of linkages with end-users.
- Activities conducted by both groups from 2017 to 2019 were summarized, and a future action plan for 2020 onwards was discussed.
- Participants visited the National Nuclear Center in Kurchatov, Kazakhstan to see the research reactor (IVG.1M). In addition, an open seminar took place at the center, where Japan, Bangladesh, and Malaysia gave presentations.

Radiation Safety and Radioactive Waste Management

This project has been improving radiation safety of nuclear / radiation facilities in FNCA countries. In order to assure radiation safety for the public, FNCA countries also share information on appropriate treatment and disposal of radioactive waste management as well as the environmental impact assessment.

Workshop 2019

- Dates: October 1-3
- Place: Hanoi, Vietnam
- Participating Countries: 11



TOPICS

- Each country gave a presentation on the current status of their low-level radioactive waste repositories.
- Discussions took place on preparing the consolidated report on low-level radioactive waste repositories.
- Vietnam gave a presentation on NORM (Naturally Occurring Radioactive Materials) / TENORM (Technologically Enhanced NORM), and Malaysia presented on the disposal of disused radiation sources.
- Activities conducted from 2017 to 2019 were summarized, and a future action plan was discussed. It was proposed to set NORM/TENORM management as a major theme for 2020 onwards.
- Participants visited the facilities of Yen Phu Rare Earth JSC, a rare-earth mining and refining company in Yen-bai Province.

Kazakhstan Team Won the "Best Research Team of the Year"



Best Research Team



Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Applications Project, Kazakhstan

**Representative: Mr. Alexandr Borissenko
CEO, JSC "Park of Nuclear Technologies"**

FNCA project "Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Applications" is aimed to expand the application of radiation technologies for development of various industries in the country.

Through acquaintance with FNCA activity and participation in its workshops, JSC "Park of Nuclear Technologies" gained the first experience on application of radiation technologies in agricultural industry. Implementation of a project "Production of Radiation-cross-linked Water Super Absorbents" has been started since 2013. This project made possible to start research and development activities, and sharing experience in the application of soil conditioners, growth regulators and others. As a result of FNCA cooperation, new perspectives for application of radiation technologies in agricultural industry that is new one for enterprise, have been opened. Earlier, the application of electron accelerators was focused only on production of materials for building industry and provision of services on radiation sterilization of medical products.

Key staffs involved in the project

From left: Mr. Azat Nurkassimov, Mr. Zeinolla Yershin
Mr. Alexandr Borissenko, Mr. Murat Kassymzhanov
Dr. Yerlan Zhatkanbayev



From left: Dr. OKA Yoshiaki, Chairman of JAEC, Prof. Bambang Permadi Brodjonegoro, Minister for Research and Technology of Indonesia, Mr. Alexandr Borissenko

Today, a company leads a number of projects in agricultural industry: "Food Products Processing by Ionizing Radiation", "Technology for Male Substitution of Quarantine Pests of Melon Flies", "Production of Initial Materials for Rice and Barley Breeding with Ionizing Radiation Processing".

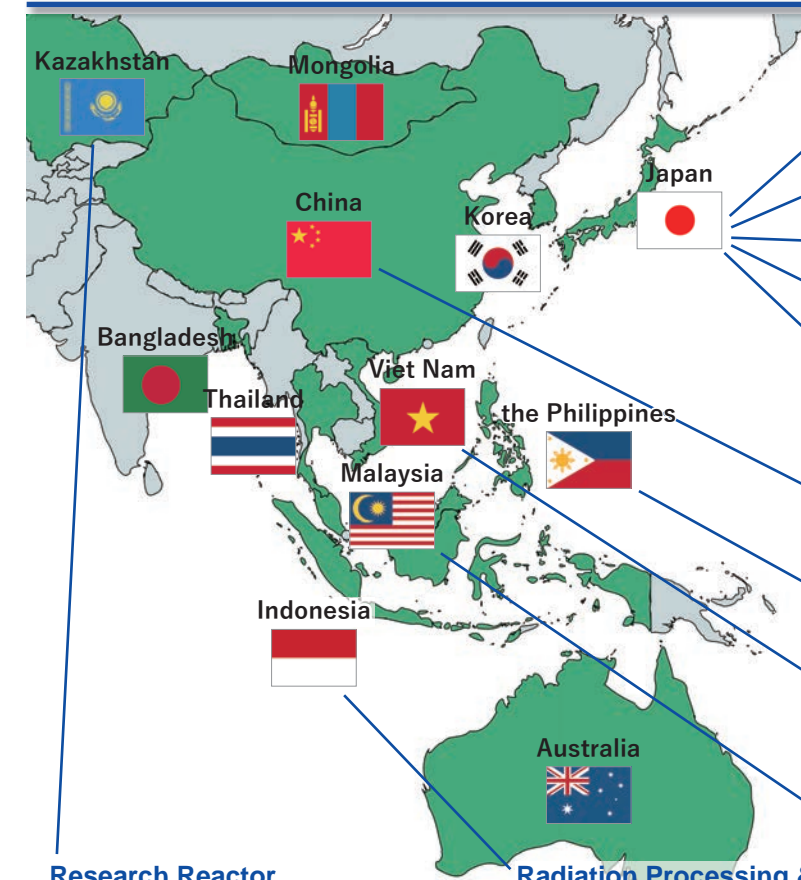
Our project team is very grateful to FNCA participants for the bestowed confidence and support to Kazakhstan team in the nomination "FNCA Award 2019 Best Research Team of the Year".

We believe that experience acquired over the period of our collaboration with FNCA will serve an excellent foundation for further studies and application of radiation technologies in agricultural industry.



Radiation Sterilization Complex (RSC)

Activities in JFY 2019



Research Reactor Utilization WS
September 10 - 12, 2019, Kazakhstan

Radiation Processing & Polymer Modification WS
September 3 - 7, 2019, Indonesia

The 20th Senior Officials Meeting
July 19, 2019, Tokyo

The 20th Ministerial Level Meeting
December 5, 2019, Tokyo

The 21st Coordinators Meeting (Canceled)
March 4, 2020, Tokyo

2020 Study Panel (Canceled)
March 5, 2020, Tokyo

Climate Change Science Research WS
October 7 - 10, 2019, Kyoto & Fukui

Radiation Oncology WS
October 28 - 31, 2019, China

Nuclear Security and Safeguards WS
November 26 - 28, 2019, The Philippines

Radiation Safety and Radioactive Waste Management WS
October 1 - 3, 2019, Vietnam

Mutation Breeding WS
September 3 - 6, 2019, Malaysia

List of Coordinators		
Country	Name	Affiliation
	Ms. Lynn TAN	Adviser, International Affairs Australian Nuclear Science & Technology Organisation (ANSTO)
	Prof. Dr. Md. Sanowar HOSSAIN	Chairman Bangladesh Atomic Energy Commission (BAEC)
	Mr. HUANG Ping	Division Director, Department of International Cooperation China Atomic Energy Authority (CAEA)
	Dr. Hendig WINARNO	Deputy Chairman of BATAN for Nuclear Technology Utilization National Nuclear Energy Agency (BATAN) of Indonesia
	Mr. WADA Tomoaki	Chief Executive Director, Kobe Science Museum
	Prof. Erlan G. BATYRBEKOV	Director General National Nuclear Center (NNC) of the Republic of Kazakhstan
	Ms. JEE Eun Kyoung	Director, Space, Nuclear and Big Science Cooperation Division Ministry of Science and ICT (MSIT), Republic of Korea
	Dr. Siti A'iasah HASHIM	Deputy Director General (Technical Service Program) Malaysian Nuclear Agency (Nuclear Malaysia)
	Mr. Chadraabal MAVAG	Head, Nuclear Technology Department Nuclear Energy Commission (NEC) of Mongolia
	Dr. Lucille V. ABAD	Chief, Atomic Research Division, Department of Science and Technology, Philippine Nuclear Research Institute (PNRI)
	RADM. Wachara KARUNYAVANIJ	Deputy Executive Director Thailand Institute of Nuclear Technology (TINT)
	Dr. TRAN Ngoc Toan	Vice President, Vietnam Atomic Energy Institute (VINATOM)



Excellent Research Team of the Year

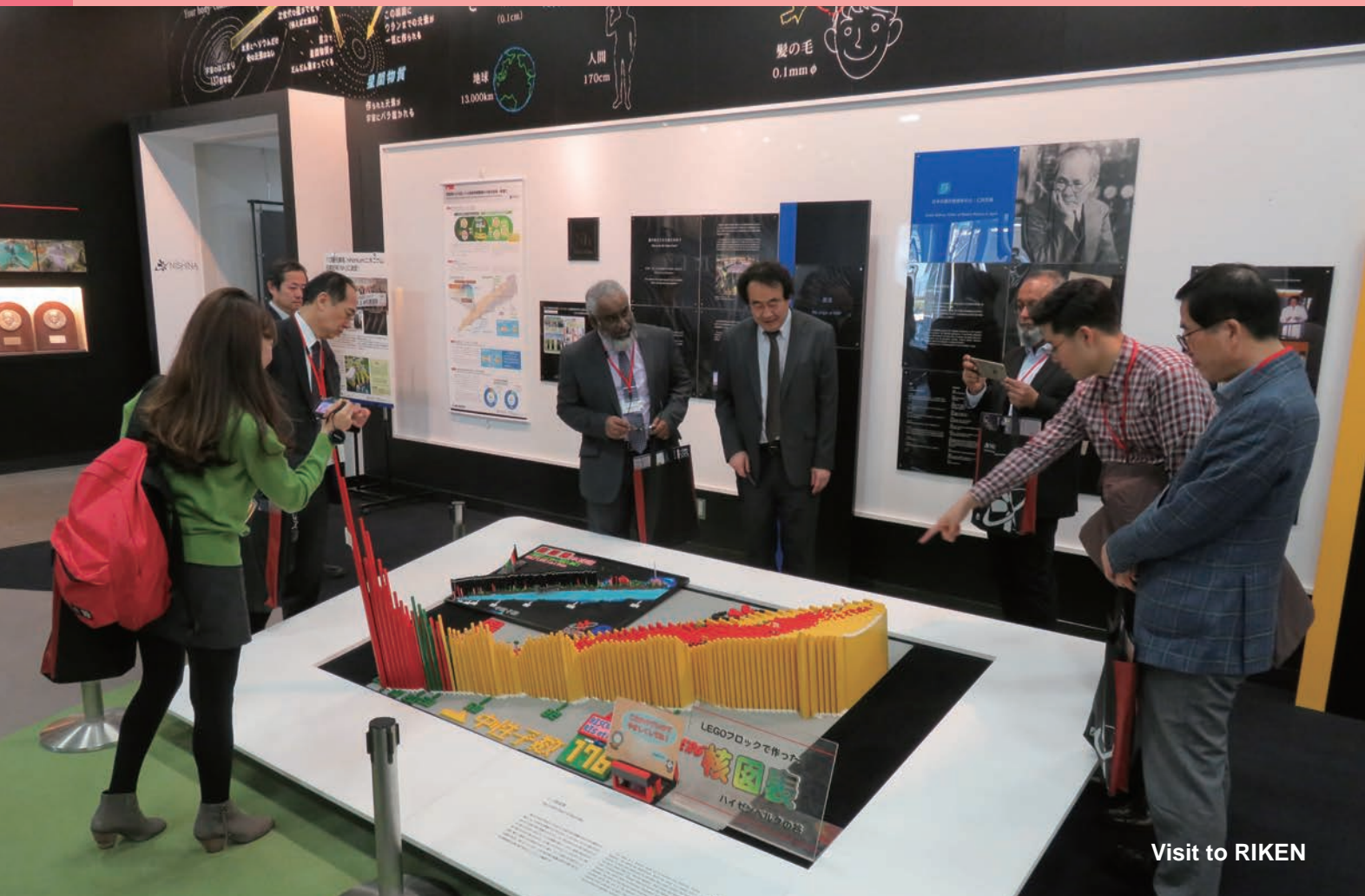
"Excellent Research Teams of the Year" were awarded to following two projects of the two countries, in recognition of their achievement next to the Best Research Team.



**Vietnam
Mutation Breeding Project**



**Australia
Research Reactor Utilization Project**



Agreement to Promote Existing Activities Related to Agriculture Development, Food Security, Environment Protection, Human Health, Nuclear Safety, and Human Resource Development

The CAO and JAEC held the 20th FNCA Coordinators Meeting, co-hosted by the Ministry of Education, Culture, Sports, Science and Technology of Japan, in Tokyo on March 6, 2019. Participants included representatives from the 12 FNCA member countries (Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Korea, Malaysia, Mongolia, The Philippines, Thailand, and Vietnam) and delegates from regional offices of the IAEA/RCA.

Summary of the 20th Coordinators Meeting

The meeting is summarized as follows:

- Representatives from FNCA's seven current projects outlined their annual activities. It was confirmed that the activities are being implemented steadily under effective cooperation of member countries.
- Participants agreed to promote the existing FNCA activities related to agriculture development, food security, environmental protection, human health, nuclear safety, and human resource development according to the

direction shown in the Joint Communique of the 19th FNCA Ministerial-Level Meeting. In addition, besides those existing areas, they determined to further the FNCA's activities by adopting future themes that reflect the member countries' broader interests in supporting sustainable development.

- IAEA/RCA gave a presentation on the outline of their activities and cooperation between the FNCA and RCA. In addition, it was confirmed that the RCA and FNCA would continue their cooperation, mainly through mutual participation in meetings and exchanging information in the fields of mutation breeding, radiation processing and polymer modification, and radiation oncology, and that they would continue to seek ways to further deepen their cooperation.
- It was pointed out that the FNCA should seek a cooperative alliance with international organizations that are performing research activities similar to those of RCA such as the United Nations Development Program (UNDP).

Discussing Nuclear-related Environmental Impact Assessment from the Perspectives of Legal and Regulatory Frameworks

The CAO and JAEC hosted the FNCA 2019 Study Panel, with the cooperation of the OECD/NEA, in Tokyo on March 7, 2019. Participants at the meeting comprised representatives from 11 FNCA member countries (Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, The Philippines, Thailand, and Vietnam) and delegates from OECD/NEA and the United States of America (Nuclear Regulatory Commission (NRC)).

At the meeting, under the main theme of "Nuclear-related environmental impact assessment from the perspectives of legal and regulatory frameworks", the participants from the member countries were given lectures on the two topics of "the international legal framework related to environmental impact assessment" and "activities in each country on nuclear-related environmental impact assessment" to deepen their knowledge and understanding of nuclear-related environmental impact assessment from the perspectives of legal and regulatory frameworks. In addition, the member countries shared their issues through active Q&A and obtained advice and proposals, which promoted mutual understanding among the member countries and resulted in practical application in each country.

Summary of the 2019 Study Panel

Mr. SANO Toshio, the Commissioner of the JAEC,

who served as the Chair of the meeting, expressed his impressions as follows.

- The purpose of this meeting is to share the good practices and experiences in establishing a foundation for nuclear power generation among member countries and maximize the use of such knowledge in member countries and regions.
- The valuable knowledge and experiences we have obtained through the four lectures and reports from 11 countries are all beneficial and contribute to the purpose of this meeting. In addition, personal networks built during the meeting will become valuable assets in future activities.
- FNCA's activities are critically useful and practical, and their outcomes are beneficial for social welfare in the member countries and regions. Therefore, there should be PR efforts that highlight these outcomes.
- Possibilities for cooperation between the FNCA and external related organizations such as IAEA/RCA, or UNDP which has own development assistance programs should be sought.
- Environmental impact assessments are crucial factors in future nuclear activities, and all member countries would be worth considering accession to the existing treaties and/or protocols related to environmental impact assessment.

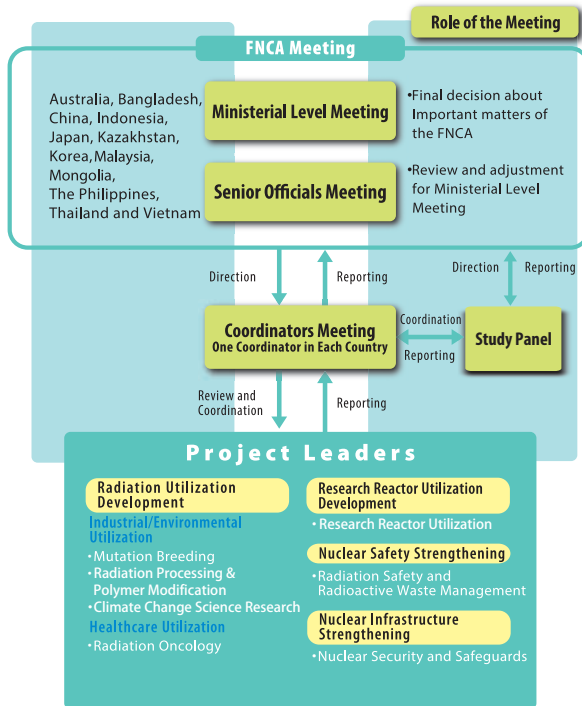


Group Photo

What's FNCA?

FNCA (Forum for Nuclear Cooperation in Asia) 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.

The FNCA Framework



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.

Senior Officials Meeting

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

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.

Message from FNCA Coordinator of Japan



With the objectives of utilizing nuclear technologies for the development of Asian countries and improving each country's national welfare, the framework of the Forum for Nuclear Cooperation in Asia (FNCA) was created under Japan's leadership in 2000. Since then, interregional cooperation related to nuclear technologies has been in progress with the participation of 12 Asian countries. Substantial cooperation has been made in various fields,

including agriculture, healthcare, environment, nuclear safety, and nuclear non-proliferation. This cooperation has already made numerous remarkable achievements, which are in practical use in Asian societies. I hope that the FNCA will, from this point forward, expedite international cooperation toward achieving the Sustainable Development Goals (SDGs), which were adopted by the United Nations in 2015, as well as develop young nuclear human resources in Asian countries. Specifically, I think that key agenda items should include using radiation for sustainable agriculture, promoting radiotherapy for improving cancer survival rates in Asia, applying nuclear technologies to find out the mechanism of Asia's rapidly-changing climate, radioactive waste disposal and nuclear security measures, which are crucial tasks for promoting nuclear research and development. I would also like to ask young researchers in the member countries to actively participate in our meetings.

WADA Tomoaki, FNCA Coordinator of Japan

FNCA

Forum for Nuclear Cooperation in Asia

FNCA

Search



<https://www.fnca.mext.go.jp/english/index.html>



International Affairs & Research Dep.,
Nuclear Safety Research Association (NSRA)
5-18-7, Shimbashi, Minato-ku, Tokyo, 105-0004
TEL: +81-3-5470-1983/FAX: +81-3-5470-1991



This newsletter is issued by Nuclear Safety Research Association (NSRA) under the contract with the Ministry of Education, Culture, Sports, Science and Technology (MEXT)