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Report: Workshop for Human Resources Development Project



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17th Ministerial Level Meeting

The 17th FNCA Ministerial Level Meeting (MLM), which was organized by Cabinet Office of Japan (CAO) and the Japan Atomic Energy Commission (JAEC), was held at Mita Conference Hall, Tokyo, on 30 November, 2016.

The meeting was attended by ministerial level representatives from twelve member countries and Director General of the OECD Nuclear Energy Agency (NEA).

Japan was represented at the meeting by Mr Yosuke Tsuruho, Minister of State for Science and Technology Policy and Mr Hirotaka Ishihara, State Minister of Cabinet Office. Minister Tsuruho delivered the welcome address. In it, he referred to FNCA's remarkable achievements in all important areas concerning the peaceful use of nuclear energy since its foundation in 2000; the importance of further enhancing nuclear safety by sharing valuable lessons learned from the Fukushima Daiichi Nuclear Power Plant Accident with

the international society; and expectations that strategic cooperation with related international organizations will offer a major opportunity for FNCA to achieve its goals.



OECD/NEA Director-General
Mr William D. Magwood IV

Mr William D. Magwood IV, Director-General of OECD/NEA delivered the keynote speech titled "Stakeholder Engagement in Nuclear Decisions." He emphasized the importance of establishing communication with the public. After that,

representatives reported on the progress of nuclear energy policy and initiatives in their respective countries; the reports included information related to stakeholder involvement.

The secretariat explained a number of items that were awaiting endorsement by the MLM, including "launch

of an evaluation framework", "introduction of an FNCA Award", and "preparation for the development of meeting guidelines." These items were approved and confirmed by MLM members accordingly.

At the meeting's conclusion, a joint communique was adopted that mentioned "themes and activities to be promoted," "reform and improvement of the management of FNCA activities," and other relevant matters.

Finally, Mr Bakhytzhan Mukhambetkaliyevich Jaxaliyev, Vice-Minister of the Ministry of Energy of the Republic of Kazakhstan, announced that Kazakhstan would host the 2017 FNCA MLM on 11 October in Astana, Kazakhstan's capital.



Mr Yosuke Tsuruho,
Minister of State for
Science and Technology
Policy



Mr Hirotaka Ishihara,
State Minister of Cabinet
Office



Mr Yosuke TSURUHO

Minister of State for Science and Technology Policy

Efforts towards Decommissioning of Fukushima Daiichi Nuclear Power Station Aiming to Rebuild a Trustful Relationship with the Public

It's been six years since the accident at the Fukushima Daiichi Nuclear Power Station. Japan has been making efforts in line with the Medium and Long Term Road Map towards decommissioning etc. of Fukushima Daiichi Nuclear Power Plant, and is now in the middle of Phase-2. The off-site conditions in Fukushima have been improving. The number of evacuees from Fukushima peaked to 165,000 people in May 2012, but has now decreased to as low as 84,000. Fukushima is actively striving for reactivation of its local communities.

After the Great East Japan Earthquake, Japan encountered three energy-related challenges, which were a decrease in energy self-sufficiency ratio, increase in energy costs, and increase in carbon dioxide (CO2) emissions. To overcome such challenges, the nation has been continuing efforts, with a targeted completion in the year of 2030, for broad-based measures for energy saving and promotion of a well-balanced configuration of power supply sources. Japan has 45 nuclear reactors other than the 15 which a permanent shut-down has been decided. Out of the 45 reactors, 5 have resumed operations, and 21 are now under examination by the Nuclear Regulation Authority.

In the field of nuclear science and utilization, four major research and development programs are now

being implemented, namely, (1) Nuclear Fuel Cycle and Disposal of High Level Radioactive Waste, (2) Decommissioning of Fukushima Daiichi Nuclear Power Station, (3) Research for Nuclear Safety and (4) Study of Nuclear Science and Technology.

Understanding and support of the public is important to promote the utilization of nuclear energy. In Japan, because of the nuclear accident in Fukushima, citizens have especially deep concerns over the safety of nuclear energy. The Government of Japan will carefully promote public hearings and information activities based on scientific evidence and objective facts in order to rebuild a trustful relationship with the public.



Land-side impermeable walls utilizing the frozen-soil method



Collaborative Laboratories for Advanced Decommissioning Science (CLADS)

Kazakhstan Mr Bakhytzhan Mukhambetkaliyevich JAXALIYEV

Vice-Minister, Ministry of Energy

Highest Production of Uranium in the World Bank of Low Enriched Uranium to be Established in 2017

Kazakhstan has the second largest reserves and the largest production of uranium in the world. As a stakeholder in the International Uranium Enrichment Centre, we have utilized uranium enrichment services for as much as 2,500,000 SWU of uranium.

We have established a company based on NAC "Kazatomprom" to produce 200 tons/year of fuel assembly to be used at nuclear power stations in the Asian region.

As a part of world efforts to enhance the framework of nuclear non-proliferation, the Bank of Low Enriched Uranium is scheduled to be established in 2017, and construction is now expected to be completed in the middle of 2017.

The critical experiment facility at the Institute of Nuclear Physics in Almaty has been converted into a facility using low enriched uranium fuel, and WWR-K Reactor started operations in December last year in relation with the new low enriched uranium fuel.

With close cooperation with organizations in Japan,

Vietnam Mr PHAM Cong Tac

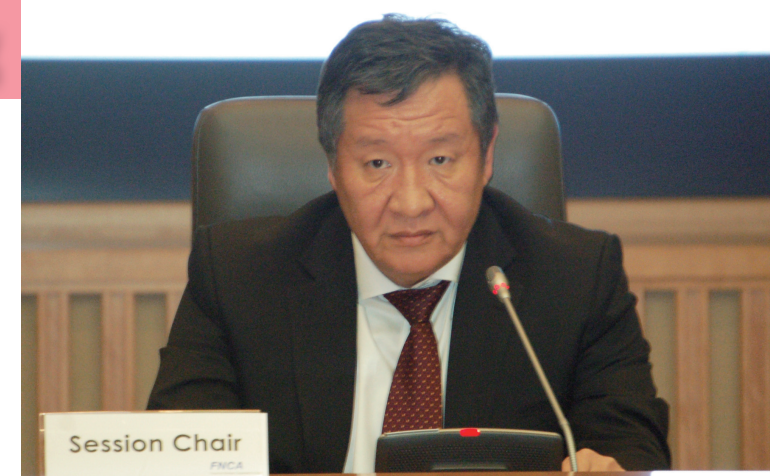
Deputy Minister,
Ministry of Science and Technology (MOST)

Aiming at Enhancing Nuclear Techniques and Radiation Applications

Because Vietnam is now under the industrialization process, the development of nuclear technology also facilitates socioeconomic improvements. In 2006, the strategy until 2020 for peaceful utilization of nuclear energy was approved.

In 2011, the Government approved the Master Plan until 2020 for the development of ionizing radiation for medical use. Our country currently has about 60 departments for radioactive medicines and treatment where about 100 units of nuclear medicine imaging apparatuses and radiation therapy equipment have been installed.

In 2010, the program for agricultural application of nuclear technology was approved. The strategic goal includes the establishment of the Plant Mutation Breeding Center, equipped with irradiation units (of low/high radiation) and apparatuses that enable mutation breeding of crops suitable for cultivation under various climate conditions.



France, Belgium and other countries, the National Nuclear Center has conducted activities to verify the safety of recent projects for nuclear power generation reactors and research reactors based on research reactors in our country.

In the Institute of Nuclear Physics, the Nuclear Medicine/Biophysics Centre has been established. At this facility, the production of a wide variety of radioactive medicines and radiation sterilization for medical purposes are scheduled to be performed.

Domestically, with regard to the operation of nuclear facilities, collaboration with stakeholders and their participation in the decision-making process has become a reality on a constant basis, such as explanations about decisions on construction of nuclear facilities, organizing public hearings, outreach activities using museum and exhibition centers, free study tours to company facilities, and publication of pamphlets or booklets and the like.



Our country has set a goal to achieve the master plan for development of ionizing radiation in various fields by 2021.

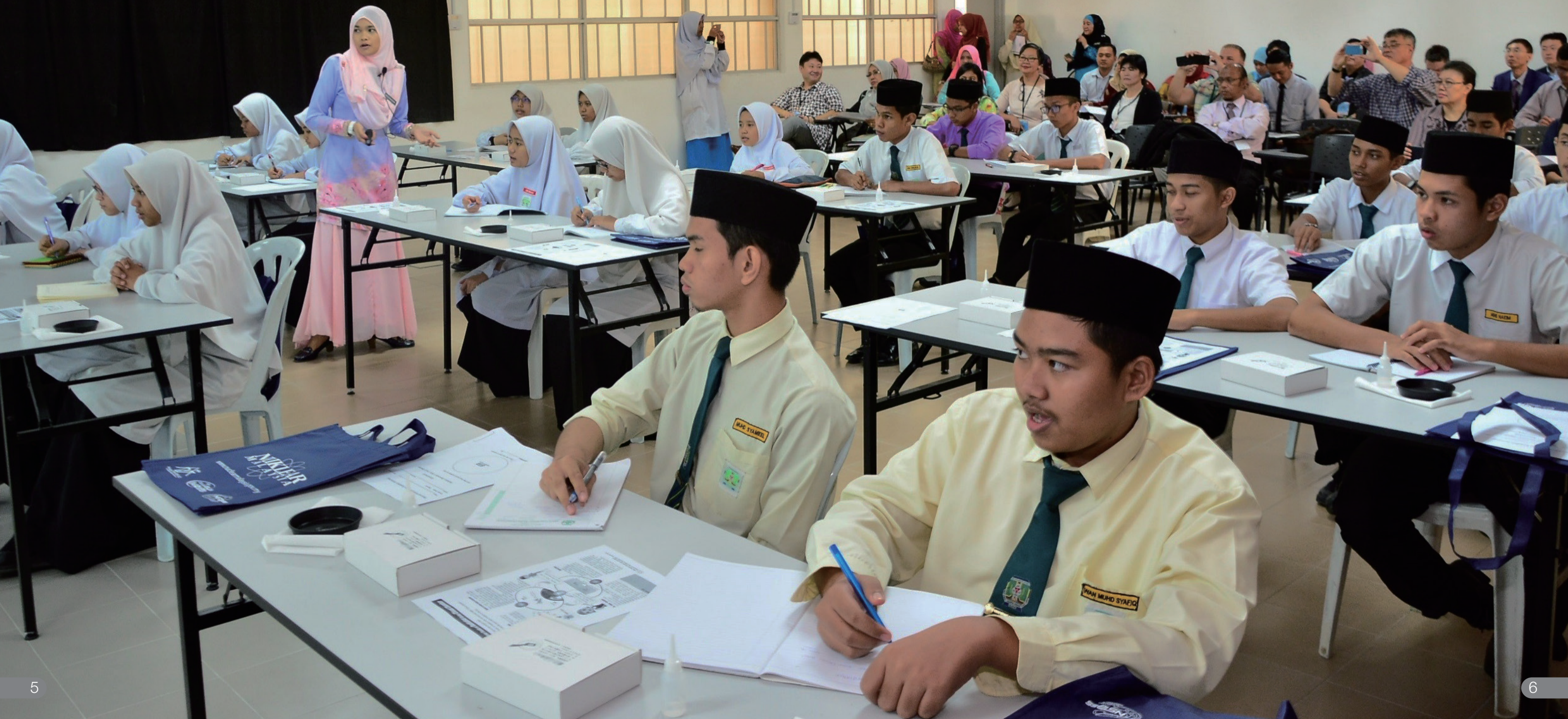
They are establishments such as a nuclear agriculture center, establishment of an irradiation facility to secure food health/safety of agricultural products for domestic and international market, and application to advanced diagnostic technology, etc. Among the policies of our country in the nuclear field, utilization of irradiation technology is prioritized to enhance the ability to monitor/evaluate the structural integrity of materials to be used in industry.

Feature Story

Malaysian Secondary School Students

Learn about Radiation

Report: Workshop for Human Resources Development Project





What is RADIATION? -Report on Classes at Secondary School in Malaysia-

Kajang Federal Islamic Secondary School

Human Resources Development (HRD) Workshop was held in Kajang, Malaysia from 1 to 3 August 2016. This project has been focusing on HRD for stakeholder involvement since 2014. Aligned with the topic, highlight of this workshop was a visit to Kajang Federal Islamic Secondary School, which was selected as one of the pilot schools for the Nuclear Science and Technology for Secondary Schools organized by Malaysian Nuclear Agency in 2015.

FNCA WS participants were invited to the school for better understanding on how Malaysia promoted radiation education activity in Secondary schools. The participants had interaction with the school teachers and students. The participants also observed scientific exhibition and cloud chamber experiment during a physic class. Supplementary materials on radiation, which had been translated into English, were provided by Japan.



Session 1 Science Exhibition: Exhibition of Research outcomes based on knowledge gained from physics classes



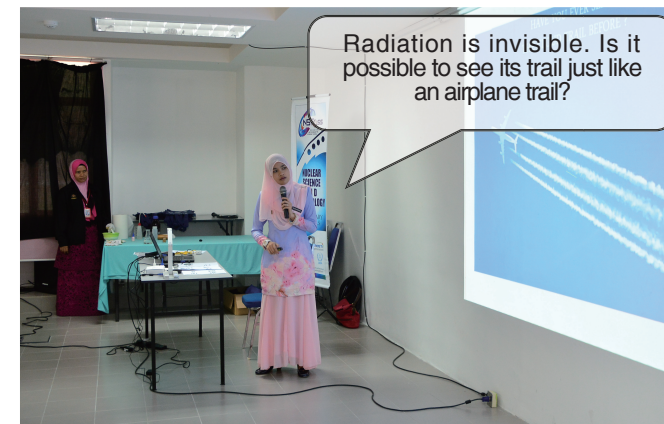
Hakaru-kun experiment on radiation and Dr Jane Gerardo-Abaya, Section Head, Division of Asia and the Pacific, IAEA



Structure of an atom

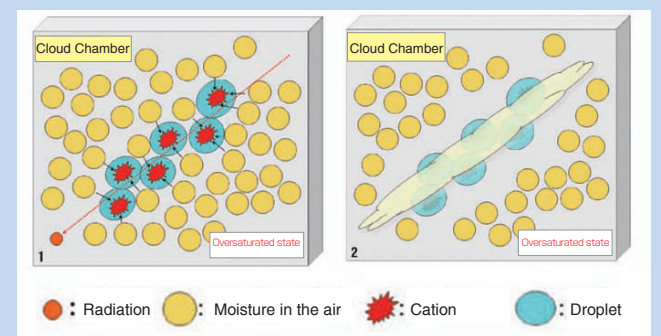
Session 2 Physics class and experiment of cloud chamber

In a physic class, the teacher gave basic knowledge of radiation science to the students and explained how to see tracks of radiation with Cloud Chamber. The students constructed the Cloud Chambers and tried to observe the track of radiation. The student and the workshop participants had question and answer about prospectus of career in radiation and nuclear field.

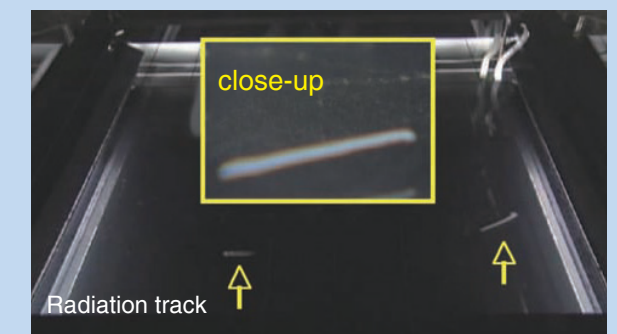


Principle of the Cloud Chamber

Inside the cloud chamber, there is excess moisture content and it is in oversaturated state. When radiation passes through such a state, nearby constituent elements of air and moisture in the chamber are ionized along the track of radiation to generate positive ions. These positive ions become condensation nuclei to gather surrounding moisture to make water droplets that are visible like an airplane trail.



Inside the Cloud Chamber



Reference: "Mini-Hyakka (Mini Encyc.), Cloud Chamber", Institute for Environmental Sciences, 2007

Comment from School



We feel honored to be given the opportunity to play host to the FNCA HRD project group. It was enlightening for all the students and teachers involved to be able to get first- hand information and direct feedback from renowned experts in the nuclear education field. In fact, many students felt motivated to pursue more knowledge or possibly a career in the nuclear field as they were impressed with the immense opportunity to create a better future using nuclear technology.

–Physics teacher



Tandem Accelerator,
The Wakasa Wan Energy Research Center (WERC)

Aiming to Attain Sustainable Agriculture with Mutation Breeding Technology

— Mutation Breeding Project Workshop in Tsuruga, Fukui Prefecture —



Outlines of Mutation Breeding Project

This project aims to contribute to increased production and quality improvement of food in Asia, by developing new varieties of key crops such as rice, bananas, orchids, sorghum and soybean with resistance to diseases, insects, drought and other factors through mutation breeding using gamma rays and ion beams. From JFY2013, activities have been conducted under the topic of "Mutation Breeding of Rice for Sustainable Agriculture" to develop rice varieties that deliver high yields using less fertilizer and agricultural chemicals, and that are resistant to diseases, drought, climate change and so forth.

Workshop(12-16 Dec.)

The Mutation Breeding Project Workshop was held at the Wakasa Wan Energy Research Center (WERC) in Tsuruga, Fukui Prefecture from 12 to 15 December, 2016. The workshop was attended by representatives from Bangladesh, China, Indonesia, Japan, Malaysia, Mongolia, Philippines, Thailand and Vietnam, and also from IAEA/RCA. In this workshop, representatives reported on mutation breeding of rice for sustainable agriculture in their respective countries, and presentations and discussions took place under the theme of previous sub-projects on sorghum, soybean and bananas. An open seminar and technical visit were held on 14 and 15 respectively.



Open Seminar (14 Dec.) Application of Radiation Technology and Mutation Breeding for Sustainable Agriculture”

“Open Seminar for Application of Radiation Technology and Mutation Breeding for Sustainable Agriculture” was held on 14 December at the Wakasa Wan Energy Research Center, and was attended by approximately 100 persons from research institutes, corporations, universities, agriculture workers, local public agencies and the like.

The opening addresses were delivered by Mr Yuichi Michikawa, Assistant General Manager for the Research and Development Bureau of the Ministry of Education, Culture, Sports, Science and Technology and Mr Nobuaki Asahi, Chairman of the Wakasa Wan Energy Research Center. After the opening addresses, Dr Tomoko Abe, Group Leader of the Nishina Center for the Accelerator-Based Science, Institute of Physical and Chemical Research (RIKEN) made a presentation titled “New Varieties Bred with Fast Ion-beam Irradiation” in which she explained the mechanisms of mutation induction by ion beam irradiation and introduced potential new breeds that would contribute to innovation in the field of food, energy and pharmaceuticals.

Then, Professor Emeritus Hirokazu Nakai of Shizuoka University, Project Leader in Japan of this project, made a presentation titled “Mutation Breeding and its Application for Sustainable Agriculture” that presented breeding of rice cultivar adaptable to natural farming using mutants, improvement of screened groups adaptable to natural farming during sprouting season by mutation breeding, efforts for cultivation of rice by mutation breeding in Mongolia, and so on. Thereafter, Dr Hiroshi Kato, Director of Institute of Radiation Breeding, Institute of Crop Science, National Agriculture and Food Research Organization, made a presentation titled “Selection of Higher Yield Mutants in Rice” in which he reported that he acquired a phylaxis that seemed to have high-yielding ability, though the increase of yielding ability was low. He also mentioned that he would continue efforts to acquire a phylaxis with a larger increase of yield by making combinations between mutants each other and, consequently, by screening from even more mutants. At the end of the seminar, Malaysia and Vietnam made presentations on their successful cases of mutation breeding in their countries. Both have developed many different mutant varieties. In 2016 in Malaysia, they were commended by the King, and, in Vietnam, they have made achievements such as transfer of commercial right of the new mutant line of rice to a nursery company for the registration.



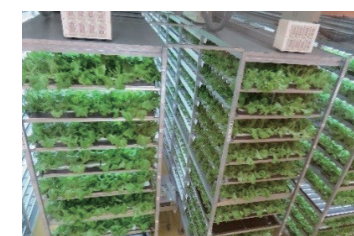
Technical Visit (15 Dec.)

On 15 December, the participants of the Workshop visited the Wakasa Wan Energy Research Center, Plant Factory of NYK Trading Corporation (Tsuruga City) and Nagano Farm LLC. (Takahama Town) to receive lectures on those facilities and took factory inspection tours to see how they were making efforts for sustainable agriculture.



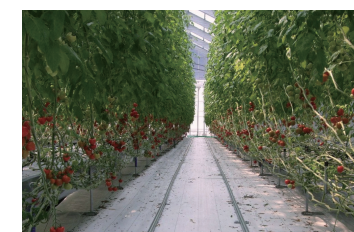
The Wakasa Wan Energy Research Center (WERC)

They took a tour of an accelerator facility that is used for plant mutation breeding with ion beams. The accelerator facility at the Wakasa Wan Energy Research Center is one of four facilities in Japan available for breeding purposes. It is capable of irradiation of biological material with proton or carbon accelerated by synchrotron, and is being utilized for improvement of plants and microorganisms by making use of characteristics of each ion.



Lettuce Plant factory, NYK Trading Corporation

They inspected cultivation of organic lettuce at a fully controlled plant factory using artificial light completed in 2015. They produce as many as 10,000 heads of lettuce every day in the factory of which the total floor space is as large as 1,396 sq. meters. The signature of lettuce grown in this factory is that they are vitamin and mineral-rich, tasty, hygienic, safe and have long-lasting freshness.



Nagano Farm

A plant inspection tour was arranged to the all-season horticultural facility where medium-size tomatoes named “Koshino-Ruby” are cultivated. 14,000 roots of tomato are cultivated and the produce is distributed to JA-Wakasa, supermarkets in the town and so on. For the purpose of environment-friendly cultivation, the facility uses hybrid type space heaters that combines heat pumps and warm air furnaces to decrease heavy oil consumption and CO2 emissions.

Introduction of On-Going 10 Projects

As FNCA Project activities, 10 projects are being conducted in various nuclear fields. Each project promotes joint research, debates on 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.

▼ Research Reactor Network

This project has been improving technology infrastructure and promoting mutual utilization of research reactor through establishment of network among FNCA countries.



- **Workshop 2016**
- Dates: 7-9 December
- Place: Sydney, Australia
- Joint WS with Neutron Activation Analysis
- Participating Countries: 9



■ TOPICS

- This project and Neutron Activation Analysis Project will be consolidated into one new project in FY2017 that will restart with the tentative title of “Research Reactor Utilization”.

▼ Neutron Activation Analysis

This project has been utilizing neutron activation analysis (NAA) for “Suspended Particulate Matter (SPM)” and “Rare Earth Elements (REE)”, assessing the results and applying the finding in a proactive manner to make contributions to socio economic development.



- **Workshop 2016**
- Dates: 7-9 December
- Place: Sydney, Australia
- Joint WS with Research Reactor Network
- Participating Countries: 11



■ TOPICS

- Efforts made by each country were presented to show how to strengthen collaboration with end users, what efforts are being made to acquire new end users, and so on.

▼ Safety Management Systems for Nuclear Facilities

This project has been encouraging FNCA countries to recognize and continuously improve their weak points of nuclear facilities by means of self-assessment and peer review, aiming at more secure and effective nuclear safety management systems, and eventually enhancement of nuclear safety.



- **Workshop 2016**
- Dates: 24-28 October
- Place: Bangkok, Thailand
- Participating Countries: 11



■ TOPICS

- The final fiscal year for activities of the Project
- Peer review was conducted regarding the research reactor TRR-1 of the Thailand Institute of Nuclear Technology (TINT) (see photos).

▼ Radiation Safety & Radioactive Waste Management

This project has been improving radiation safety in FNCA countries by sharing experiences and knowledge while encouraging the safety of workers at nuclear related facilities through discussions. In order to assure radiation safety for the public, FNCA countries also share information on appropriate treatment and disposal of radioactive waste as well as the environmental impact.



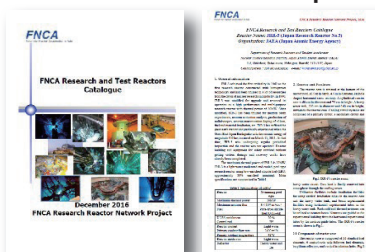
- **Workshop 2016**
- Dates: 4-6 October
- Place: Almaty, Kazakhstan
- Participating Countries: 9



■ TOPICS

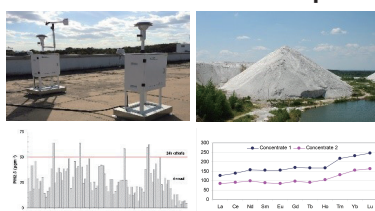
- Technical visit to the Institute of Nuclear Physics (INP) of Kazakhstan
- It was confirmed to complete and distribute “Consolidated Report on Nuclear/Radiological Emergency Preparedness and Response” by the end of FY2016.

■ Recent Activities and Outputs



FNCA Research and Test Reactor Catalogue (2016)

■ Recent Activities and Outputs



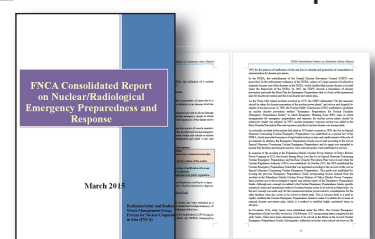
Sampling and analysis of SPM and REE

■ Recent Activities and Outputs



Self-Assessment/Peer Review Tool Developed & Conducting Peer Review in WS Host Country (2010~)

■ Recent Activities and Outputs



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

▼ Mutation Breeding

■ Workshop 2016

- Dates: 12-15 December
- Place: Fukui, Japan
- Participating Countries: 9 + IAEA/RCA



▼ Biofertilizer

■ Workshop 2016

- Dates: 7-11 November
- Place: Hanoi, Vietnam
- Joint WS with Electron Accelerator Application
- Participating Countries: 10



▼ Electron Accelerator Application

■ Workshop 2016

- Dates: 7-11 November
- Place: Hanoi, Vietnam
- Joint WS with Biofertilizer
- Participating Countries: 8



▼ Radiation Oncology

■ Workshop 2016

- Dates: 8-11 November
- Place: Surabaya, Indonesia
- Participating Countries: 11



▼ Human Resources Development

■ Workshop 2016

- Dates: 1-3 August
- Place: Kajang, Malaysia
- Participating Countries: 12



▼ Nuclear Security & Safeguards

■ Workshop 2016

- Dates: 4-6 October
- Place: Yogyakarta, Indonesia
- Participating Countries: 9+IAEA



This project has been using mutation breeding technology with irradiation to crops that are highly needed in Asian countries, and developing varieties that are more resistant to disease, insects, and drought, or give higher yield and offer higher quality.

■ TOPICS

- Regarding the project of mutation breeding of rice for sustainable agriculture, registration and practical use of the induced mutants of the relevant crops acquired in various countries have been smoothly implemented.
- It was confirmed to continue to use the phrase of “Sustainable Agriculture” as an important key word for promotion of the new phase starting from JFY2018.

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

This project has been developing multifunctional biofertilizers having both plant growth promoting activities and resistance activities against plant pathogens. In order to achieve the aims, radiation sterilization technology is applying to create ideal environment to maximize the abilities of biofertilizer-microorganisms.

■ TOPICS

- It was agreed that the research on synergetic effects of biofertilizer and radiated oligochitosan should be continued until 2017.
- It was confirmed to promote the editing of FNCA Guideline Vol. II “Production of Biofertilizer Carrier Using Radiation Technology” towards the publication at the end of FY2017.
- Regarding preparation of papers on the comparison of effects between radiation sterilization and autoclave sterilization, it was reported that new papers had been published in China and Malaysia, and that papers would be published in Indonesia, Philippines, Thailand and Vietnam.

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

■ TOPICS

- It was encouraged that participating countries in this project to commercialize the plant growth promoter in 5th phase (2015-2017).
- It was agreed that production process of super water absorbents (SWA) should be optimized to realize the rational production costs.
- It was reported that “FNCA Guidelines on Chitosan PGP Application for Rice, Chilli and Other Crops” prepared in 2016 had been published on the FNCA website.

*Please refer to P14 for more details about this project.

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.

■ TOPICS

- Regarding CERVIX-V of the new protocol (5th protocol) for cancer of cervix uteri, the protocol has been almost completed and the clinical test is targeted to start in FY2017.
- The results of the questionnaire were reported regarding the current state of brachytherapy in clinical test facilities in the member countries. It was also agreed to visit applicable facilities to conduct studies on radiation doses for brachytherapy.

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

This project has been improving mutual cooperation and strengthening the nuclear infrastructure by identifying needs, exchanging information, and discussing the possible cooperation on development of nuclear human resources

■ TOPICS

- The final fiscal year for activities of the Project
- The continuing subject since 2014, namely, “Human Resources Development to Acquire Stakeholder Involvement” was covered.
- It was acknowledged that science education is important for public acceptance for nuclear energy and radiation.

*Please refer to P5-8 for more details about this workshop.

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

■ TOPICS

- Country reports were followed by presentations and discussions on subjects regarding nuclear forensics, nuclear security of radiation source, raising awareness for safeguards, and capacity building for operators of nuclear facilities.
- Information was shared about the state of each country's efforts for nuclear security and safeguards, information from regulatory authority on 3 S's (Nuclear Safety, Safeguards, and Nuclear Security), and concrete efforts and examples of successful case for development of culture of nuclear security.
- An open seminar titled “Capacity Building for Improvement of Nuclear Security” (co-sponsored by FNCA, BAPETEN, BATAN, and cosponsor of ISCN/JAEA) was held.



Radiation Oncology

Fighting cancers in Asia by disseminating and advancing radiation therapy

Radiation therapy at the National Cancer Center of Mongolia

Treatment procedures (protocols) for cervical cancer, nasopharyngeal cancer, and breast cancer were created through joint clinical trials involving multiple facilities in 11 countries to establish standard medical treatment methods for **cancers which occur frequently in the Asian region** and to improve and promote radiation therapy in the region. These protocols optimized for Asian people are now widely used in the member countries.

▼ Advance and Achievement of Cervical Cancer Protocol

1st stage:
Standardization of Radiation Therapy
CERVIX-I (1996-2003)



2nd stage:
Accelerated Hyperfractionated Radiation
CERVIX-II (2000-2005)



3rd stage:
Radiation Therapy + Chemotherapy
CERVIX-III (2002-2010)



Pick Up!

4th stage:
Radiation Therapy + Chemotherapy + Prophylactic Irradiation
CERVIX-IV (2008 - now ongoing)



5th stage:
3D Image Guided Brachytherapy
CERVIX-V (will start in 2017)



CERVIX-III

-Chemoradiotherapy for Locally Advanced Cervical Cancer-

Previous protocols of FNCA were for therapy using radiation only. However, FNCA introduced **chemoradiotherapy** for the first time, which simultaneously used irradiation and anticancer drugs and had been becoming a major protocol in the advanced countries at that time. The **5-year overall survival rate** of 120 registered patients was as high as **55%**. This is as good as the result (about 50-60% overall survival rate) of multiple clinical trials of chemoradiotherapy for patients having the same diseases in Europe and the USA. Also, the ratio of people having a side effect was low compared to the clinical trials results in Europe and the USA.

Comparison of Clinical Trial Results for Chemoradiotherapy Overall Survival Rate (5 years)

Approx. **55%** Approx. **50-60%**
FNCA protocol (Asia) **Other clinical trials (Europe & USA)**

*Local control rate (5 yr): About 77% (FNCA) and about 70-80% (Europe and USA)

CERVIX-III is the first chemoradiotherapy control whose safety and effectiveness were confirmed in Asia and now it is used as standard therapy for locally advanced cervical cancer in many hospitals in the FNCA member countries.



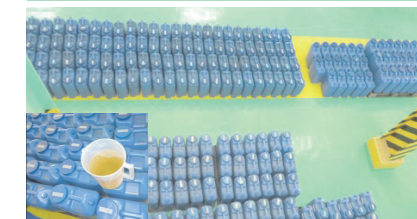
Electron Accelerator Application

Supporting agriculture and fisheries in Asia with products developed with radiation technologies

Rice field (left) in the Philippines with almost no damage from a typhoon due to the use of PGP. Rice field without the use of PGP (right) damaged by the typhoon.

Electron accelerator^{*1} is used for radiation processing such as degradation, crosslinking, and graft polymerization of natural polymers^{*2} to produce and make practical **plant growth promoters (PGP)**^{*3} and **super water absorbents (SWA)** and realize the economic advantage of increasing the yield of crops and vegetables in the member countries.

▼ Achievements in agriculture and fishery



(Top) PGP made by electron accelerator (The Philippines)
(Bottom) PGP made at Irradiation Center (Thailand)



The Philippine Nuclear Research Institute (PNRI) is conducting a 5-month field test in a 37,000 ha farm to confirm the effectiveness of oligo-carrageenan PGP for rice plants. A radiation system was built where a 2.5 MeV electron accelerator will produce 600,000 liters of PGP to use for successful field tests. The picture above shows a rice field in the Province of Bulacan, which was hit by Typhoon Koppu in October 2015. The rice plants in the right field, a control group, were damaged by the typhoon, whereas the PGP-processed rice plants in the left field survived. (Test by Dr. Gil Magsino, University of the Philippines Los Baños)



The Thailand Institute of Nuclear Technology (TINT) succeeded in making practical oligochitosan PGP and SWA. A PGP production plant having the capacity of producing 100,000 liters per month was built at the Thai Irradiation Center in Pathum Thani.



The Vietnam Atomic Energy Institute (VINATOM) began a new project to increase the catfish culture efficiency by adding oligochitosan to the feed.

*1 A system where electrons are accelerated by an applied high voltage to obtain high-energy electron beams. It is used for radiation processing.
*2 Polymers occurred naturally. Typical ones include cellulose, starch, protein, chitin, and chitosan.
*3 Obtained by degrading natural polymers such as chitosan and carrageenan using irradiation. Foliar spray of PGP can promote the growth of plants.

Among radiation processing technologies developed over 65 years, there are not so many commercialized products with high-value-added using radiation degradation made by direct irradiation of materials, except for the pulverization of Teflon. In the development of plant growth promoters (PGP) currently promoted by FNCA, this radiation degradation is used to produce oligo-chitosan or oligo-carrageenan with the irradiation of chitin/chitosan obtained from the shell of shrimps or crabs, or carrageenan obtained from seaweeds. The production of PGP from these materials is a new usage and especially suitable for Asian countries having rich natural polymer materials as resources; it will develop a new field of radiation processing, as well as effective use of electron accelerators, which are optimal for mass production.

Dr Hideki Namba, FNCA advisor of Japan
(Technical advisor of Radiation Application Development Association)





Continuation of Two Projects including Mutation Breeding was Determined

The 17th Meeting was held under the sponsorship of the Cabinet Office of Japan and the Japan Atomic Energy Commission and co-sponsorship of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), and was attended by representatives of 12 FNCA participating countries, IAEA, IAEA/RCA and OECD/NEA. A visit to the National Institute of Radiological Sciences was also arranged on the previous day, 7 March.

During the meeting, they discussed action items decided by the joint communique of the 16th Ministerial-Level Meeting. In addition, it announced the decision to continue the Radiation Breeding Project, which is now in the third year of the current phase, and the Neutron Activation Analysis Project, which has been extended for one year to establish cooperation with end users.

As main conclusions and suggestions of the meeting, they agreed on items such as the following that were pointed out in the joint communique of the 16th Ministerial-Level Meeting (partial excerpt):

- To strive to launch a new project for the study of climate change through the use of nuclear technology
- To promote projects and themes regarding nuclear infrastructure such as human resources development and nuclear safety
- Further promotion of radiation application projects that will help adaptation to climate change
- To start cooperation with OECD/NEA regarding legislation on nuclear energy such as nuclear damage compensation that may become an important issue among FNCA participating countries
- To introduce an improvement plan for evaluation of projects and study panels in line with the improvement plan of FNCA activities

*Please refer to the FNCA website (<http://www.fnca.mext.go.jp/>) for more details.



To Build a Trustful Relationship between Stakeholders and Nuclear Technology

2016 Study Panel was held under the sponsorship of the Cabinet Office of Japan and the Japan Atomic Energy Commission and was attended by 11 FNCA participating countries (Korea was absent), IAEA and OECD/NEA.

Emphasizing Stakeholder Involvement













This panel was held in response to the decision, which was announced in the joint communique of the 16th Ministerial-Level Meeting, for the enforcement of activities, etc. to build trust in nuclear technology. During the panel, in addition to keynote lectures by the legal department of OECD/NEA and experts from the Nuclear Bureau of IAEA, each institute presented results of efforts and work regarding the location of nuclear power stations and involvement of stakeholders in disposal of low activity waste.

The following items were pointed out as major lessons of the meeting (partial excerpt):

- Eligibility for stakeholders shall be softened and anyone that considers "he/she is a stakeholder" shall be accepted as a stakeholder.
- Information disclosure is important to build a trustful relationship. In Europe, neighbouring countries affected by environmental problems may request for information disclosure pursuant to the treaty.
- Establishment of a legal framework is one of the fundamentals and building relationships with local communities is the key to success.
- Publicity of the benefits derived from nuclear science and technology will contribute to improvement in the understanding of residents.

Activities in JFY 2016

Coordinators List

Country	Name	Affiliation
	Mr Peter McGlinn	Senior Adviser, International Relations, Australian Nuclear Science and Technology Organisation (ANSTO)
	Mr Dilip Kumar Saja	Member (Physical Science), Bangladesh Atomic Energy Commission (BAEC)
	Mr Liu Yongde	Secreatry General, China Atomic Energy Authority (CAEA)
	Dr Hendig Winarno	Deputy Chairman of BATAN 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 of the Republic of Kazakhstan
	Mr Chung Won Lee	Director of Space, Nuclear and Big Science Cooperation Division, Ministry of Science, ICT & Future Planning (MSIP)
	Dr Abdul Muin Bin Abdul Rahman	Senior Director (Management Programme), Malaysian Nuclear Agency (Nuclear Malaysia)
	Mr Chadraabal Mavag	Head, Nuclear Technology Department, Nuclear Energy Commission (NEC)
	Dr Soledad S. Castañeda	Chief of the Atomic Research Division, Officer-in-Charge, Deputy Director, Philippine Nuclear Research Institute (PNRI)
	Dr Pornthep Nisamaneephong	Executive Director, Thailand Institute of Nuclear Technology (TINT)
	Dr Cao Dinh Thanh	Vice President, Vietnam Atomic Energy Institute (VINATOM)

Radiation Safety & Radioactive Waste Management WS

4-6 October 2016, Kazakhstan

Joint WS on Biofertilizer& Electron Accelerator Application

7-11 November 2016, Vietnam

Safety Management Systems for Nuclear Facilities WS

24-28 October 2016, Thailand

Human Resources Development WS

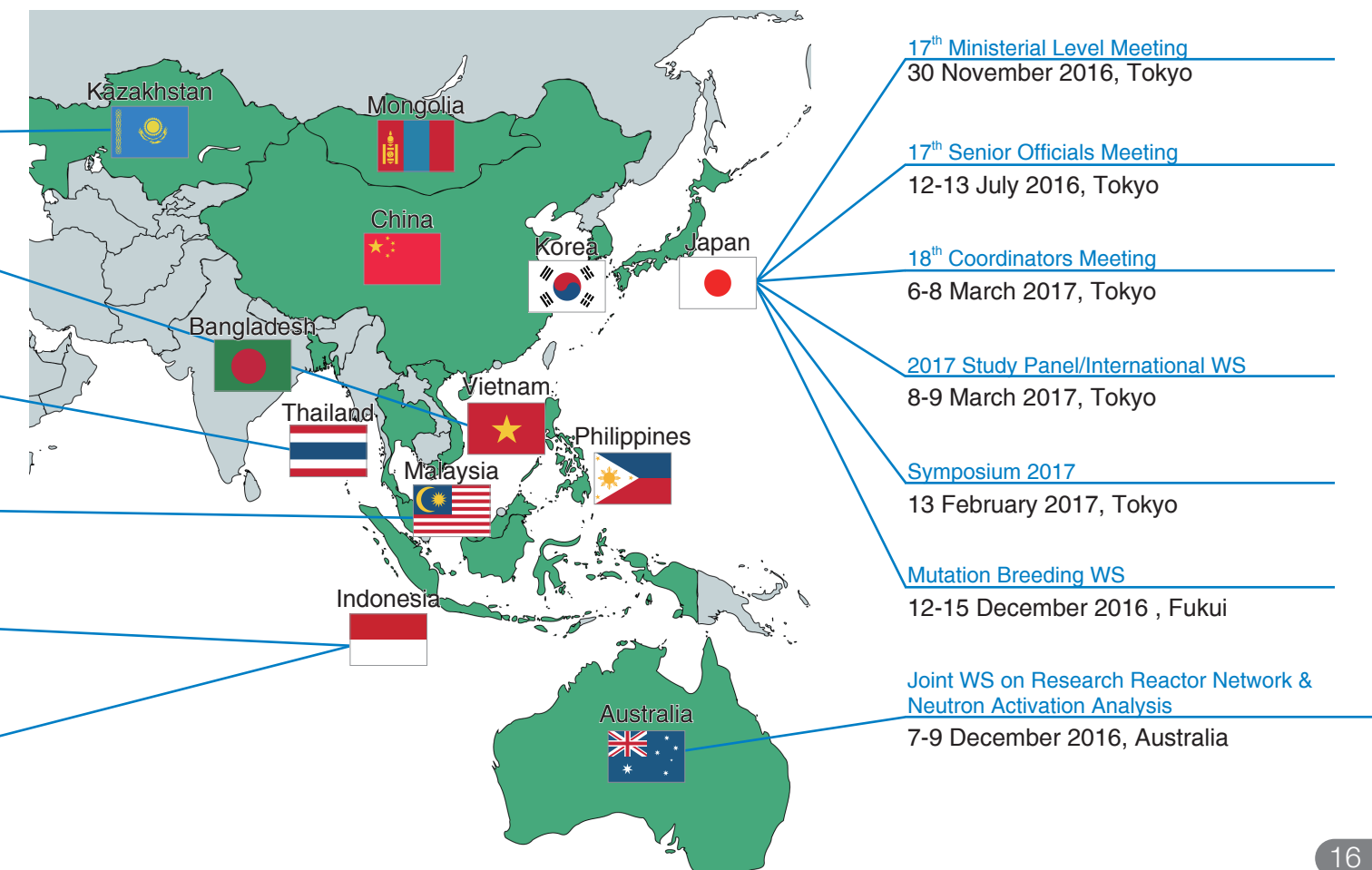
1-3 August 2016, Malaysia

Nuclear Security and Safeguards WS

4-6 October 2016, Indonesia

Radiation Oncology WS

8-11 November 2016, Indonesia



Australia-led “Climate Change Science Research Project” to start soon.

Australia proposed this project, aiming to undertake nuclear and isotopic based analyses that supports research into past climate change, and provide the expertise to interpret the new knowledge to better understand the mechanisms and processes of past climate variability.

This multi-disciplinary research combines radionuclide, stable isotope analysis and conventional analytical techniques with ecological methods to obtain datasets that allow reconstructions of high resolution climate records from a variety of different proxies or indicators that have been archived in the environment.

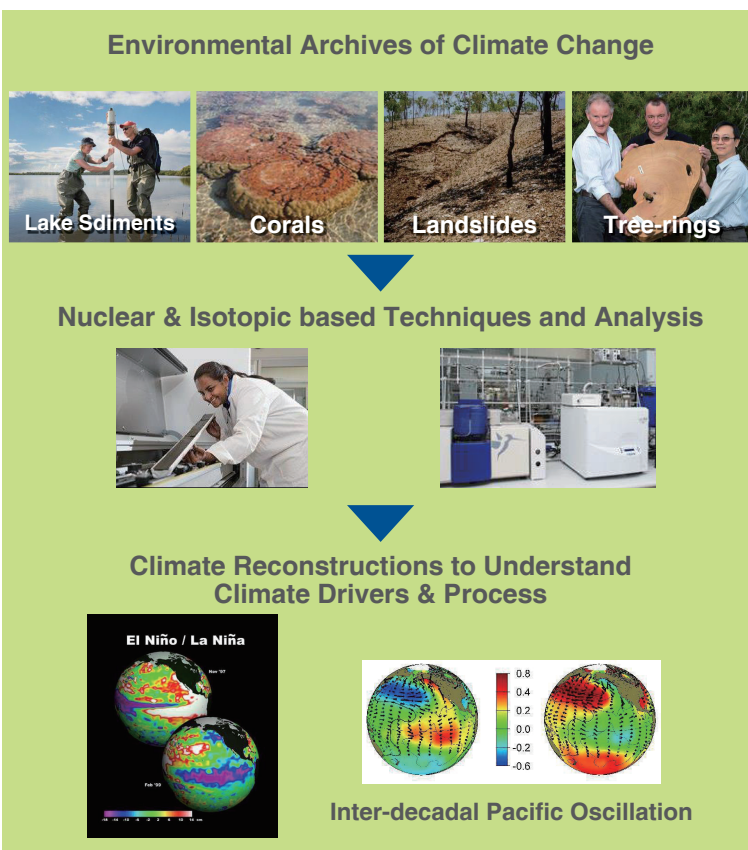
Using radionuclides and isotopes we are able to identify and date past climate change with the goal of interpreting the drivers of the Earth’s climate system. In order to achieve this we aim to reconstruct high-resolution climate information using tree-rings, corals and lake archives from key regions in the Asia-Pacific region. We will use the reconstructions to understand climate drivers and processes, such as the Australian Monsoon, El Niño Southern Oscillation, Indian Ocean Dipole and Inter-decadal Pacific Oscillation.



— Message from Project Leader —

It is essential to understand how our climate has changed in the past if we are to understand what is happening now and into the future. This exciting new project will bring together knowledge and expertise from the FNCA member countries to address these issues, which are significant to our region, and Australia is very much looking forward to working with the different nations involved.

Dr Krystyna Saunders
ANSTO



The 18th Ministerial Level Meeting to be held in Astana, Kazakhstan.



▲ Astana City, Kazakhstan



▲ Prof Ertan G. Batyrbekov
FNCA Coordinator of Kazakhstan
Director General
National Nuclear Center, Kazakhstan

The 18th FNCA Ministerial Level Meeting will be held in Astana City, Kazakhstan on 11th October 2017 in conjunction with the International Specialized Exhibition “EXPO-2017”. The declared theme of the exhibition is “Future Energy” that is devoted to alternative energy and green technologies.

Kazakhstan, as the host country, expects that the meeting will be effective for all the FNCA member countries combined with the synergy of the EXPO-2017 and also further strengthen our cooperation in the future FNCA activities.

FNCA very much appreciates the initiative by Kazakhstan.

Tomoaki Wada

FNCA Coordinator of Japan

Mr Tomoaki WADA

He completed graduate education of Precise Machinery Engineering at the University of Tokyo and started to work for the Science and Technology Agency of the Japanese Government in 1977. He worked for IAEA as a safeguards analyst in 1987, and was appointed as a Director of Policy Division of MEXT in 2001. He became a Vice Director General of Cabinet Office of the Japanese Government in 2004, and was appointed as a Director General of National Institute of Science and Technology Policy, MEXT in 2008. He started to teach at the Tokyo University of Science (TUS) as a professor in 2010, and has been working as a Chief Executive Director of Kobe Science Museum since 2014. He officially took up his post of FNCA Coordinator in 2015.

FNCA Leads the World as a “Nuclear Cooperation Model among Regions”

—One year has passed since I took over as the FNCA Coordinator.

I have been discussing the expansion of the FNCA with Dr Suet Machi, the former FNCA Coordinator of Japan (who passed away in 2015), since before its inauguration in 2000. I undertook the position as the FNCA Coordinator of Japan in order to advance the various systems that Dr Machi had already established. The original purpose of the FNCA was to promote the peaceful use of nuclear technology in Asia, led by Japan.

The FNCA’s strategy for fulfilling this purpose is mainly to hold the Ministerial Level Meeting, in which ministerial level representatives can freely discuss the FNCA’s cooperation policies and participating countries’ nuclear energy policies, as well as to pursue cooperation projects. I believe that my role as the FNCA Coordinator of Japan is to facilitate these activities.

—How the FNCA can contribute to Asian countries and what Japan’s role is in the FNCA.

The level of nuclear research in each Asian country has greatly increased since the inauguration of the FNCA. However, it is difficult to say that electricity generation by nuclear power has made good progress in fulfilling the FNCA’s main purpose, primarily due to the accident at the TEPCO’s^{*1} Fukushima Dai-ichi Nuclear Power Plant in 2011.

Since then, the nuclear power generation scheme of each country, including Japan, has not been extensively pursued. Japan’s history of nuclear energy research and development indicates a problematic progression of a number of features, including the development of the nuclear fuel cycle, the use of radioactive waste, and the use of radiation, not to mention the occurrence of accidents in nuclear power plants. We have been developing

nuclear technologies in various fields while discussing this development process with opposition parties. Asian countries can share this unique experience through membership in the FNCA, and can all promote the use and development of nuclear energy and the introduction of nuclear power generation into the society again. I think that supporting these efforts is one of Japan’s most important roles in the FNCA.

At present, the FNCA’s activities are concentrated in the use of radiation instead of nuclear power generation, leading to many useful results. For Asian countries, the use of radiation is easier to develop than the use of nuclear energy. By making outstanding achievements through the use of radiation and by showing that nuclear energy is valuable in our society, the FNCA can help the use of nuclear energy to enable good progress in Asian countries.

—The characteristics of the FNCA’s framework compared with those of various other frameworks in the world.

At present, the FNCA leads Asian countries in the field of nuclear cooperation, enabling the participating countries to closely cooperate with each other. In South America, nuclear cooperation has been pursued under the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (generically known as the Treaty of Tlatelolco). I believe that the FNCA can be a framework to lead not only Asian countries but also the world as a “nuclear cooperation model among regions” in the future, advancing the further development of nuclear technologies.

—What I have learned through the exchange of opinions among overseas researchers and what I want for young researchers.

The FNCA plays an extremely important role in human resources development as well as in cooperation projects. Through the Nuclear Researchers Exchange Program (NREP) of the MEXT^{*2} many researchers in Asian countries have been trained in Japan’s institutes and universities. Since many participants in the program have taken high-level jobs at nuclear energy agencies in Asian countries, I sometimes hear the Japanese language spoken in workshops held in Asian countries; I am very pleased to have such opportunities. If the FNCA is appropriately linked not only with these workshops, but also with Japan’s human resource development system, human resources in Asian countries can be effectively developed. This connection can contribute greatly to the establishment of a network of nuclear energy institutes in Asian countries.

Recently, it has been pointed out that young researchers in Japan do not usually study abroad. Many Japanese young researchers have less freedom to exchange their opinions with others and present their research results in English than do researchers in other Asian countries and in African countries. I want Japanese researchers to be able to effectively use the FNCA to appeal to the international society for the freedom to share their research results in order to build a successful research career. I also hope that young researchers can play an active role in the FNCA. At present, those who are not accepted by the international society cannot be considered researchers; to be accepted by the international society, young researchers should effectively use the FNCA.

^{*1} TEPCO: Tokyo Electric Power Co., Inc

^{*2} MEXT: Ministry of Education, Culture, Sports, Science and Technology

FNCA Symposium 2017

- Date: 13 February 2017
- Participating Countries: 10
- Place: The University of Tokyo
- Participants: 110 people approx.



FNCA Symposium 2017 was held on February 13, 2017 at the University of Tokyo to not only review the activities and achievements of FNCA over the 15 years since 2000 but also to discuss how international nuclear cooperation in Asian countries should be and promote more activities for the development of the social economy in those countries.

Keynote speeches were delivered by Mr Tomoaki Wada (FNCA Coordinator of Japan), project leaders, and representatives from FNCA member countries to introduce their activities and achievements. Panel Discussion was held with representatives from the member countries to report case examples and discuss the current status and needs of their peaceful uses of atomic energy. Japanese specialists participating in FNCA and people from industry, i.e. International Nuclear Energy Development of Japan Co., Ltd. and Hitachi-GE Nuclear Energy, Ltd., also presented Japan's role in the Asian nuclear cooperation, case examples of international nuclear cooperation in research and development, and industrial activities in Japan for the countries which newly introduced nuclear power.



Panel Discussion "Role of Japan in Asian region in the field of peaceful use of nuclear energy" facilitated by Mr Wada, FNCA Coordinator of Japan & Dr Namba, FNCA Advisor of Japan



Panel Discussion "Utilization of outcomes of FNCA project activities and needs for development of nuclear technology in member countries"

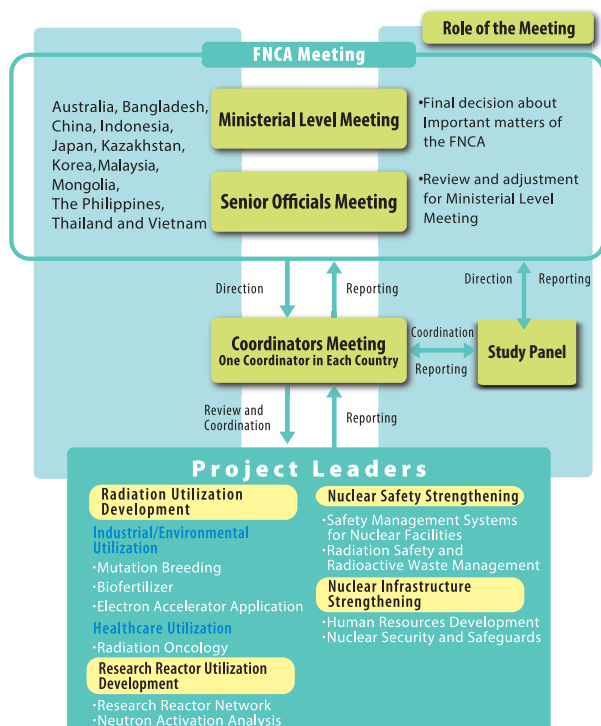


Left: Symposium venue, Right: Presentations by manufacturers and research institutes

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

This is a meeting of ministerial level representatives in science and engineering who are in charge of activities which use nuclear energy and radiation. FNCA's cooperation policies and nuclear policies of the member countries are discussed in this meeting.

Coordinator's 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 and future policies.

Study Panel

In the Study Panel, senior officials and experts from the FNCA member countries share their actual experiences of activities for infrastructure development of nuclear power generation to use such knowledge for domestic and international activities. In FY2015, a study panel meeting was held with the topic "Credibility to nuclear power, participation of stakeholders, and communication with society."

Projects

For ten projects in four areas associated with radiation utilization and nuclear power infrastructure (eight projects in and after FY2017), 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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This newsletter is issued by Nuclear Safety Research Association (NSRA) under the contract with the Ministry of Education, Culture, Sports, Science and Technology (MEXT).