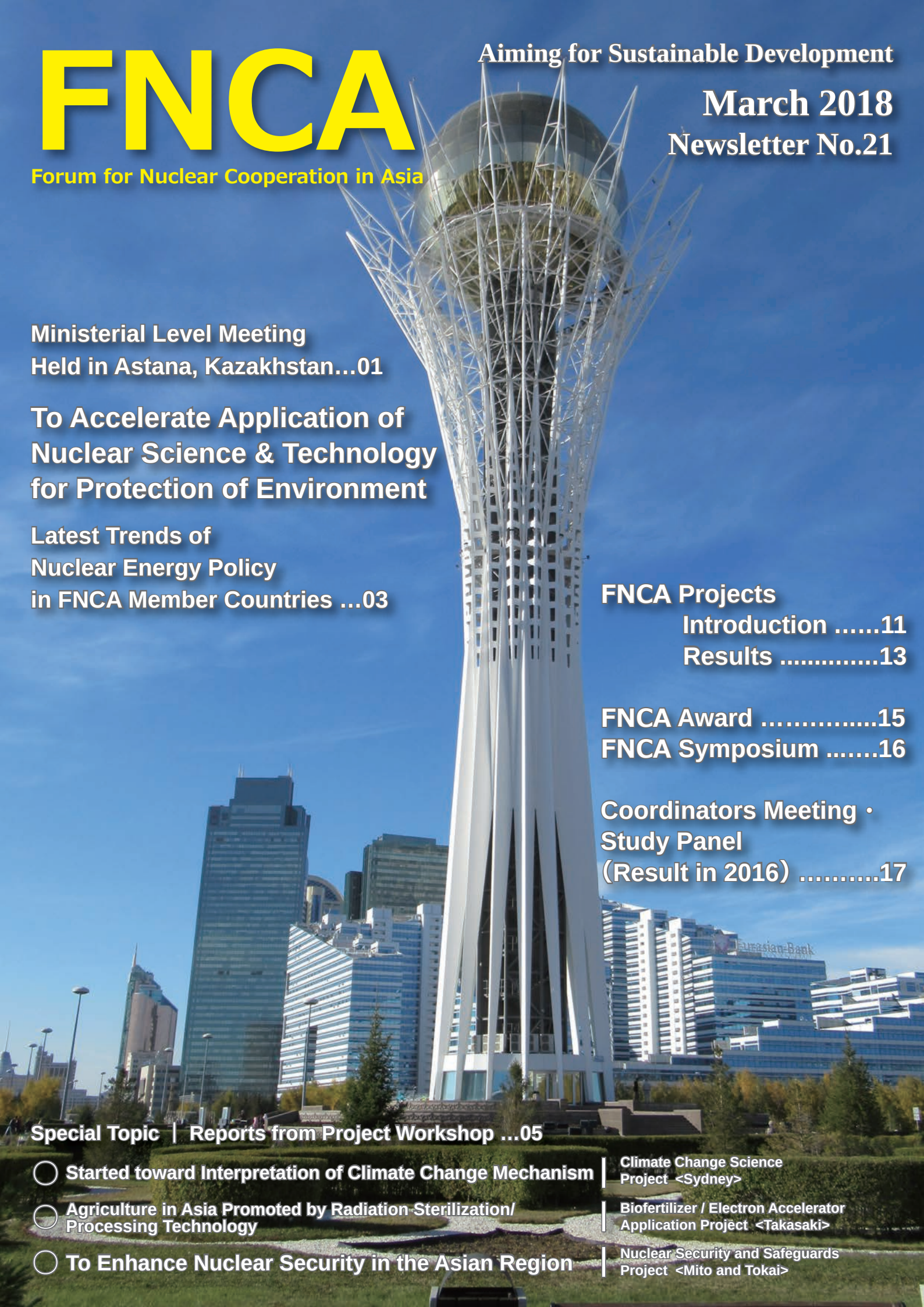
FNCA

Forum for Nuclear Cooperation in Asia

Aiming for Sustainable Development

March 2018
Newsletter No.21



▲ From Left: Ms. HA Thi Lam Hong, Ministry of Science and Technology (MOST), Vietnam: Dr. Carlo A. ARCILLA, Philippine Nuclear Research Institute (PNRI): Mr. MANLAIJAV Gunaajav, Nuclear Energy Commission (NEC) of the Government of Mongolia: Dr. Dahlan Bin HJ MOHD, Malaysian Nuclear Agency (Nuclear Malaysia): Dr. Pornthep NISAMANEEPHONG, Thailand Institute of Nuclear Technology (Public Organization): Mr. Bakhytzhan JAXALIYEV, Vice-Minister of Ministry of Energy of the Republic of Kazakhstan: Dr. Yoshiaki OKA, Chairman, Japan Atomic Energy Commission (JAEC): Mr. Kanat BOZUMBAYEV, Minister of Energy of the Republic of Kazakhstan: Prof. Erlan BATYRBEKOV, Director General of National Nuclear Center (NNC) of the Republic of Kazakhstan: Mr. Steven McINTOSH, Australian Nuclear Science and Technology Organisation (ANSTO): Dr. Dilip Kumar SAHA, Bangladesh Atomic Energy Commission (BAEC): Dr. Hendig WINARNO, National Nuclear Energy Agency of Indonesia (BATAN): Mr. LONG Maoxiong, China Nuclear Energy Association (CNEA)

◎To Accelerate Application of Nuclear Science & Technology for Protection of Environment

FNCA MINISTERIAL LEVEL MEETING
Held in Astana, Kazakhstan

The 18th Ministerial Level Meeting of Forum for Nuclear Cooperation in Asia (FNCA), which was organized by the Ministry of Energy of the Republic of Kazakhstan, the Japan Atomic Energy Commission and the Cabinet Office of Japan was held on October 11, 2017 in Astana City, the Republic of Kazakhstan.

Ministers and other leaders in charge of the field of nuclear science and technology from FNCA member countries met to hold policy discussion on the theme on “Application of Nuclear Science and Technology for Protection of Environment”.

From Japan, Dr. Yoshiaki OKA, Chairman of the Japan Atomic Energy Commission attended the meeting on behalf of the Government of Japan. Mr. Kanat BOZUMBAYEV, Minister of Energy of the Republic of Kazakhstan attended the meeting representing Kazakhstan.

■ Keynote Speech

Prof. Erlan BATYRBEKOV, Director General, National Nuclear Center of Kazakhstan spoke about their efforts for the application of nuclear science and technology to environmental protection in Kazakhstan. In addition, Mr. Galymzhan PIRMATOV, Chairman of the Management Board, NAC Kazatomprom JSC gave a presentation on the outline of the Bank of Low-Enriched Uranium established in Kazakhstan based on the agreement with IAEA and emphasized the significance of such development of the stable supply system of uranium that was contributing to the nuclear non-proliferation regime.

For detailed results of the Ministerial Meeting, refer to http://www.aec.go.jp/jicst/NC/sitemap/fnca_e.htm

■ Country Reports

A representative of the countries gave a presentation on “Application of Nuclear Science and Technology for Protection of Environment”, etc. Japan presented the development of the “Basic Policy for Nuclear Energy” as well as some explanation on the efforts, etc. for subsequent environmental improvement after TEPCO’s Fukushima Daiichi Accident .

■ Roundtable Discussion

The meeting participants acknowledged that project activities in the framework of FNCA and collaboration with international organization are helpful to overcome a variety of different challenges that FNCA member countries are facing in environmental conservation such as “Land Contamination”, “Air Pollution” and “Climate Change”. Then, based on such acknowledgement, they agreed on further strengthening of future collaborative relationships.

■ The 1st FNCA Award Ceremony

The 1st FNCA Award Ceremony took place. It praised the country that attained an outstanding achievement among the FNCA project activities in FY2016. (See Page 15 for the FNCA Award)

■ Joint Communique

As a summary of the meeting, Joint Communique was adopted as follows to describe the course of action.

- To actively endorse the existing projects involving nuclear science and technology such as “Mutation Breeding”, “Radiation Oncology” and “Climate Change Science”, and also possible future projects that contribute to sustainable development of the countries.
- To continue the promotion of further collaboration with international organizations such as IAEA and OECD/NEA, especially in the area of legal framework.
- To take action to establish a system for improvement, etc. of FNCA website functions, etc. so that knowledge sharing and performance of public relations will be enhanced.
- To strengthen collaborative ties, which have been established through FNCA activities, so that the challenges in relation to environmental protection can be addressed. Also, in order to directly address environmental protection, the promotion of nuclear science and technology is recommended in addition to the technology of monitoring.

KAZAKHSTAN

■ Application of Nuclear Technology to Environmental Protection

The Republic of Kazakhstan has been seeking solutions for global challenges that all countries in the world are now facing, such as Climate Change, Water Shortage and Environmental Contamination, through safe and appropriate utilization of nuclear technology.

Thus, as one of the options to fulfill obligations under the Paris Climate Agreement*1, the Government of Kazakhstan considers the possibility of nuclear power development and moreover, Kazakhstan has been promoting development of new types of nuclear reactor technologies that will be both safe and low waste.

The Republic has experience in solving the problems of water shortage, purification and protection of water resources using nuclear technologies, such as seawater desalination using sodium-cooled fast breeder reactor BN-350; monitoring of regimes, balances and resources of underground water with nuclear-physical methods; production of filtering and water absorption materials using accelerators, etc.

Kazakhstan has also been actively working on the remediation and the rehabilitation of contaminated areas of Semipalatinsk Test Site in order to return these lands to the agricultural use.

■ International Bank of Low-Enriched Uranium

The opening ceremony of the IAEA International Bank of Low-Enriched Uranium was held on August 29, 2017. The Bank was established in Oskemen city on the basis of Ulba Metallurgical Plant, Kazatomprom JSC NAC. The IAEA LEU bank is a unique international project designed to provide the IAEA member-states with safe source of fuel supplies when other supply mechanisms fail.

■ Research and Development Activity in the Republic of Kazakhstan

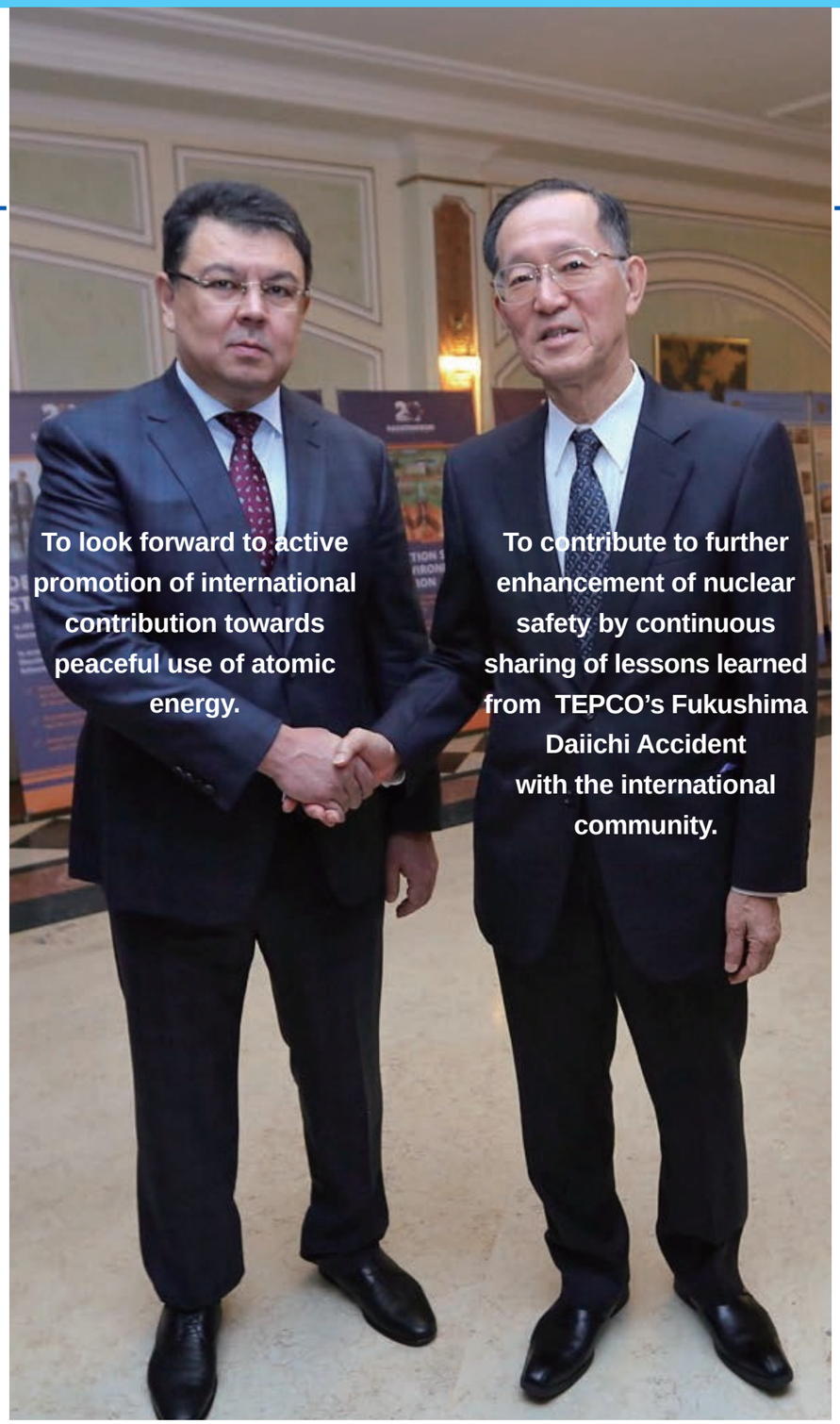
The important event of the year became the physical start-up of Kazakhstan Tokamak (KTM)*2 in the opening day of ASTANA EXPO. Tokamak KTM is a specialized facility designed to test structural materials that will be used in thermonuclear reactor of the future. It is operated at the base of the National Nuclear Center of RK in Kurchatov town.

In addition, the following facilities were established in the Institute of Nuclear Physics of the Republic of Kazakhstan:

- New building for radiation sterilization with ILU-10 electron accelerator, and
- Training Center for Nuclear Safety for training of specialists in the area of physical protection, accounting and control, etc.

*1: An international framework after 2020 for reduction of greenhouse gases, etc. The Republic of Kazakhstan has set a goal of “15% Reduction of Greenhouse Gas Emission by 2030” and “Generation of 50% of All Energy from Renewable Energy Resources by 2050”.

*2: One of experimental devices for nuclear fusion.



Mr Kanat BOZUMBAYEV
Minister of Energy of the Republic of Kazakhstan

Dr Yoshiaki OKA
Chairman, Japan Atomic Energy Commission (JAEC)

JAPAN

■ Basic Concept on the Use of Nuclear Energy

To illustrate the principle of nuclear energy policy which goes beyond the borders of government agencies, the Japan Atomic Energy Commission issued the “Basic Policy for Nuclear Energy” in July 2017, in which the direction of long-term policy for future usage of overall atomic energy was compiled. The Government has decided in a cabinet meeting to respect the said document. The document provides an overview of the whole picture of the atomic energy policy and illustrates the desired direction and form of “Peaceful Use of Atomic Energy”, “Deepening of Public Understanding”, “Development of Human Resources”, “Research and Development” and so on from a cross-sectorial point of view.

■ Energy Program of Japan

Japan relies on imports for most of its energy resources. Since TEPCO’s Fukushima Daiichi Accident in 2011, Japan has been facing three new energy challenges, namely, a decline in energy self-sufficiency rate, higher electricity cost and rising CO_2 emissions, as a result of the increased dependence on fossil fuels.

Under such circumstances, Japan specified concrete policy objectives regarding safety, stable supply, economic efficiency and environmental conformity based on the Basic Energy Program and, in 2015, developed a forecast of supply and demand of energy for FY2030.

1. Safety is the basic premise,
2. To increase the self-sufficiency ratio to approx. 25%,
3. To lower the power generation cost from the present level, and
4. To decrease the greenhouse gas emission volume to a level comparable to Europe and the U.S.

■ Current Status of Fukushima

The condition of TEPCO’s Fukushima Daiichi Nuclear Power Plant has been stabilized. About 6,000 workers are now proceeding the decommissioning work safely and steadily on the power plant site. In the beginning, the workers had to wear protective clothing. However, the environmental condition in the working area has been improved and 90% of the area now allows the workers to work in ordinary uniforms.

The air dose rate in Fukushima Pref. is at an almost equivalent level as those of major cities overseas.

Fukushima Pref. is one of the major agricultural regions in Japan and produces quality food products, such as peaches and rice. Monitoring for radioactive substances is mandatory on all produce of Fukushima Pref. and only those that satisfy the strict criteria are allowed to be shipped. The criteria are actually much more severe than those set by the World Health Organization (WHO) and Food and Agriculture Organization (FAO), and both organizations highly evaluate such circumstances in Fukushima.

Left: Sampling of corals (Indonesia), Top right: Sampling of minerals (China), Bottom right: Mangroves (Indonesia)

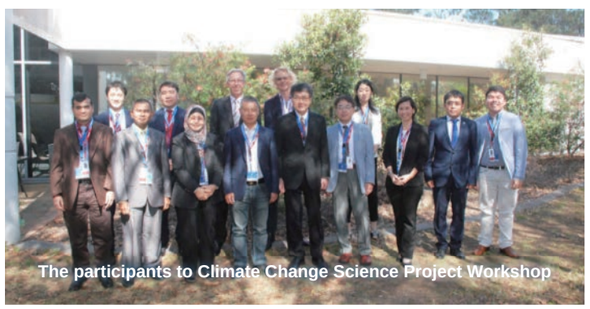
Started toward Interpretation of Climate Change Mechanism Climate Change Science Project has been launched The 1st Workshop held in Australia

Venue: Sydney, Australia
Held on: October 24 through 26, 2017
Hosted by: Australian Nuclear Science and Technology Organization (ANSTO)
Participating Countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia,Mongolia, Philippines, Thailand (10 countries)

The Climate Change Science Project in which 11 FNCA member countries are participating was set up in 2017 in response to a suggestion by Australia. In the natural world, there exist countless numbers of naturally occurring radionuclides*1 and isotope*2 in soil, rocks, rivers, lakes, oceans, forests and so on. By collecting them and through nuclear technology-based analyses of them, they provide us with a key to understanding what the climate, land features and environment of terrestrial areas and ocean areas were like in the past and how they will change in the future. This project will combine and utilize the data, which participating countries have obtained through the use of nuclear technology, to interpret phenomena that cause climate changes such as El Niño Southern Oscillation*3, Indian Ocean Dipole*4, Inter-decadal Pacific Oscillation*5.

The first workshop on FNCA Climate Change Science Project was held in Sydney, Australia, from October 24 to 26, 2017. Participating countries reported on climate change studies already underway. It was decided that the FNCA project would focus on following two themes:

- Radionuclides archived in lakes, mangroves, corals and tree rings, etc.
- Carbon storage in terrestrial soils and coastal systems*6



The participants to Climate Change Science Project Workshop

*1 Nuclide: One type of element. It differs depending on the mass number (the total number of protons and neutrons composing an atom nucleus). The one with radioactivity is called radionuclide.
*2 Isotope: One type of element. It differs depending on an atomic number (number of protons). It is classified into stable isotope and unstable isotope (radioactive isotope).
*3 El Niño Southern Oscillation: Phenomena that cause an anomaly of sea-level pressure (barometric pressure height difference) in the east of the South Pacific Ocean and in areas near Indonesia.
*4 Indian Ocean Dipole: Phenomena that cause an anomaly of seawater temperature (temperature difference) in the east and the west of the Tropical Indian Ocean once every several years in and around summer to fall.
*5 Inter-decadal Pacific Oscillation: Phenomena that cause an anomaly of sea surface temperature (temperature difference) near the central region of the North Pacific Ocean and in the coastal region of North America. The anomaly has been reversing once in one or a few decades.
*6 Carbon storage: Absorption of carbon, which had once been collected by plants from atmospheric carbon dioxide by photosynthesis, into soil, etc. from plants that were killed by withering, etc. Carbon is also absorbed and fixed by living things in the sea such as marine algae. Such carbon is called “Blue Carbon”.

Facts Discovered through Analysis of Isotope and Radionuclide

1. Lake and River Sediments

Microfossils of pollen, algae and living objects of the past period accumulated in sediment layers sunk in the bottom of rivers, lakes, ponds. These objects contain radioactive carbon of which the abundance ratio diminishes over time at a certain rate. The measurement of such carbon indicates the period when the plants or living things accumulated in the sediment layers were living.

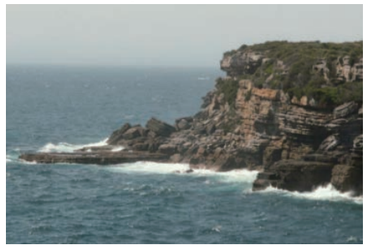
2. Tree Rings

In tree rings, isotope of oxygen remains stored by way of moisture supply from the past precipitation or soil water. Rain water is rich in ^{16}O which is one of three types of stable isotope of oxygen. Therefore, if the ratio of ^{16}O stored in tree rings is high, it means that the period, during which such trees were fed with moisture, was a humid and high-rainfall period.

3. Corals

Skeletons of coral, as with trees, also absorb stable isotope of oxygen from seawater. The stable isotope of oxygen “^{16}O” is contained in large amounts in rain water. Therefore, if the ratio of ^{16}O stored in a skeleton of coral is high, it means that the period when such coral absorbed ^{16}O was a high-rainfall period and that the salt concentration of seawater at that time was lowered by precipitation.

4. Landscape



When erosion, landslides or the like changes land features, a hidden bedrock may sometimes crop out. From that point in time, the outcropped ground starts to be exposed to cosmic rays, and minerals on the surface of such ground start producing radionuclides, which decay over time. An analysis of such radionuclides will indicate the time when the land features changed and the exposure to cosmic rays started.

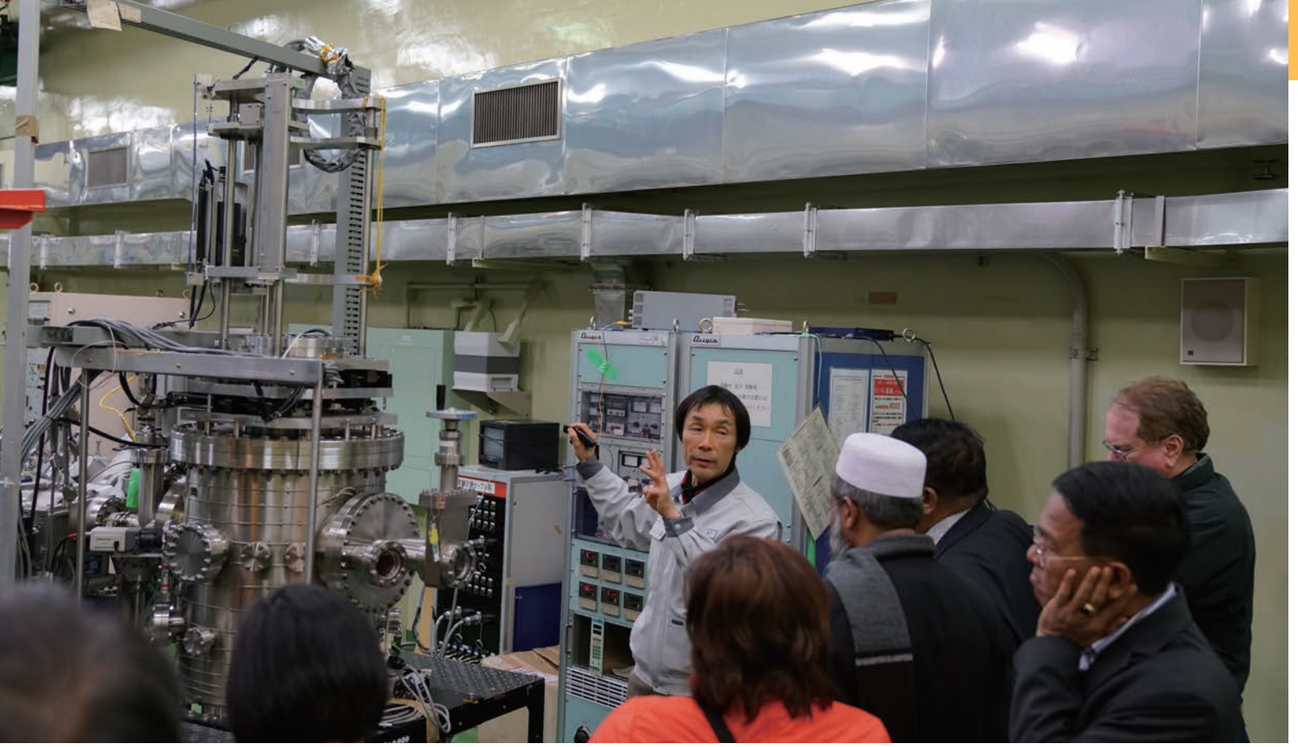
5. Carbon Storage

Carbon emitted into the atmosphere by consumption of fossil fuel stays in the air to increase the carbon dioxide concentration. It will also be absorbed by ecosystems in soil as well as by oceans. Photosynthesis, etc. of plants make the amount of carbon stored in soil the largest among those stored in ecosystems in terrestrial areas. The higher the air temperature, the more carbon stored in soil will be discharged to the atmosphere and the more it will impact global warming. If the mechanism of the storage in soil and the discharge to the atmosphere of carbon is understood, it facilitates the prediction of future trends of global warming.
Radioactive carbon, a small amount of which is contained in carbon, diminishes its abundance ratio over time at a certain rate. Therefore, it can determine the length of the period during which the carbon stayed in soil. Through utilization of these characteristics, the amount of time required for storing and discharging carbon in and out of soil can be interpreted.

Examples of equipment used for analysis (**Photos were provided by Japan Atomic Energy Agency (JAEA)**)

Accelerator Mass Spectrometry (AMS)

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)



Agriculture in Asia Promoted by Radiation Sterilization/Processing Technology

Joint Workshop held by the Biofertilizer Project and Electron Accelerator Application Project

Venue: Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology (QST), Takasaki City, Gunma Pref.
Held on: November 13 through 17, 2017
Hosted by: Ministry of Education, Culture, Sports, Science and Technology
Supported by: Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology (QST)
Participating Countries: Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, the Philippines, Thailand and Vietnam (10 countries)

The Joint Workshop of the Biofertilizer Project and Electron Accelerator Application Project was held for 5 days from Nov. 13 till Nov. 17, 2017 at Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology in Takasaki City, Gunma Pref.

On Nov. 13, an open seminar named “Application and Sustainable Development of Radiation Technology in Asia”, co-hosted by Takasaki Advanced Radiation Research Institute, was held and attended by about 130 participants.

In the joint session, participating countries gave presentations and discussions on the synergistic effect of biofertilizer and oligochitosan Plant Growth Promoters (PGP), and they conducted progress checks and evaluation on the tests.

During the parallel sessions of the Biofertilizer Project, topics such as “multifunctional biofertilizer”, “radiation sterilization of carriers for commercial production of biofertilizer”, “development of guidelines for quality assurance and control of biofertilizer” and so on were discussed, and the status of efforts and the past 3 years of activities of each country were summarized.

In the parallel session of the Electron Accelerator Application Project, challenges in the commercialization of PGP and Super Water Absorbents (SWA) were discussed. As for the SWA, some approaches toward the improvement of cost-effectiveness of the product, which had been a big challenge, were identified.

On Nov. 14, a technical visit was conducted. The participants took a tour of facilities such as the Science Plaza, Gamma-ray irradiation Facility and Electron Accelerator after they received a briefing on the outline of Takasaki Advanced Radiation Research Institute.

Synergistic Effect Created by Strong Collaboration between Two Projects

The Biofertilizer Project aims for research and development of environmentally friendly and high quality biofertilizer (fertilizer utilizing microorganisms that help plant growth) by utilization of radiation sterilization technology.

The Electron Accelerator Application Project aims for research and development of SWA (soil conditioner for use in arid region, etc. capable of absorbing and retaining water) and PGP by utilization of the technology of radiation processing onto natural polymers. Both of the projects have a common goal for their activities, namely, contribution to the development of sustainable agriculture.

Since 2012, they have been conducting evaluation tests on synergistic effects (plant growth promotion effect, disease suppression effect and etc.) that are obtainable through the combined use of biofertilizer and PGP. Since 2016, the two projects have been jointly organizing workshops to enhance the collaboration between the projects for the acceleration of effective research.

In the country reports during the joint workshop of this fiscal year, the results of evaluation tests of synergy effects on various agricultural products including rice were reported. One example of such tests in a semi-field test of rice in Bangladesh showed an increase of grain yield by 12%. Thus, the synergistic effect of the combined use of biofertilizer and PGP has been found in some countries.

Technical Visit

Participants of the Joint Workshop

Open Seminar

The Results of Project Activities Have Been Commercialized and Put to Practical Use in FNCA Member Countries

In the course of activities of the two projects, many products that utilize radiation technology have been put to practical use in the member countries. Among those, two products which have been practically used in the Philippines and Vietnam are introduced below:

The Philippines: Biofertilizer “Bio N”

“Bio N” of the Philippines is a biofertilizer produced by utilizing useful microorganisms in the soil, such as Azospirillum. It was developed for the use for rice and corn, and is quite popular among farmers.

Since 2012, they have been applying gamma ray radiation sterilization to the production process, which has resulted in higher product quality.

Vietnam: Plant Growth Promoter “RIZASA 3SL”

“RIZASA 3SL” of Vietnam is an oligochitosan Plant Growth Promoter for rice, sugarcane and chili pepper and is produced through the degradation of chitosan, which is extracted from shells of crustacea, to low-molecular by gamma ray irradiation.

According to the test results, the rice yield was increased by 10% to 20%

To Enhance Nuclear Security in the Asian Region

A Workshop on Nuclear Security and Safeguards Project Was Held

Venue: Tokaimura and Mito City, Ibaraki Pref.
Held on: September 19 through 21, 2017
Hosted by: Ministry of Education, Culture, Sports, Science and Technology
Supported by: Integrated Support Center for Nuclear Nonproliferation and Nuclear Security (ISCN) of Japan Atomic Energy Agency
Participating Countries: Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, the Philippines, Thailand, Vietnam (10 countries)

The workshop on Nuclear Security and Safeguards Project was held for 3 days on September 19 – 21, 2017 in Mito City and Tokaimura, Ibaraki Pref.

On Nov. 19 and 20 in Mito City, round-table discussion and special lectures were conducted after each country's report on efforts for Nuclear Security and Safeguards.

On Nov. 21, a technical visit was conducted at the following four facilities of Japan Atomic Energy Agency (Nuclear Science Research Institute, Integrated Support Center for Nuclear Nonproliferation and Nuclear Safety), in Tokaimura, Ibaraki Pref:

- Clean Laboratory for Environmental Analysis and Research (CLEAR)
- Virtual Reality System
- Physical Protection Exercise Field
- Forensics Laboratory

Virtual Reality System of Integrated Support Center for Nuclear Nonproliferation and Nuclear Security, Japan Atomic Energy Agency

Reaffirmation of Importance of Efforts for Nuclear Security and Safeguards

During the workshop, presentations and discussions were conducted on each FNCA member country's efforts and future actions for the following topics:

- Nuclear forensics
- Security of radioactive source
- Good practice of Additional Protocol (AP) implementation
- Capacity building in the field of nuclear security and safeguards

■ Collaboration proposed for the enhancement of nuclear forensics capability

Nuclear forensics is one of future tasks that participating countries are focusing on, and the countries have shared the issues on actions to be taken. They discussed the extent and the type of collaboration among the countries that they can promote under the framework of FNCA for the enhancement of forensics capability of each country. It is more effective to utilize technologies and devices that have already been available for various purposes rather than to establish a new nuclear forensics laboratory from scratch. Thus, utilization of resources, which were existing and available, for nuclear forensics was presented as one suggestion.

■ Efforts of Japan for the enhancement of the security for radioactive source

There are over 8,000 licensed users of radioisotopes (RI), etc. in Japan, and the requirement for the enhancement of RI security is becoming stronger. It was reported that the Government of Japan had reviewed regulations under the Radiation Hazard Prevention Act and was implementing the tightening of regulations by the law amendment enforced in April 2017. As a result of the law amendment, for example, business operators that have RI beyond international standards are mandated to provide security.

Participants of the workshop on Nuclear Security and Safeguards Project

■ To share good practice of Additional Protocol (AP) implementation

When countries that ratified AP fulfill obligations for safeguards, it is important for them to collect related information. Especially for the smooth implementation of complementary access and declaration of management status of radioactive materials as required by AP, the countries need to be well prepared in management-related and technology-related aspects. To support FNCA member countries to implement such obligations, it was proposed and agreed upon to put together the knowledge, which FNCA member countries had acquired through their experiences in the implementation of AP, and to compile such knowledge into a book of examples of good practice.

What are "Nuclear Security and Safeguards"?

"Nuclear Security" stands for measures to be taken to prevent any threat, in which an abuse of radioactive materials or radioactive sources by terrorists, etc. may be foreseen to become reality. "Safeguards" are measures to secure the circumstances where radioactive materials will not be used for any nuclear weapon, etc. but only for peaceful purposes.

For the promotion of the peaceful use of atomic energy in Asian countries, it is important to firmly secure Nuclear Security and Safeguards as well as nuclear safety. The purpose of this project is to share experiences, knowledge and information among the member countries for the enhancement of Nuclear Security and Safeguards, and to exchange opinions about policies, strategies and framework for further improvement of implementation capability in such fields.

Photo: Photo of leaders that attended the 4th Nuclear Security Summit held in the U.S. (March 31 – April 1, 2016)
Source: Website of Prime Minister's Office (http://www.kantei.go.jp/jp/97_abe/actions/201604/01nss.html)

Nuclear forensics are technical means to analyze the origin, history, transportation route, purpose and etc. of nuclear materials that have been confiscated or collected by the investigating authority. For such purposes, nuclear forensics analyze composition, physical/chemical state and etc. of nuclear material, radioactive material and any other related material.

Nuclear forensics technology can identify the origin of nuclear materials that have been used for illegal transactions or terrorism, etc. Therefore, it identifies the criminal party to increase the possibility for the prosecution, and will eventually deter nuclear terrorism, etc. Thus, the establishment of international network for nuclear forensics will contribute to the enhancement of the global nuclear security system.

Additional Protocol (AP) is a protocol for enhancement of safeguards, which is additionally concluded between IAEA and a country that already has a Safeguards Agreement with IAEA. When AP is concluded, IAEA will be authorized to implement more comprehensive safeguards in that country than the safeguards under the Safeguards Agreement. To put it concretely, any country that concludes AP will have the following obligations:

- To declare any nuclear-related activity which is not declared pursuant to the existing Safeguards Agreement, and;
- To allow IAEA complementary access to a location, etc. which is not accessible under the existing agreement.

Introduction of On-Going 8 Projects

As FNCA Project activities, 8 projects are being conducted in various nuclear fields. Each project promotes joint research, debates in common challenges, and holds a workshop annually. Each project also reports research results and provides guidelines /manuals on which research in Asian countries should be based.

▼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 2017

- Dates: October 25-28
- Place: Manila, The Philippines
- Participating Countries: 11

■ Recent Activities and Outputs

Left: Publication of protocol for nasopharyngeal cancer (NPC-II)(2005-2013) (2015, Journal of Radiation Research)
Right: Publication on QA/QC of external beam radiotherapy for cervical cancer (2006-2014) (2016, Journal of Radiation Research)

■ TOPICS

- Reports and discussions were delivered on the 5 topics namely 1) Phase II Study of Concurrent Chemoradiotherapy with Extended-Field Radiotherapy for Locally Advanced Cervical Cancer (CERVIX-IV), 2) Prospective Observational Study of 3D-Image guided brachy therapy for Locally Advanced Cervical Cancer (CERVIX-V), 3) QA/QC for 3D-IGBT, 4) Phase II Study of Neoadjuvant Chemotherapy with Concurrent Chemoradiotherapy (CCRT) for Nasopharyngeal Carcinoma (NPC-III), and 5) Phase II Study of Hypofractionated Radiotherapy for Breast Cancer (BREAST-I).
- On-site 3D-IGBT training course at FNCA Workshop was agreed by all member countries.

▼Research Reactor Utilization

This project has been promoting mutual collaboration among researchers in Asian countries on research reactors used for multipurpose 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 2017

- Dates: November 21-23
- Place: Serpong, Indonesia
- Participating Countries: 11

Open Seminar with "Seminar on Nuclear Technology Utilization"

■ TOPICS

- Open Seminar with "Seminar on Nuclear Technology Utilization" was held at National Nuclear Energy Agency of Indonesia.
- In the parallel session on Neutron Activation Analysis, activities on air pollution and mineral resources were reported by participating countries and continuing improvement for the linkages with end-users has been well demonstrated through the contribution of each participating country.
- In the parallel session on Research Reactor Utilization, current status of radiation isotopes production and application and plans for new research reactors were presented by participating countries. And some topics like boron neutron capture Therapy and material research for next year's workshop were chosen for future plan.

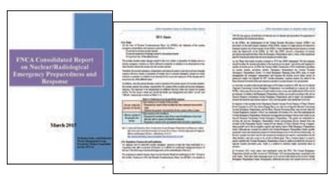
▼Radiation Safety and Radioactive Waste Management

This Project has been improving radiation safety in FNCA countries by sharing knowledge. 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.

■ Workshop 2017

- Dates: August 1-3
- Place: Bangkok, Thailand
- Participating Countries: 12

■ Recent Activities and Outputs



Consolidated Report on Nuclear/Radioactive Emergency Preparedness and Response (2017)

■ TOPICS

- The open seminar titled “Radiation/Nuclear Applications and Radioactive Waste Management” was held in the Kasetsart University.
- Framework for Consolidated Report on Low Level Radioactive Waste Repository was discussed.
- Current status on Low-level radioactive waste repository, radioactive waste and spent nuclear fuel management were shared by all participating countries.
- The participants visited Thailand Institute of Nuclear Technology in Ongkharak, in which they especially saw the Gem irradiation facility, radiochemical laboratories, Isotope characterisation laboratories, new radioactive waste storage building and so on.

▼Mutation Breeding

This project has been using mutation breeding technology with irradiation to crops that are highly needed in Asian countries, and establishing new varieties with higher yield and more resistance to various environmental stress under climate change in order to promote sustainable agriculture.

■ Workshop 2017

- Dates: October 31-November 3
- Place: Jeju, Korea
- Participating Countries: 9+IAEA/RCA

■ TOPICS

- International Symposium titled on "Application of Radiation Technology and Mutation Breeding for Sustainable Agriculture" was co-organized with Korean Society of Radiation Industry and Korea Atomic Energy Research Institute.
- Activities on Application of Mutation Breeding of Rice for Sustainable Agriculture was summarized and evaluated to conclude current phase.
- Plan and theme were discussed on new phase from 2018.
- Participants visited Institute for Nuclear Science & Technology and Sub-tropical Horticulture Research Center of Jeju National University and Citrus Research Institute of RDA.

*Please refer to P13 for more details about this project.

▼Research on Climate Change using Nuclear and Isotopic Techniques

This project aims better understand the mechanisms and processes of past climate variability through undertaking nuclear and isotopic based analyses that support research into past climate change, and sharing the expertise to interpret the new knowledge.

■ Workshop 2017

- Dates: October 24-26
- Place: Sydney, Australia
- Participating Countries: 10

■ TOPICS

- Participating countries reported on their country’s contributions to climate change studies, as well as some studies already underway.
- Work plan for 3 years activity was discussed and decided to have two streams, namely “environmental archives” and “carbon storage”.
- Participants visited Centre for Accelerator Science and Environmental Radioactivity Measurement Centre of Australian Nuclear Science and Technology Organisation for technical tour and observed some works and facilities related to the project activities.

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

▼Biofertilizer

This project has been applying technology of radiation sterilization to biofertilizer production and developing biofertilizer with better quality and multifunction having both plant growth promoting activities and plant pathogen suppression for promoting environmental-friendly agriculture.

■ Workshop 2017

- Dates: November 13-17
- Place: Takasaki, Japan
- Participating Countries: 9

■ TOPICS

- Open Seminar on “Application and Sustainable Development of Radiation Technology in Asia” was jointly held by FNCA and Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology.
- 3 years activities for current phase were concluded and evaluated after reports and discussions on some challenges.
- Draft of “FNCA guideline Volume II: Production of Biofertilizer Carrier Using Radiation” was edited towards publication in March 2018.
- Prof. Gary Stacey, super professor of Tokyo University of Agriculture and Technology delivered a special lecture.

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

▼Electron Accelerator Application

This project has been developing radiation processing technology such as radiation degradation, crosslinking, and grafting to produce oligochitosan plant growth promoter and super water absorbents as soil conditioners using indigenous natural polymers. Those materials are being tested on field.

■ Workshop 2017

- Dates: November 13-17
- Place: Takasaki, Japan
- Participating Countries: 10

■ TOPICS

- Open Seminar on “Application and Sustainable Development of Radiation Technology in Asia” was jointly held with Takasaki Advanced Radiation Research Institute, National Institutes for Quantum and Radiological Science and Technology.
- It was reported and discussed on challenges for commercialization of plant growth promoters and super water absorbents.
- Outcomes from 3-year activities of current phase were summarized and work plan for new phase were discussed.
- Participants visited TIARA, electron accelerator facilities, ^{60}Co irradiator and science plaza of Takasaki Advanced Radiation Research Institute.

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

▼Nuclear Security & 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 FNCA countries by sharing knowledge and information, and cooperation in developing human resources.

■ Workshop 2017

- Dates: September 19-21
- Place: Mito & Tokai, Japan
- Participating Countries: 10

■ TOPICS

- Country reports were followed by round table discussion and special lectures on implementation of nuclear security and safeguards.
- Presentation and discussion was held on the topics of nuclear forensics, good practices of Additional Protocol Implementation and human resource development on nuclear security and safeguards.
- Participants visited Clean Laboratory for Environmental Analysis and Research, Virtual Reality System, Physical Protection Exercise Field, Forensics Laboratory of Japan Atomic Energy Agency.

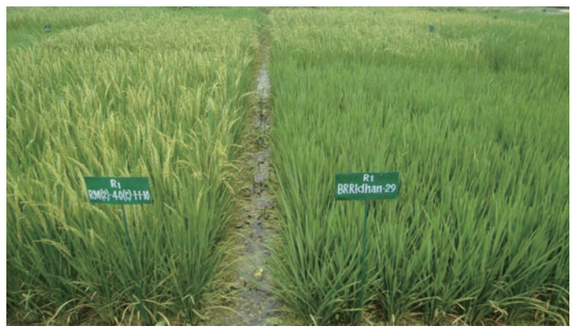
*Please refer to P9-10 for more details about this project and workshop.

Mutation Breeding Project

Challenge for Improvement of Crops for Resistance to Climate Change by Radiation Breeding

Aiming for promotion of food production and quality improvement of crops in Asia, this project is working on breeding technology, which utilizes radiation-induced mutation by gamma-ray or ion-beam, to develop new varieties that are resistant to diseases, insects, drought and other problems for important agricultural products in Asia such as rice, banana, orchids, sorghums, soybeans and others.

During the project phase from JFY2013 to JFY2017, it focused on the subject titled “Mutation Breeding of Rice for Sustainable Agriculture” to work on development of new varieties that meet the needs of each country such as a high yield crop which requires only a small amount of fertilizer and agrochemicals, a disease-resistant variety, a drought-tolerant variety and other varieties resistant to climate change. Through such activities, the project achieved great results, namely, almost all of the member countries successfully developed new varieties having good characteristics through Mutation Breeding and such new varieties have contributed to sustainable agriculture. In addition, some of the new varieties have already been put to practical use, and have resulted in a substantial economic effect. In Mongolia where they don’t grow rice, new varieties of wheat that has good salt resistance and earlier maturity than its parental variety have been developed. In addition, they are promoting experiments on rice as well, so that they can introduce a new rice variety that adapts to the limited climate conditions in Mongolia. During a new project phase starting from JFY2018, the project activities are planned to focus on a subject titled “Mutation Breeding of Major Crops for Low-Input Sustainable Agriculture under Climate Change”.



▲ **A new variety of rice developed in Bangladesh**
An early maturity and high-yield variety through mutation breeding utilizing ion-beam irradiation (the paddy on the left)

▲ **A new variety of rice developed in Malaysia**
A variety with high tolerance to drought through mutation breeding utilizing gamma-ray

Safety Management Systems for Nuclear Facilities Project

Contributed to Enhancement of Safety in Nuclear Facilities through Self-assessment and Peer Review

For the purpose of securing the safety of nuclear facilities, owners of such facilities address an issue on radiation protection and take actions for repair and maintenance, etc. of facilities to prevent nuclear accidents. The organizational systems to ensure appropriate implementation of such actions are called the “Safety Management System”.

In the course of this project, Peer Review was conducted in research reactor facilities of six countries and good features of each facility (Good Practices) as well as items to be improved were pointed out, so that FNCA Member Countries could understand them and continuously improve the Safety Management System for Nuclear Facilities. Such arrangements aided in the enhancement of the safety of nuclear facilities. In particular, there were as many as 117 cases of good practices discovered in each facility, and such cases were compiled into a Good Practice Examples and have been put on the FNCA Website*. Thus, this project was successfully completed in FY 2016.

Peer Review being held at the Thailand Institute of Nuclear Technology TRR-1/M-1

* Good Practice Examples URL: http://www.fnca.mext.go.jp/english/sms/good_practices.pdf

System of Peer Review

(1) Visit to a Research Reactor
Experts from the countries visit a predesignated facility to check repair and maintenance conditions, etc.

(2) Review by Experts
Based on results of the visit, good practices and points to be improved are discussed and determined in terms of safety management of the facility.

(3) Preparation of Peer Review Report
Good practices and points to be improved are summarized in a report

History of Peer Reviews

Reviewed Facilities		Year
Multipurpose Reactor G.A. Siwabessy (RSG-GAS)	Indonesia	2010
PUSPATI TRIGA Mark II Research Reactor (RTP)	Malaysia	2011
High Flux Advanced neutron Application Reactor (HANARO)	Korea	2012
3MW TRIGA Mk-II Research Reactor (BTRR)	Bangladesh	2014
Dalat Nuclear Research Reactor	Vietnam	2015
Thai Research Reactor-1 / modification 1 (TRR1/M1)	Thailand	2016

Australian Team Won the First "Best Research Team of the Year"

"FNCA Award" was established to recognize a country team's most outstanding achievement among FNCA project activities in previous fiscal year. The "Best Research Team of the Year" was awarded to Australia's "Research Reactor Network" for the first time. In addition, "Excellent Research Teams of the Year" were awarded to other three countries. Award Ceremony was held at the 18th FNCA Ministerial Level Meeting.

▲ Mr Michael Druce (ANSTO, right) received the trophy for the "Best Research Team of the Year" from Dr Yoshiaki OKA, Chairman of JAEC (left).

Best Research Team

Research Reactor Network Project
Australia

Award Winner: Mr Michael Druce
Project Leader of Australia
Australian Nuclear Science and Technology Organisation

● Message from Mr Michael Druce

The main emphasis of the FNCA's Research Reactor Network was on medical radioisotopes and in particular ensuring a reliable supply of molybdenum.

ANSTO has designed and constructed a new process plant, called ANSTO Nuclear Medicine (ANM), to produced molybdenum-99 from the fission of uranium. ANM has the capacity to produce 3,500 six day curies per week, and it is now undergoing commissioning. Key features of the new plant include state of the art design, the use of low enriched uranium targets, and low emissions of xenon isotopes to meet CTBTO desired outcomes.

A project of this magnitude involves many people who have very diligently over several years to ensure the plant is a state of the art facility.

The ANSTO staff involved in this project are greatly honoured by this award and thank FNCA members for choosing the team for this initial award.

ANSTO continues to work to maximize the effectiveness of the OPAL research reactor. The reactor is at power for 300 days each year and is used to produce medical radioisotopes, to irradiate silicon ingots, for neutron activation analysis and the neutrons beams are used for a wide range of scientific experiments.

◀ **Key staff involved in the design of the plant**
(From left) Mr Michael Druce, Mrs Bhawna Sharma, Mr Moshiul Alam, Mr Richard Watts

Excellent Research Teams of the Year

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

- Bangladesh: Radiation Oncology Project
- Malaysia: Mutation Breeding Project
  Human Resources Development Project
- Philippines: Electron Accelerator Application Project

Results of the Activities in the Field of Radiation Application were Reported

FNCA Symposium 2018 was held at the Wakasa Wan Energy Research Center on the topic of "Radiation application utilizing its features has expanded to this extent"

On January 23, 2018, FNCA Symposium 2018 was held at the Wakasa Wan Energy Research Center in Tsuruga City, Fukui Prefecture. It was attended by over 100 participants including more than 20 experts, from Japan as well as from 10 overseas member countries of FNCA.

Fukui Prefecture has formulated the "Energy Research and Development Centralization Plan" in order to establish an area of integrated research and development center of energy with a focus on nuclear power, and has also been strengthening the R&D function including radiation application, which is an important sector of FNCA. At the symposium, information was shared through the keynote speech and panel discussions concerning the situation and prospect of the wide range of application of radiation technology in various fields in Asia.

Opening remarks were made by Mr. Hiroshi Masuko, Deputy Director General of the Ministry of Education, Culture, Sports, Science and Technology, Mr. Kinichi Toyokita, Director of the Department of General Policy, Fukui Prefecture and Mr. Toshio Sano, Commissioner of Japan Atomic Energy Commission, and then Mr. Tomoaki Wada, FNCA Coordinator of Japan, presented information concerning the situation and results of the FNCA project activities centered on radiation application.

Mr. Hideo Nakajima, Director of the Wakasa Wan Energy Research Center introduced the activities of radiation application in Fukui Prefecture such as breed improvement of vegetables and cancer treatment.

Mr. Akihiro Tsuji, Director of International Nuclear Energy Cooperation Division, Ministry of Foreign Affairs introduced the efforts of Japan by way of cooperation activities in the International Atomic Energy Agency (IAEA), while the representatives of the FNCA member countries presented information concerning the current situation and prospect of radiation application in each country.

In the panel discussions, in addition to the effectiveness and future prospect of radiation technology in the agricultural sector in particular, the current status of application of radiation technology utilizing research reactors in Japan and other FNCA member countries was actively discussed.

On January 24, the participants from overseas visited the Japan Atomic Power Company Tsuruga Power Station to inspect the container, the spent fuel pool, and the safety facilities in compliance with the new regulations, etc. of Unit 2.

▲ Group Photo at Tsuruga Power Station

The 18th Coordinators Meeting, Tokyo, March 7-8, 2017


Visit to J-PARC Center

■ Introduction of New Projects

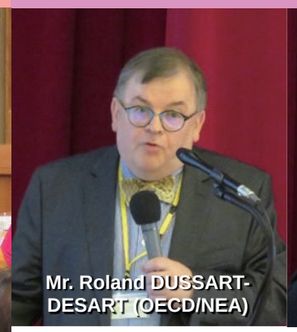
The 18th Coordinators Meeting hosted by the Cabinet Office/Government of Japan and the Japan Atomic Energy Commission, co-hosted by the Ministry of Education, Culture, Sports, Science and Technology was held, and was attended by the representatives of 11 FNCA member countries as well as IAEA/RCA (Korea did not attend). On March 6, the day before the meeting, a tour of J-PARC Center (Japan Proton Accelerator Research Complex) in Tokaimura, Ibaraki Pref. was conducted. The launch of two projects was decided at the meeting. They are the "Climate Change Science Research Project" to study the past climate change by using nuclear and isotopic techniques, and "Research Reactor Utilization Project" aiming for the upgrade of the technology level of human resources in charge of neutron activation analysis and research reactors. Also the framework and operational procedure of the "FNCA Award" were agreed upon. FNCA Award is an award program for significant achievements and regional contributions that are made in the course of FNCA activities.

■ Conclusions and Recommendations (summarized)

The following was agreed upon based on the joint communiques of the 16th and 17th FNCA Ministerial Level Meeting:

- The Climate Change Science Research Project would start anew in 2017 to understand the vulnerability and resilience of ecosystem and landscapes to climate change through utilization of nuclear and isotopic techniques.
- To enhance the radiation safety and radioactive waste management project especially regarding the construction of waste storage and disposal facilities, and the promotion of radiation safety and safety culture.
- As for the "FNCA Award", it would first start in the proposed scheme, and discussions for continuous improvement would follow thereafter.

2017 Study Panel/International Workshop, Tokyo, March 8-9, 2017


Mr. Roland DUSSART-DESART (OECD/NEA)


Ms Ximena VÁSQUEZ MAIGNAN (OECD/NEA)


Mr Sebastiaan REITSMA (Independent Nuclear Insurance Expert)

■ Sharing of Knowledge and Experience of Nuclear Liability

The 2017 Study Panel/International Workshop was held, being hosted by the Cabinet Office/Government of Japan and the Japan Atomic Energy Commission, co-hosted by the Ministry of Education, Culture, Sports, Science and Technology and supported by the Organization for Economic Cooperation and Development/Nuclear Energy Agency (OECD/NEA). The panel was attended by 11 FNCA member countries, as well as representatives of OECD/NEA (Korea did not attend). This panel was organized in response to the decision of the 17th Ministerial Level Meeting, which decided on the collaboration with international agencies that have extensive experience and knowledge in the field of nuclear laws to focus on the theme of "Nuclear Liability".
Better understanding of international legal framework of nuclear compensation system and the outline of the nuclear insurance could be obtained through lectures given by overseas experts. In addition, a systematic explanation was given about the "Japan's Nuclear Compensation System and Experiences in Fukushima", to which FNCA member countries paid their utmost attention, so that common recognition on the necessity and the importance of the development of legal systems were shared among FNCA member countries.

■ Summary of the Meeting

At the end of the meeting, Mr. Nobuyasu ABE, Commissioner, Japan Atomic Energy Commission (chairman of the meeting) stated the following as a summary of the meeting:

- Various lectures on international legal framework of nuclear compensation helped facilitate better understanding of treaties and enhanced the recognition on the importance of conclusion of treaties and any associated development/revision of domestic laws.
- As a result of sharing information on the Japan's nuclear compensation system and the experience in Fukushima, the recognition was enhanced regarding the necessity for the development of a framework of compensation system that realizes quick response when an accident occurs.
- Because FNCA member countries are neighbors, they have a keen interest in the compensation, etc. for damage across the border. It was meaningful that they gained knowledge on the status of the development of nuclear compensation system of other countries.
- Mr. Abe, as chairman of the meeting, was hoping to organize a meeting for this theme again in the future to share information on the progress of each country's efforts.

Coordinators List

Country	Name	Affiliation
	Mr. Peter McGLINN	Senior Adviser, International Affairs Australian Nuclear Science &Technology Organisation (ANSTO)
	Mr. Mahbubul HOQ	Chairman, Bangladesh Atomic Energy Commission (BAEC)
	Mr. LIU Yongde	Secretary General, China Atomic Energy Authority (CAEA)
	Dr. Hendig WINARNO	Deputy Chairman for Nuclear Technology Utilization National Nuclear Energy Agency (BATAN)
	Mr. Tomoaki WADA	Vice President Japan Foundation of Public Communication on Science and Technology
	Prof. Erlan G. BATYRBEKOV	Director General National Nuclear Center (NNC) of the Republic of Kazakhstan
	Mr. KIM Young Eun	Director of Space, Nuclear and Big Science Cooperation Division Ministry of Science and ICT (MSIT)
	Dr. Abdul Muin Bin ABDUL RAHMAN	Deputy Director General (Technical Program) Malaysian Nuclear Agency (Nuclear Malaysia)
	Mr. Chadraabal MAVAG	Head, Nuclear Technology Department Nuclear Energy Commission (NEC)
	Dr. Soledad S. CASTANEDA	Deputy Director/Department of Science and Technology Philippine Nuclear Research Institute (PNRI)
	Dr. Pornthep NISAMANEEPHONG	Executive Director, Thailand Institute of Nuclear Technology (TINT)
	Dr. TRAN Ngoc Toan	Vice President, Vietnam Atomic Energy Institute (VINATOM)

Activities in JFY 2017

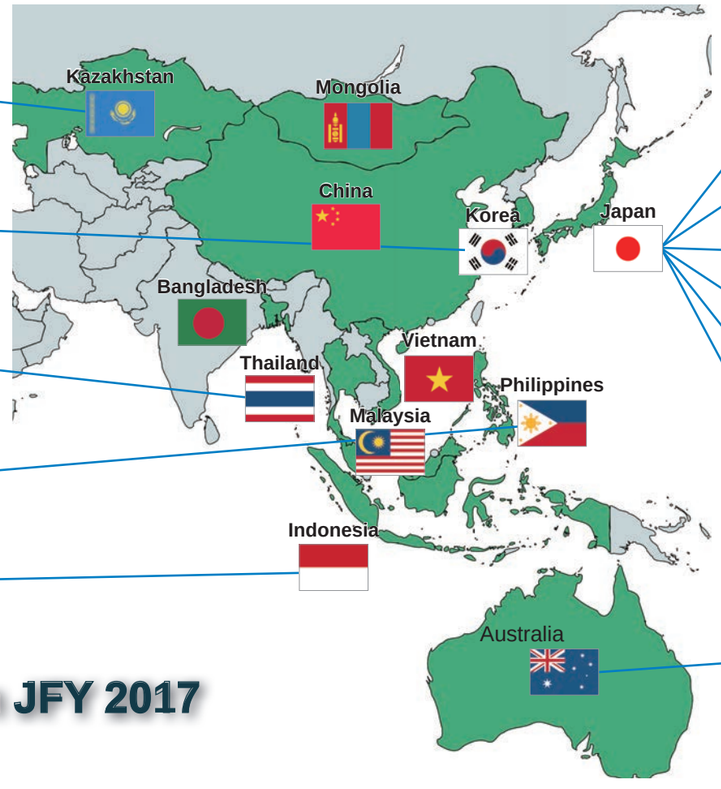
The 18th Ministerial Level Meeting
October 11, 2017, Kazakhstan

Mutation Breeding WS
October 31- November 3, 2017
Korea

Radiation Safety and Radioactive Waste Management WS
August 1-3, 2017, Thailand

Radiation Oncology WS
October 25-28, 2017, Philippines

Research Reactor Utilization WS
November 21-23, 2017, Indonesia



The 18th Senior Officials Meeting
July 19-20, 2017, Tokyo

Nuclear Security and Safeguards WS
September 19-21, 2017, Ibaraki

Joint WS on Biofertilizer & Electron Accelerator Application
November 13-17, 2017, Gunma

2018 Symposium
January 23, 2018, Fukui

The 19th Coordinators Meeting
March 22, 2018, Tokyo

2018 Study Panel
March 23, 2018, Tokyo

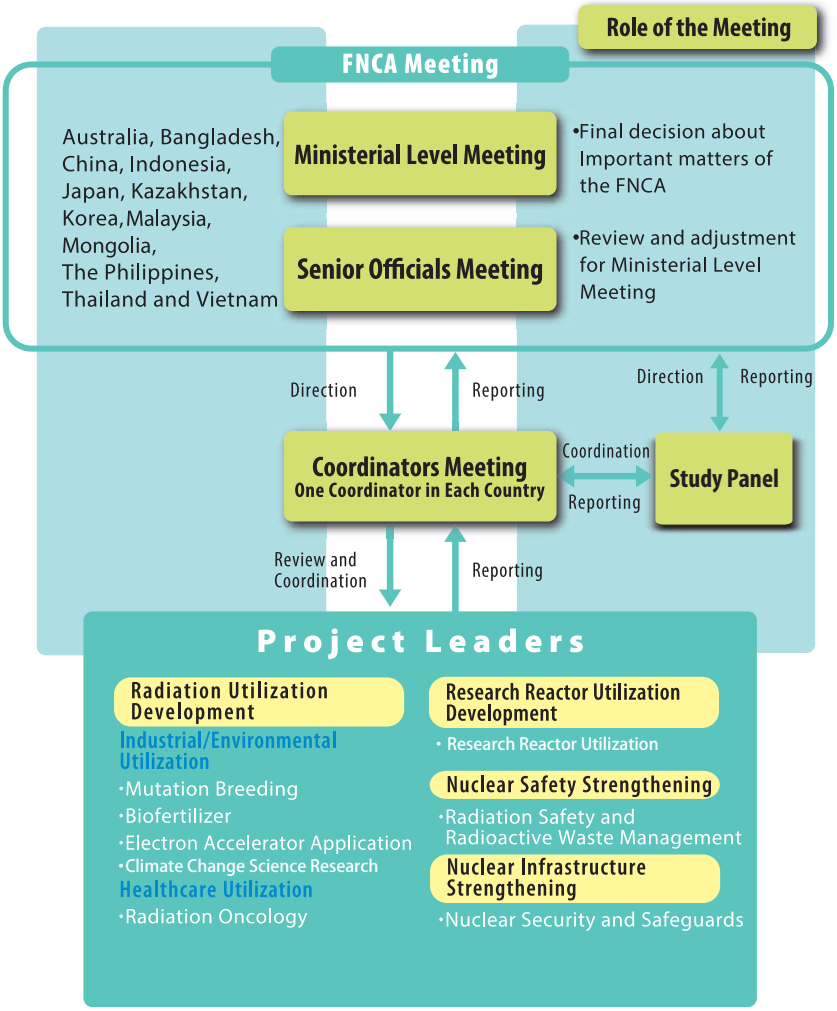
Climate Change Science Research WS
October 24-26, 2017, Australia

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 power, 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. In FY2016, Study Panel/International Workshop on nuclear liability was held with the cooperation of OECD/NEA.

Projects

For eight 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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