

FNCA

Forum for Nuclear Cooperation in Asia Newsletter

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Aiming for Sustainable Development

Photo on the upper left: Production of face shield
(from the country report of Malaysia at FNCA Ministerial Level Meeting)
Photo on the bottom right: Fever screening at a hospital in Vietnam
(from the country report of Vietnam at FNCA Workshop on Radiation Oncology Project)



Reporting on development of nuclear technologies to combat COVID-19

FNCA Ministerial Level Meeting was held Online First Time Ever

The Cabinet Office of Japan (CAO) and the Japan Atomic Energy Commission (JAEC) organized the 21st FNCA Ministerial Level Meeting (MLM) on December 10, 2020. This meeting was held to give the ministers responsible for nuclear science and related fields from 12 FNCA member countries an opportunity to engage in policy discussions once a year with the aim of promoting regional cooperation related to the peaceful use of nuclear energy. This year, due to the pandemic of COVID-19, the MLM was held online first time ever.

Ministerial level representatives (including the ministers of two countries and the directors of government agencies responsible for nuclear energy) from FNCA member countries attended the meeting. Besides, Mr. Rafael Mariano GROSSI, Director General of International Atomic Energy Agency (IAEA), delivered the keynote speech.

Representing Japan, Mr. INOUE Shinji, Minister of State for Science and Technology Policy attended the meeting. He mentioned that the FNCA has made notable achievements in every important field related to the peaceful use of nuclear energy since its establishment in 2000, and that although the FNCA has also been stagnating unavoidably due to the current pandemic of COVID-19, the project activities are maintained by the strong leadership of the coordinators and the project leaders and measures such as video conferencing systems.

Lastly, a Joint Communiqué that addressed issues such as the "Maximizing the efforts to promptly normalize FNCA project activities and the several regular meetings while ensuring the safety" and the "Exploring possible collaboration between the FNCA and the IAEA in combating zoonotic diseases including COVID-19 in the future" was adopted as the conclusion of the meeting.

Keynote Speech

Mr. GROSSI gave a keynote speech entitled "IAEA initiatives to tackle infectious diseases under the current pandemic of COVID-19". Following the recent outbreak of COVID-19, the IAEA provided its member countries with COVID-19 testing equipment, training on the use of this equipment, and other forms of support as its initial and current measures. The IAEA is currently providing support to 126 countries. As a measure for the future, they also plan to launch the ZODIAC, a platform that systemizes networks of proprietary technologies and research institutes from the perspective of applying nuclear technologies, in order to prevent global zoonotic infections, which occur repeatedly but on an irregular basis.

Mr. GROSSI mentioned that its implementation has recently been approved by the IAEA Board of Directors and that he expected more member countries to participate in the project because that would increase the value of the platform while also increasing the value that the participating countries would gain from the project.



Mr. Rafael Mariano GROSSI
Director General
International Atomic Energy
Agency (IAEA)

Country Report

Representatives from the participating countries reported on their nuclear research activities and the efforts that they had made to sustain nuclear power generation, etc., during the COVID-19 pandemic. The report from Japan included: (1) the restarting of nuclear power stations; (2) the status of Advanced Liquid Processing System (ALPS) treated water at TEPCO's Fukushima Daiichi Nuclear Power Station; and (3) examples of efforts made in the Japan Atomic Energy Agency (JAEA) and the National Institutes for Quantum and Radiological Science and Technology (QST) for research and development activities during the COVID-19 pandemic (For details, refer to page 3).

The 4th FNCA Award Ceremony

FNCA Awards were given to the countries that have made significant achievements through the FNCA project activities in 2019. The Best Research Team was awarded to Japan (Climate Change Science Research), and the Excellent Research Team was awarded to Indonesia (Radiation Processing and Polymer Modification) and Malaysia (Mutation Breeding) (For details, refer to page 4).



Dr. NAGAI Haruyasu
Project Leader of Japan
(Climate Change Science Research)
The Winner of Best Research Team
of the Year

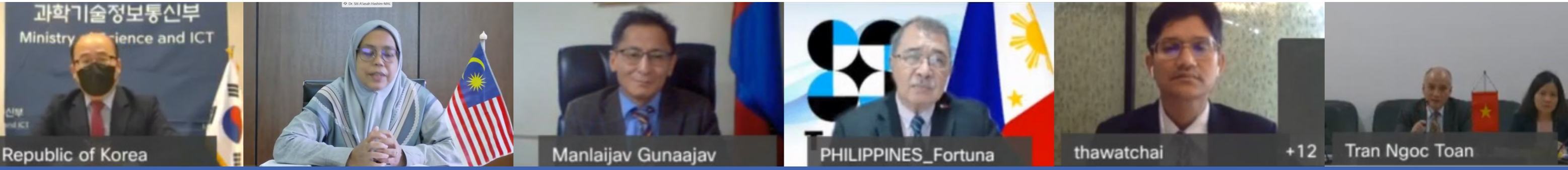
Project Report

Mr. WADA Tomoaki, FNCA Coordinator of Japan reported on the "FNCA project activities and achievement in 2020". Coordinators Meeting scheduled in March 2020 changed to "Ad Hoc Coordinators Meeting 2020" by emails. The evaluation of the projects to be finished in the end of FY2019, and the evaluation of proposal of new project were postponed. Information on the progress of existing projects was shared online.

Joint Communiqué

- The meeting concluded with the adoption of a Joint Communiqué that defines the following activity policies:
- Maximize efforts to promptly normalize FNCA project activities and the several regular meetings while ensuring the safety under the pandemic of COVID-19.
 - Anticipating that IAEA will strengthen its coordination with the relevant international organizations including the WHO in combating zoonotic diseases including COVID-19, explore possible collaboration between the FNCA and the IAEA in the future.
 - Enhance cancer therapy with radiation technology in the Asian region.
 - Adopt "Nuclear Isotopic Technology and Climate Change" as the topic of the 2021 Study Panel.
 - Adopt "The Enhancement of Utilization of Research Reactors and Accelerators" as the topic of the Round Table Discussion of the 22nd FNCA Ministerial Level Meeting.
 - Promote activities related to the applications of nuclear science and technology, particularly in sustainable agriculture development and food security, environmental protection, medical care and human health, and infrastructure development for nuclear safety and security culture.
 - Activate organizational exchange of human resources among universities and research institutions, and of information related to the reinforcement of HRD infrastructure by utilizing virtual means such as webinar and/or online workshops where appropriate.
 - Continue to promote public communication to raise an awareness of, and build public trust in, nuclear technology through the public relations functions of the FNCA such as its website and open seminars in the member countries, and make efforts to further reinforce the relationships with relevant international institutions, including the IAEA and the OECD/NEA.

For detailed results of the Ministerial Level Meeting, refer to https://www.fnca.mext.go.jp/english/mini/e_21_minister.html



Mr. Chang-Yune LEE
Ministry of Science and ICT (MSIT)
Republic of Korea

Dr. Siti Aiasah HASHIM
Malaysian Nuclear Agency
(Nuclear Malaysia)

Mr. MANLAIJAV Gunaajav
Nuclear Energy Commission (NEC) of Mongolia

Mr. Fortunato T. DE LA PEÑA
Department of Science and Technology (DOST)
The Philippines

Dr. Thawatchai ONJUN
Thailand Institute of Nuclear Technology (TINT)

Dr. TRAN Ngoc Toan (Left)
Vietnam Atomic Energy Institute (VINATOM)

Mr. INOUE Shinji Minister of State for Science and Technology Policy, Japan

In a policy speech given last October, Japanese Prime Minister SUGA Yoshihide announced that Japan will develop a carbon-neutral, decarbonized society by 2050. Given this, nuclear energy is expected to play a key role in contributing to a reduction in greenhouse gas emissions. Thus, Japan is pursuing the stable and long-term utilization of existing light water reactors (LWRs), while stressing the importance of safety by ensuring that new regulatory standards are met. To date, nine reactors have already been restarted, seven are being renovated following approval by the Nuclear Regulation Authority (NRA) in relation to compliance with regulatory standards, and eleven are under review by the NRA in relation to additional safety measures.

In terms of the decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station (FDNPS), the Government of Japan has not yet decided on how water treated by the Advanced Liquid Processing System (ALPS) should be handled. If this water is discharged into the environment, it will be sufficiently repurified and diluted to meet regulatory standards for radionuclides, including tritium.



During the COVID-19 pandemic, nuclear and radiation related facilities (e.g., the Japan Atomic Energy Agency (JAEA) and the National Institutes for Quantum and Radiological Science and Technology (QST)) have implemented various operational continuity measures. At the JAEA, although it is difficult to access the Japan Proton Accelerator Research Complex (J-PARC) directly due to the pandemic, remote access experiments are being conducted using several neutron instruments instead to ensure continued research opportunities. To sustain its research activities, QST has recommended that all its staff install the contact tracing app on their smartphones. Technologies such as quantum sensors and spin photonics can be considered areas of research that could potentially help to resolve the COVID-19 pandemic.

Japan Team Wins “Best Research Team of the Year”



Best Research Team



Japan
Climate Change Science Research Project
Project Leader of Japan: Dr. NAGAI Haruyasu
Japan Atomic Energy Agency (JAEA)

A Japanese research team consisting of the Japan Atomic Energy Agency (JAEA), the National Institute for Environmental Studies (NIES), the University of Tokyo, and Ibaraki University is participating in the FNCA Climate Change Science Research Project. The team successfully completed the “Practical Guide on Soil Sampling, Treatment, and Carbon Isotope Analysis for Carbon Cycle Studies” and disseminated it to the project member countries. Owing to this achievement, the team won the FNCA Award for Best Research Team of the Year at the 21st Ministerial Level Meeting.



Left: Dr. OKA Yoshiaki, Chairman of JAEC
Right: Dr. NAGAI Haruyasu



Excellent Research Team of the Year

“Excellent Research Team of the Year” awards were presented for the projects conducted by the two countries listed below in recognition of their achievements after the Best Research Team.



Indonesia
Radiation Processing & Polymer Modification Project



Malaysia
Mutation Breeding Project

Development of Nuclear Technologies to Combat COVID-19 in FNCA Member Countries

Australia

A number of beamlines at the Australian Synchrotron in Melbourne are being used to help researchers construct the molecular structures of COVID-19 proteins in 3D.

The Philippines

To assist in the fight against COVID-19, the Philippines is developing 3D-printed Venturi valves for use in air ventilators. In addition, irradiation sterilization studies are being conducted to determine the applicability of this process.

China

In the early days of the COVID-19 outbreak in China, irradiation technologies were used to replace the traditional ethylene oxide method of sterilizing medical protective equipment, which helped alleviate the shortage of such equipment.

Thailand

At the outset of the pandemic, surgical and N95 masks became scarce due to rising demand. The Thailand Institute of Nuclear Technology (TINT) and other such organizations collaborated to develop innovative masks treated with electron beams. In addition, graduation diplomas were irradiated to reduce the risk of COVID-19 contamination.

Indonesia

The gamma irradiation technique is expected to be used as an alternative means of inactivating a virus in the vaccine development process. Irradiation using gamma and electron beams can also help in the sterilization processes for various medical substances that are becoming increasingly necessary during the pandemic.

Vietnam

Vietnam has applied a reverse transcription polymerase chain reaction (RT-PCR), a method derived from nuclear technologies, to successfully develop test kits for detecting the COVID-19 virus. This continues to be the most accurate method available. Medical equipment and products are irradiated for sterilization.



Gamma Irradiation in the development of
Venturi valves (The Philippines)



Irradiated face masks
(Vietnam)

FNCA Open Seminar

At the FNCA, open seminars are convened at a workshop venue annually in order to share information on project activities and achievements with local citizens. Due to the COVID-19 pandemic, all project workshops were held online in FY2020. In recognition of the effort that has gone into holding these open seminars over the years, the project leaders for seven FNCA projects recorded presentations on their activities and achievements. Titles of the presentations are provided below, and the recordings are available from the following FNCA website.

https://www.fnca.mext.go.jp/english/e_project.html

※ Refer to the report of 2020 workshop in the website of each project.



Recording of the FNCA Open Seminar

Project	Title of Presentation
Mutation Breeding	FNCA Mutation Breeding Project
Radiation Processing & Polymer Modification	Radiation Processing and Polymer Modification for Agricultural, Environmental and Medical Applications
Climate Change Science Research	FNCA Climate Change Science Research Project Overview
Radiation Oncology	FNCA Radiation Oncology Project for Cervical Cancer
Research Reactor Utilization	Report of Project Activities on Research Reactor Utilization(RRU) Overview of the FNCA RRU Project — NAA Sub-Project
Radiation Safety & Radioactive Waste Management	NORM/TENORM Problem
Nuclear Security & Safeguards	FNCA Nuclear Security and Safeguards Project

Crop Breeding Using Gamma Rays or Ion Beams: Conducting Activities Under Themes Suited to the Country's Needs and Timing Requirements

The FY2020 workshop was held online, with an online meeting being held on November 11 and subsequent discussions being conducted via email from November 11 to 25. Representatives from 10 countries attended the workshop.

During the online meeting, participating countries described their progress and presented their activity plans in relation to the project entitled "Mutation Breeding of Major Crops for Low-Input Sustainable Agriculture under Climate Change". After that, proactive Q&A sessions and opinion exchanges were carried out via email.

The mutation breeding project has carried out activities under various themes. The project team has summarized the results of these activities in reports published on the following FNCA website:

https://www.fnca.mext.go.jp/english/mb/e_introduction.html

- ◆ Drought Tolerance in Sorghum and Soybean (2002–2006)
- ◆ Insect Resistance in Orchids (2003–2009)
- ◆ Disease Resistance in Banana (2004–2010)
- ◆ Composition or Quality Improvement in Rice (2007–2012)
- ◆ Mutation Breeding of Rice for Sustainable Agriculture (2013–2017)



Salt-tolerant landrace from coastal area of Bangladesh (left) and early-maturing mutant line (right)



Local variety of rice in Indonesia (center) and early maturing mutant lines



Activity Result Reports



Achievement Sub-Project on Mutation Breeding of Rice for Sustainable Agriculture (Published in 2020)

Message from the Project Leader of Japan

In plant breeding, it is very important to visit the actual sites as they can teach us a lot of things. Since the workshop was held online this year, we were unable to visit the sites, of course. However, thanks to the advantages of the Internet, more researchers - especially young ones - attended the workshop than usual. Also, the email discussion held after that was quite productive as everyone engaged in the discussions proactively. Even with the current restrictions on research activities, the participating countries are steadily carrying out whatever actions the current situation allows them to do. I believe it is important for us to continue our research collaborations and discussions through the FNCA framework.



Dr. HASE Yoshihiro
Project Leader of Japan



Participants in the Online Workshop

Yuliasti Mutation Breeding Project

Aiming to Develop Crop Varieties Resistant to Climate Change and its Impacts by Using Radiation Breeding Technologies

Leading Country: Japan

Participating Countries: Bangladesh, China, Indonesia, Japan, Republic of Korea, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (10 Countries)

The Mutation Breeding Project has been carried out with the aim of developing new crop varieties that are in high demand in the Asian region, such as sorghum, soybeans, orchids, bananas, and rice, by using mutation breeding technologies. These technologies involve gamma ray or ion beam irradiation and contribute to increased food production and improved crop quality in the region. Since FY2013, the project team has launched activities targeted at rice, an important crop in the Asian region. The activities have focused on addressing issues caused by climate change, which has increasingly attracted international attention, and contributing to sustainable agriculture. As a result, new crop varieties that are superior in terms of various environmental stress tolerances (e.g., disease resistance, drought tolerance, and salt tolerance) have been developed in many participating countries. Since FY2018, the project team has launched the activities that expanded its range of targets beyond just rice to include other major crops that are in high demand in the respective countries. The activities aim at

contributing to the promotion of sustainable agriculture by developing new crop varieties that are resistant to various environmental changes caused by climate change and can be produced with even less inputs of chemical fertilizers and agrochemicals.

Local crop varieties are already well adapted to the local environment. In some participating countries, the project team is utilizing the local crop varieties to pursue research into the development of new crop varieties that are better suited to cultivation by resolving problems such as low yields, long cultivation periods, and long plant heights while retaining their preferable characteristics.

Cooperation in the use of ion beam irradiation is provided by Takasaki Advanced Radiation Research Institute of the National Institutes for Quantum and Radiological Science and Technology (QST) in Japan, thereby contributing to the promotion of research in the respective countries.

Efforts toward Practical Use of Radiation Processed Products in Member Countries

In member countries, oligo-chitosan produced by radiation processing of shrimp shells is experimentally used as feed additives for chickens or farmed fish. In Indonesia, excellent results have been obtained, such as increased production of chicken eggs and promoted growth in farmed fish. In Vietnam, the survival rates of farmed fish have improved. In the Philippines, plant growth promoter (PGP) produced by radiation processing of carrageenan, a natural polymer from seaweed, was foliar-sprayed over paddy-field rice. The result was that the stems of the rice became strong and did not fall over during typhoons. This result has triggered significant progress of the technology transfer. Additionally, the use of super water absorbent (SWA) in arid regions of Kazakhstan improved the survival rate of seedlings.

Furthermore, a wide range of R&D are also under way such as application of hydrogels produced by radiation cross-linking to three-dimensional cell culture substrates (Japan, Malaysia, etc.) and to hemostats (The Philippines), preparation of metal adsorbents by irradiation-induced graft polymerization and application of them to the removal of harmful metals (China), and development and commercialization of liquid multifunctional Biofertilizer (Malaysia).

■ Achievements of the project

The results of the project are published as reports. These reports are open to the public.

- ◆ FNCA Guideline on Development of Hydrogel and Oligosaccharides by Radiation Processing
- ◆ FNCA Guidelines on Chitosan PGP Application for Rice, Chili and Other Crops

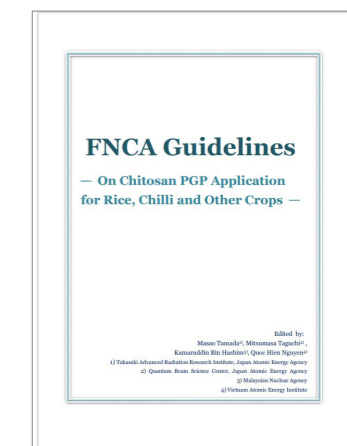
https://www.fnca.mext.go.jp/english/eb/e_projectreview.html

■ Workshop

Workshop in FY2020 were held online on October 26-27. Ten countries participated in the online workshops. The current status of R&D activities and the impact of COVID-19 in each country were reported.



In Kazakhstan, the survival rate of Scotch pine seedlings in arid regions was improved by using super water absorbent (SWA)



FNCA Guidelines on Chitosan PGP Application for Rice, Chili and Other Crops

It was reported that field tests and discussions with stakeholders for the commercialization of products were conducted even though R&D activities were limited by lockdown and work from home. Participants engaged in lively discussions and exchanged their opinion.

Message from the Project Leader of Japan

This project is aimed at promoting the R&D of the seven themes selected to meet the needs of the member countries and technology transfer of the developed radiation processing technologies. In the workshop, the current status of the R&D and technology transfer are shared. Moreover, challenges are clarified and research plans for the next few years are developed through group discussions on the seven R&D themes. In the current fiscal year, although the workshops were held online for four hours on two days because of COVID-19, the achieved results could barely be shared through presentations from each country and Q&A sessions. The irradiation facilities of more than half of the member countries stopped operating, and research activities were also restricted. However, they seem to be gradually recovering from such situations. In the next fiscal year, we will continue advancing the project through the facilitation of needs-based R&D, with the goal of achieving socioeconomic fruits for the member countries.



Dr. TAMADA Masao
Project Leader of Japan

Aiming to Utilize Radiation Processing in the Agricultural, Environmental and Medical Fields

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

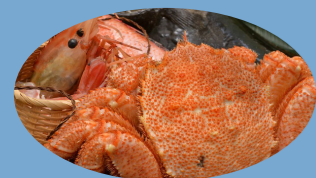
Leading Country: Japan

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

Molecules with high molecular weight are termed polymers of which derived from natural resources such as animals and plants are called natural polymers. Natural polymers can be obtained inexpensively from shrimp shells, crab shells, cassava, seaweed and so on, which are easily available in member countries. By applying radiation processing to them using electron beam and gamma-rays, new materials that benefit the member countries can be developed. In the case of DNA, natural polymers in microorganisms, biofertilizer having a variety of functions are being developed through microorganisms breeding by gamma-rays irradiation.

The radiation processing and polymer modification project conducts research activities with the target of promoting development and practical use of new products through a wide utilization of radiation processing in the agricultural, environmental and medical fields in line with the needs of the member countries. In our workshop, we not only promote information exchanges of research and development (R&D) among the member countries, but also share experimental data through joint research. Moreover, we actively disseminate knowledge about radiation processing technology to end users through open seminars.

■ Examples of Polymer Modification by Radiation Processing



Natural polymers extracted from shells of crustaceans such as shrimps and crabs (chitosan)



Natural polymers extracted from cassava (starch)

Polymeric property modification by radiation processing

Plant Growth Promoter (PGP)



Super Water Absorbent (SWA)



Deploying Radionuclide and Isotopic Analytical Techniques Globally and Contributing to Measures Against Global Warming

Demonstration of sediment sampling at Rawa Pening Lake in Indonesia (FY2018 Workshop)

Leading Country: Australia

Participating Countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (11 Countries)

In the natural world, there exist countless numbers of naturally occurring radionuclides and isotopes in soil, rocks, rivers, lakes, oceans, forests and so on. By collecting them and conducting a nuclear technology-based analysis of them, we gain a key understanding of what the climate, the land features and the environment of terrestrial areas and ocean areas were like in the past and how they will change in the future. The Climate Change Science Research Project was launched in FY2017 based on a proposal from Australia. The 11 FNCA member countries are carrying out activities aimed at combining the data that they have obtained through the use of nuclear technologies to identify the phenomena that cause climate change.

To analyze samples obtained from the natural world, precise pre-processing is required. To ensure that the analyses progress smoothly in each country, Japan and Australia are promoting the use of pre-processing technologies through this project. In addition, Japan accepts young researchers from participating countries and shares with them measurement technologies that utilize accelerator mass spectrometry (AMS).

In past workshops, sediment sampling being conducted at a lake in Java, Indonesia, was demonstrated in FY2018, followed by a visit to the Varve Museum in Wakasa-town, Mikata-kaminaka district, Fukui prefecture, in FY2019. Through these workshops, the participating countries deepened their understanding of sampling technologies and how to utilize the analysis results.

In FY2020, the workshop was held online, with each country reporting on the progress that they had made in their research activities and conducting an investigation into the possibility of starting a new activity on food provenance under the project. Living organisms, from which meats and marine products are produced, are composed of carbon, oxygen, nitrogen, and hydrogen. Their ratios of stable isotopes vary depending on the growth environment. Fraudulent claims concerning the place of origin of food have sometimes been a problem in recent years, but the accuracy of the indicated places of origin can be confirmed by analyzing the stable isotopes of foods.



Participants in the Online Workshop

Research in Project Member Countries

Indonesia is researching the impact of climate change on its coastal ecosystem by analyzing blue carbon (carbon absorbed and solidified by seaweed, plankton, and other aquatic organisms) in mangrove forests. Since mangroves provide superior CO₂ absorption through photosynthesis, they are expected to make a significant contribution to carbon reduction. Bangladesh and Malaysia are performing environment assessments and researching saline concentration and turbidity by analyzing the sediments in mangrove forests.

The Philippines is sampling coral fossils and modern corals to research changes in the marine environment, such as rises in the sea surface temperature and sea level,

by using 3D X-ray scanning and carbon (C-14) dating. In addition, they are researching evidence of past nuclear bomb tests and nuclear accidents based on the ratio of the radioisotope (I-129) for iodine that remains in corals.

Thailand is analyzing shellfish fossils to research changes in the paleoclimate. With the cooperation of Wat Chedi Hoi (Pathum Thani Province, central Thailand), where a temple made of oyster shells was built, the project team took samples of the oyster shells and performed tests such as neutron activated analysis, wavelength dispersive X-ray fluorescence spectrometry (WD-XRF), inductively coupled plasma mass spectrometry (ICP-MS), and mass analysis of oxygen isotope ratio.



Sampling from mangrove forest
In Indonesia



Sampling of coral fossils in the
Philippines



Wat Chedi Hoi Temple in Thailand

Practical Guide on Soil Sampling, Treatment, and Carbon Isotope Analysis for Carbon Cycle Studies

In Japan, a research group of the Japan Atomic Energy Agency (JAEA) as well as a research team consisting of representatives of various research institutes and universities are participating in this project. The research team in Japan is carrying out studies to determine the carbon behavior of accumulation and release (carbon cycle) in the land ecosystem, which has a significant influence on global warming, with the aim of predicting and mitigating it. In FY2020, JAEA developed guidelines for the methods used to determine the carbon cycle. The guidelines cover a wide range of topics, including soil sampling, soil sample treatment, isotope ratio mass spectrometry for carbon isotopes, and accelerator mass spectrometry of radiocarbon. As a result, they enable research teams in Asian countries to perform carbon cycle studies by themselves.

The guidelines is available from the following FNCA website:

https://www.fnca.mext.go.jp/english/ccs/e_guide.html

Message from the Project Leader of Japan

By using the technologies that JAEA has accumulated in the nuclear field, the project team has performed R&D aimed at contributing to global warming mitigation by utilizing radiocarbon. In FY2020, our achievements were highly rated and we won the Best Research Team of the Year at the FNCA Ministerial Level Meeting, partly because we had finished developing the "Practical Guide on Soil Sampling, Treatment, and Carbon Isotope Analysis for Carbon Cycle Studies" in cooperation with the National Institute for Environmental Studies, the University of Tokyo, and Ibaraki University.

In the future, we will use the guidelines to promote international cooperation with research teams in Asian countries. We are expected to organize basic data related to soil organic matter in the Asian region, accurately evaluate CO₂ emissions from the soil, which depend on temperature changes, and contribute to problem solving in global warming research.



Dr. NAGAI Haruyasu
Project Leader of Japan



Radiation Oncology Project

Improving Radiation Oncology in the Asian Region by Conducting Multinational Collaborative Clinical Trials

Leading Country: Japan

Participating Countries: Bangladesh, China, Indonesia, Japan, Kazakhstan, Republic of Korea, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (11 Countries)

In collaboration with 11 FNCA member countries, the Radiation Oncology Project is carrying out collaborative clinical trials on the use of radiation oncology for uterine cervix cancer, nasopharyngeal cancer, and breast cancer, all of which have a high incidence in the Asian region. By establishing optimal treatment protocols for radiation therapy and chemotherapy through these clinical trials, the project team aims to improve cancer treatment efficacy and the level and quality of radiation therapies in FNCA member countries. In particular, they have established five types of protocols to date for the clinical trials for uterine cervix cancer, which has the highest incidence and death rates in women.

Attended by the 11 FNCA member countries, a workshop for this project was held online on November 27, 2020. At this workshop, the treatment results for the three ongoing clinical trials for uterine cervix cancer, nasopharyngeal cancer, and breast cancer were reported by the Japanese representatives. All of the trials are basically progressing smoothly. Also, the results for the dosimetry audits conducted on a total of 4 hospitals, in China (October 2019) and the Philippines (January 2020) were reported by Japan. The audit aims to ensure uterine cervix cancer treatments be performed with an appropriate radiation dose.

These audits will be resumed as soon as the COVID-19 pandemic subsides.

Furthermore, the results of questionnaires on "Palliative Radiation Therapy for Bone Metastasis & Brain Metastasis" conducted among participants in prior to the workshop were presented. The project team has been considering these therapies as new clinical trials and will continue to hold discussion to establish the protocols.

In addition, the project team held a special session entitled "Status of Radiotherapies during the COVID-19 Crisis," where the participants presented country reports concerning the performance of radiation therapies in 15 hospitals located in the 11 countries participating in the project under the difficult circumstances associated with performing normal medical practices during the COVID-19 crisis. Together with various data (e.g., the number of infectious patients in each country), reports were presented on the status of medical field and the various efforts being made to provide therapies while avoiding the risk of infection. Some of the reports presented in this session will be introduced on the next page.

Providing Radiation Therapies While Reducing Infection Risks during the COVID-19 Crisis

In 2020, the COVID-19 pandemic that swept across the entire world also had a significant impact on the practice of medicine in hospitals. With many hospitals struggling to admit and treat infectious patients, the pandemic restricted access to normal treatments and therapies. Radiation therapies for patients with cancer were no exception.

In Indonesia, the number of infectious patients has continued to increase since the first domestic COVID-19 infection was confirmed at the beginning of March 2020. By the end of the year, the accumulated number of domestic infectious patients had exceeded 700,000. At the Cipto Mangunkusumo Hospital in Jakarta, many cancer patients refrained from making routine hospital visits due to fears about the risk of infection, so the hospital was unable to perform scheduled therapies and follow-up appointments.

Given this, radiation therapy staff took various infection prevention measures for both themselves and their patients and utilized therapeutic methods that reduced the need for patients to make hospital visits by providing online medical services and increasing the radiation dose delivered each time. In addition, they provided radiation therapies for cancer patients who were infected with COVID-19 only in urgent cases and at the end of the day while also mitigating the risk of infection via the treatment rooms and therapeutic equipment. They suspended treatment for other patients until the infectious patients had recovered from COVID-19. Specific measures and experiences related to the provision of radiation therapies during the COVID-19 crisis in Indonesia have also been summarized in a research paper, which is expected to serve as a set of guidelines for the current situation, with infections still spreading, and future infectious disease pandemics.



Hospital staff asking a visitor for his contact information in case he contracts a hospital-acquired infection



Rearranged breakroom to allow sufficient space between staff



Online staff meeting



Medical staff treating a cancer patient while wearing personal protective equipment



Online medical care



Research paper on the current situation and efforts to provide radiation therapies during the COVID-19 crisis in Indonesia



Message from the Project Leader of Japan

At this workshop, FNCA members reported on their efforts to provide radiation therapies while implementing measures aimed at reducing the risk of infection even though COVID-19 infections were spreading significantly. The fact that hypo-fractionated radiotherapy (radiation therapy that increases the dose per irradiation session and reduces the overall number of irradiation sessions/hospital visits) continued to be carried out in the hospitals of many member countries is particularly impressive. During this pandemic, therapies that require short-term irradiation sessions are effective so they should be used more actively and frequently.



Prof. KATO Shingo
Project Leader of Japan

Building a Network for the Widespread Utilization of Research Reactors

The RRU project covers quite a broad range of topics. Holding a workshop every year gives the project team an opportunity to build a network.

Radioisotope production is the topic that attracts the most attention from each country. It is important to secure a stable supply of medical isotopes, so the ANSTO built a ^{99}Mo (molybdenum) production facility in 2017 to supply ^{99}Mo to domestic and overseas markets. Going forward, the RRU group will also exchange information on the production and practical quality assurance/control of new isotopes.

NAA is a method that allows the various elements contained in a sample to be analyzed and quantified simultaneously in a non-destructive way. As an element analysis method that can quantify multiple elements in a solid sample at almost the same time without destroying the sample, it has superior characteristics to other analysis methods and it is actively used in each country. The NAA group performs the environmental monitoring of pollutants in media such as the air, soil, rivers, lakes, and seas while also using non-NAA analysis methods according to the particular situation in each country. By using both NAA and other analysis methods, the NAA group is expected to confirm data reliability.



ANSTO's ^{99}Mo production facility
(Australia)



Sampling equipment for airborne
particulate matter (China)



Soil sample analysis using NAA
(Malaysia)

Message from the Project Leader of Japan (RRU)

Each country is doing its utmost to actively promote this project. Through mutual exchanges about research reactors in Asian countries, the project is expected to clarify the functions and roles of the research reactors required in the Asian region. While ascertaining the situation in each country, we aim to identify new themes, develop topics that we have already discussed and technologies that we have accumulated, and establish a bridgehead toward the building of new research reactors in each country.



Prof. OHTSUKI Tsutomu
Project Leader of Japan (RRU)



Prof. EBIHARA Mitsuru
Project Leader of Japan (NAA)

Message from the Project Leader of Japan (NAA)

Of the many analysis methods that can be used, the NAA is an important element analysis method that is utilized for a substantial portion of the research reactors in Asian countries. It is important to raise and maintain the technological levels of participating countries. We also aim to actively perform PR activities so that a wide range of end users understand the effectiveness of the NAA and the importance of research reactors.

Research Reactor Utilization Project

Promoting Cooperation among Researchers for Multiple Utilization of Research Reactors

https://twitter.com/JAEA_JRR3/status/1333700322766647297

Leading Country: Japan

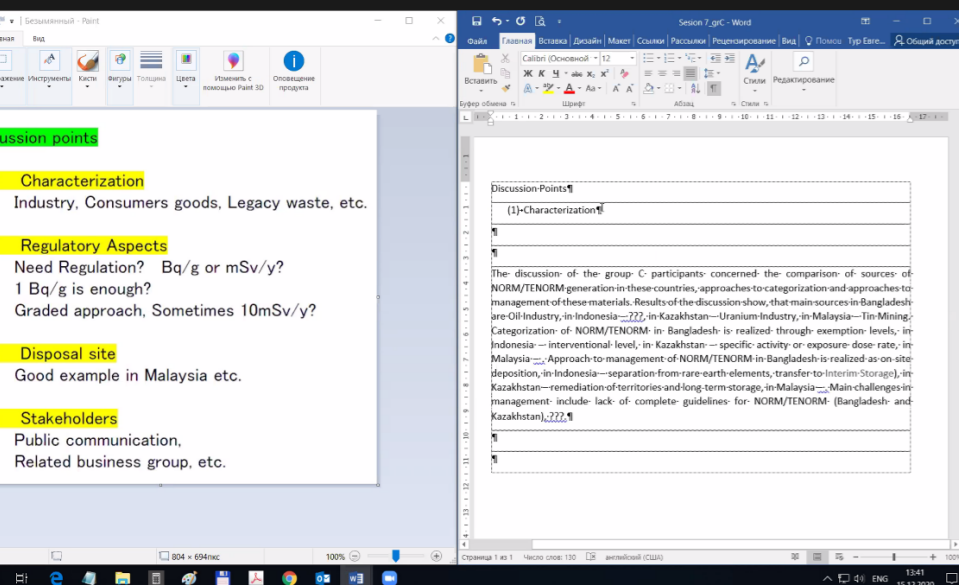
Participating Countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Republic of Korea, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (12 Countries)

Many Asian countries have operated and managed research reactors for many years, and they utilize them for a variety of applications. The Research Reactor Utilization (RRU) project shares information such as the characteristics and usage status of a country's research reactors with the aim of improving the research knowledge and technical skills of researchers and engineers in FNCA member countries.

At its workshops, the RRU group reported on their efforts in FNCA member countries and shared information under the following themes; "Isotope Production Including New Isotopes" and "New Research Reactors" in FY2017; "Boron Neutron Capture Therapy (BNCT)", "Neutron Radiography (NR)", and "Material Research" in FY2018;

and "Nuclear Science including Human Resource Development (HRD)" in FY2019. The Neutron Activation Analysis (NAA) group analyzed suspended particulate matter (SPM), which causes air pollution, and rare earth elements (REEs) found in mineral resources.

Attended by the 12 FNCA member countries, a workshop for this project team was held online on December 17, 2020. Many countries have found it difficult to conduct research activities due to the COVID-19 pandemic. The RRU group reported on the current status of "Radioisotope production and new isotopes" in each country during the COVID-19 crisis, while the NAA group reported on "Environmental monitoring using NAA and other measurement technologies".



Activities with a Focus on NORM/TENORM, Spent Radiation Sources and Nuclear Disaster Prevention

The FNCA 2020 Workshop on RS&RWM Project was held online on December 14-15, and 11 FNCA member countries participated in this workshop.

In a new phase which starts in FY2021 (FY2021-FY2023), we are planning activities that are aimed at making a report on Naturally Occurring Radioactive Materials (NORM) / Technologically Enhanced Naturally Occurring Radioactive Materials (TENORM), spent radiation sources management and nuclear disaster prevention. As part of the preparation work, "NORM/TENORM", which is a common issue of the participating countries, was decided as the main topic of this workshop, and the participants delivered their presentations on the current situation of NORM/TENORM and exchanged their opinions on the first day. On the second day, the participants were divided into three groups and discussed actively.



A part of the materials presented in online workshop

Radiation Safety and Radioactive Waste Management Project

To Promote Exchanges of Knowledge and Experience on Radiation Safety, Radiation Protection and Waste Management

Leading Country: Japan

Participating Countries: Australia, Bangladesh, China, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (11 Countries)

The FNCA Radioactive Waste Management (RWM) Project, which was a former project of Radiation Safety and Radioactive Waste Management (RS&RWM) project, started in 1995 with an aim for enhancing safety of radioactive waste management in the Asian region. Since then, FNCA participating countries have changed and shared their knowledge that have gained from information and their experiences on the radioactive waste management.

In 2008, while continuing the past activities of the FNCA RWM project, we decided to conduct new activities with a view to enhancing of knowledge and information on radiation safety and radiation protection and the RS&RWM project was launched.

With regard to radiation safety, it is important for the participating countries to properly understand the

contents and concepts of the International Commission on Radiological Protection (ICRP)'s recommendations, the relevant IAEA international standards and other basic information concerned. It is recognized, however, that they cannot be applied directly and uniformly as the laws, regulations, standards or criteria of radiation safety in some cases and each country should have enough practical knowledge and insights to utilize them at the phase of application.

Recently, the participating countries have shared their information, under the theme of "Low-level Radioactive Waste Repositories", to understand the issues and realize the construction plans of those repositories. As a result, we have published the "Consolidated Report on Low-level Radioactive Waste Repository (interim report)" in 2020.

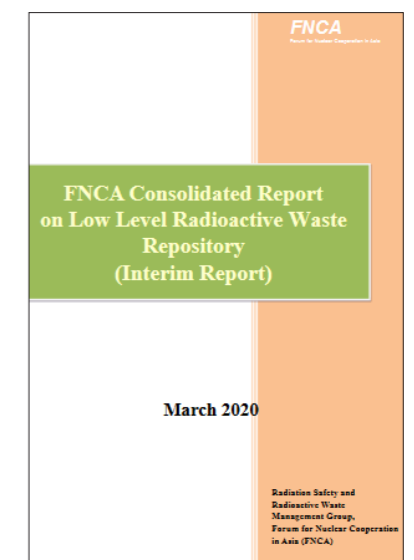
Reports Published on this Project

In RS&RWM project we promoted activities on various topics, and compiled the results of such activities into the reports mentioned below:

- ◆ Radioactive Waste Management (2003)
- ◆ Safe Management of Spent Radiation Sources (2003)
- ◆ TENORM (2005)
- ◆ Current Status of Decommissioning and Clearance (2008)
- ◆ Radiation Safety (2014)
- ◆ Nuclear/Radiological Emergency Preparedness and Response (2017)
- ◆ Low-level Radioactive Waste Repository (2020)

These reports can be found on FNCA website below:

https://www.fnca.mext.go.jp/english/rwm/e_projectreview.html



Consolidated Report on Low Level Radioactive Waste Repository (Interim Report) (Published in 2020)

Message from the Project Leader of Japan

In 2020, the FNCA RS&RWM workshop was held online because of the COVID-19 worldwide pandemic. Although it was a short while, the workshop provided opportunities to exchange their knowledge and concerns for the participating countries, and I think that the workshop was very valuable for the participants. I would like to continue to work together with the participating countries, so the FNCA's activity can be helpful in improving systems and regime of the member countries despite of the different circumstances each country presents.



Prof. KOSAKO Toshiso
Project Leader of Japan

Nuclear Security and Safeguards Project

Online Workshop



Further Strengthening of Nuclear Security and Safeguards in the Asian Region

Leading Country: Japan

Participating Countries: Bangladesh, China, Indonesia, Japan, Kazakhstan, Republic of Korea, Malaysia, Mongolia, The Philippines, Thailand, Vietnam (11 Countries)

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

In recent years, the participating countries have shared information on their recent initiatives and held detailed

discussions about future activity plans and cooperative activities with nuclear forensics, cyber security, radiation source security, and the Additional Protocol (AP) as the major themes.

At the online workshop held in FY2020, information was shared on the nuclear security and safeguards initiatives that were undertaken in each country. The participants gave presentations and held discussions under the theme of good practices regarding export control, which is required for the development of human resources in terms of nuclear security and for the Additional Protocol (AP) in terms of safeguards. In addition, complementary access (CA) using a virtual tour of a research reactor was demonstrated as an online exercise.

Nuclear Security and Safeguards Project

Tabletop Exercises for Nuclear Forensics

Nuclear forensics is a technical method that is used to analyze the composition, physical and chemical form, and other attributes of nuclear and radioactive materials that have been confiscated or sampled by investigative authorities to determine the origin, transportation route, purpose, and other details related to the materials. Because this method enables the origin of nuclear materials used for unauthorized trading, terrorism, and other such activities to be identified, it acts as a deterrent to such activities by increasing the prospects of criminals being identified and facing criminal prosecution.

Nuclear forensics is a subject that FNCA member countries would like to focus on in future. In this project, workshops are held to share knowledge and information related to nuclear forensics among the participating countries. At the workshop held in FY2019, a tabletop exercise (TTX) concerning nuclear forensics was conducted. Through discussions and exchanges of opinion, the participating countries identified priority issues that need to be addressed or strengthened by the designated nuclear forensics organizations or related agencies that have responsibility for nuclear forensics.

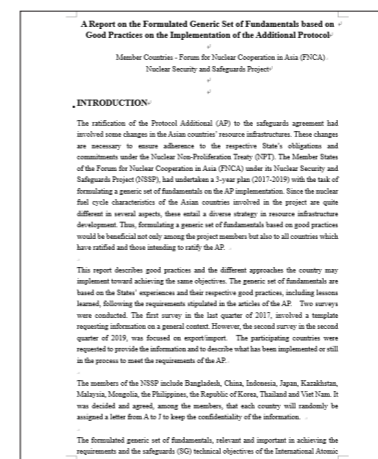
Good Practices in the Implementation of the Additional Protocol (AP)

An Additional Protocol (AP) is concluded with a country that has already concluded a safeguards agreement with the IAEA. The Additional Protocol obligates them to declare any nuclear-related activities that have not been declared under the current safeguards agreement and to allow the IAEA to gain complementary access to places that are not approved under the current agreement, etc. Ratification and implementation of the Additional Protocol are important to strengthening safeguards and the nuclear non-proliferation regime.

A country that has ratified an Additional Protocol must make administrative and technological preparations to allow complementary access and declare the control

status of its nuclear materials. To help FNCA member countries implement these obligations smoothly, the knowledge that participating countries have obtained through their experiences of implementing the Additional Protocol was summarized under this project as a report on good practices in FY2020. This report on good practices has been made publicly available from following FNCA website to help not only FNCA member countries, but also countries that will ratify the Additional Protocol or countries that have experienced problems in the implementation of the Additional Protocol.

https://www.fnca.mext.go.jp/nss/A_Report_on_the_Good_Practices_on_the_Implementation_of_the_AP.pdf



Report on good practices for the Additional Protocol (AP)



Tabletop exercises for nuclear forensics (FY2019 Workshop)



Online exercise for Complementary Access (CA) (FY2020 Workshop)

Message from the Project Leader of Japan

Although we were unable to hold face-to-face meetings due to the COVID-19 measures implemented in FY2020, we held an online workshop in February 2021. At this workshop, we planned to map the roles, required abilities, necessary training, and other matters related to the nuclear security of each country. This would enable participating countries to identify the gaps in their nuclear security systems and strengthen the systems. In future, we aim to promote the sharing of good practices and other information to help strengthen nuclear nonproliferation and nuclear security in the Asian region.



Mr. NAOI Yosuke
Project Leader of Japan

What's FNCA?

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

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

The FNCA Framework



Ministerial Level Meeting

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

Senior Officials Meeting

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

Coordinators Meeting

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

Study Panel

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

Projects

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

Message from FNCA Coordinator of Japan



In 2020, FNCA was affected significantly by the COVID-19 outbreak. Since the World Health Organization (WHO) classified it as a pandemic in March, business days and hours were restricted in many FNCA member countries. One particular issue was that we were unable to perform research associated with field studies or the movement of people. Furthermore, since entry restrictions to prevent the COVID-19 were implemented in each country, all FNCA meetings had to be held online.

During these online meetings, the research results from each country were presented, with some remarkable results being reported in some fields.

The Radiation Oncology Project reported a high 2-year survival rate for Uterine Cervix Cancer (CERVIX-V). The Climate Change Science Research Project established a sampling method for analyzing the C-14 contained in soil by utilizing Accelerator Mass Spectrometry (AMS) and other such techniques. In addition, the Radiation Safety and Radioactive Waste Management Project provided a summary of an intermediate report regarding respective countries' policies for low-level radioactive waste management and treatment facilities and their security initiatives. These results are, of course, testimony to the hard work that have put into these projects over the course of many years.

However, due to time constraints and other restrictions associated with online meetings, it is almost impossible for the project members to consider applying new research elements and ideas regarding how they should proceed with their research by engaging in the small group free discussions that would usually be carried out before and after the meetings in normal circumstances. In the latter half of 2021, we expect COVID-19 vaccines to become more widely available and the situation to improve due to the thorough implementation of COVID-19 infection prevention measures. Consequently, we hope to hold the next FNCA project meeting as real meeting.

WADA Tomoaki, FNCA Coordinator of Japan

FNCA

Forum for Nuclear Cooperation in Asia



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

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